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OVER THE BAR WITH BETTER CANOLA AGRONOMY

Demonstration and trial results
Crop establishment case studies

AUTUMN 2010



better **canola** through enhanced
productivity increasing the **value** of the Australian industry



better OILSEEDS

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INTRODUCTION

While some things never change, this can't be said for canola. Australian growers have steeled themselves in the face of adverse seasons, and their farming practices are continually changing to reduce production and financial risks in growing crops while maximising profitability.

For canola, successful crop establishment is the key to achieving high-yielding crops. Good and even early establishment provides excellent weed competition and makes management decisions for timing of operations straightforward. This booklet aims to provide the latest information from trials and demonstrations and from successful growers as they strive to produce high yielding canola crops.

In contrast to current grower practices outlined in this book, 15 years ago when the canola industry was established, practices differed markedly. For example, growers were advised to cultivate soils deeply to avoid hardpans and provide an ideal seedbed. Growers commonly dropped seed on the soil surface and harrowed it in, hoping for the best. Integrated pest management did not come into the equation and blackleg management meant choosing a variety with good resistance rating and only growing canola in a paddock every four years. Sowing in mid-June in some medium rainfall areas was commonplace and recommended sowing rates were as high as 7 kg/ha. Weed control could be difficult as no herbicide tolerant varieties were available to growers.

Case studies to showcase successful crop establishment techniques

This booklet contains case studies of nine outstanding growers from a range of rainfall zones across Australia. They are finding success in modern cropping techniques to maximise establishment and cost-efficiency for their canola crops. Many of these growers consider a number of factors before deciding to sow canola in a given year, and these become increasingly important in medium and low rainfall areas to minimise financial and production risks. No-till croppers have modified their machinery, sowing rates, row spacing, time of sowing, pest and disease management techniques, fertiliser strategies, weed management and variety choice to successfully get the crop up and make the most of the growing season.

Trials and demonstrations

The results from Better Oilseeds trials and demonstrations from each canola-growing State in 2008 are presented in this book. These provide new information on a range of issues that farmers need to consider before sowing a crop of canola. These include fertiliser strategies, blackleg management, sowing time, variety choice, seed source, herbicide tolerance type and management of dual purpose canola for grain and grazing.

The Better Oilseeds project

The Better Oilseeds project is jointly funded by the Grains Research and Development Corporation and the Australian Oilseeds Federation. The project provides much-needed support for oilseed growers, aiming to lift production of oilseed crops: canola, sunflower, soybean and safflower, ensuring critical mass and consistency of production and improving the quality of grain.

Australian oilseed production peaked in 1999, but the peak was less than what many analysts believed was the potential. In recent years, lower rainfall and/or lower prices have resulted in the crop area declining from the 1999 peak and has also contributed to oilseeds disappearing from some farms in traditional growing areas.

The project aims to put aside the weather and price factors and to look at ways to support the industry to improve the skill level of advisers and growers enabling them to more reliably produce oilseeds under our current climatic conditions and to take advantage of more favourable seasons when they return.



Better Canola demonstration site and case study locations

SUMMARY

This book focuses on canola establishment and presents results from trials/demonstrations and grower case studies from each canola growing State. These growers have found success with canola and are outstanding in their on-farm practices of crop preparation and sowing to maximise establishment of their canola stand.

Trials and demonstrations

The trials and demonstrations in 2008 covered a range of factors growers needed to consider when planning to sow canola and provides knowledge on how to achieve successful crop establishment.

Varieties

In Western Australia, 10 growers across the wheatbelt sowed canola variety demonstrations. The Oilseeds WA/Better Oilseeds canola variety demonstrations in conjunction with National Variety Trial data provide growers with the required information to select a canola variety suited to their region in Western Australia. For results, contact Grain Industry Association of Western Australia.

In 2008 the Better Oilseeds team in Victoria chose to test Roundup Ready canola in the Wimmera and compare it with varieties of other herbicide tolerance types in a demonstration. The demonstration gave hundreds of growers the chance to see the new technology alongside popular Clearfield and triazine tolerant canola varieties, and to view differences in weed control. Results are presented in "GM Canola - Performances and Experience in 2008" which can be downloaded on www.grdc.com.au/gmcanola2008.

Seed quality

A trial at Cummins on SA's Eyre Peninsula in 2007 found that size matters when it comes to canola seed, where larger seed increases yield. In contrast, trials at south-east SA and again at Cummins in 2008 found no effect of seed size on canola yield.

And while size can matter, the source of the seed is also important. A trial at Cummins found in nearly all cases yields were reduced when using farmer-retained seed rather than certified seed, with yield loss up to 26% in 2008.

Sowing rates and row spacing

In south-east SA, three trials looked at the effect of sowing rates on hybrid canola yield. Sowing rates of hybrids are an important consideration for growers. Hybrid seed is often much larger so there are fewer individual seeds per kg of seed sown. However, the increased vigour from hybrids resulted in a higher percentage of seed successfully establishing. However, the high cost of seed relative to the open pollinated varieties is a limitation. The trials aimed to see "how low can you go?" and found the two hybrids tested could be sown at 2 kg/ha without yield loss. The exception was at one site where weed competition was high, demonstrating that early weed control is very important when crops are sown at low rates.

A very low rate (1 kg/ha, or 20 seeds/m²) often reduced yield of both hybrids and open pollinated varieties in trials in south-east SA and the Eyre Peninsula in 2008. This contrasted with a Better Oilseeds trial at Lameroo, in 2007, where low sowing rates (1 and 2 kg/ha) improved canola yields under extremely dry conditions compared with the highest rates (5 and 7.5 kg/ha) for the variety Bravo TT, while sowing rate had no effect at other sites which received more rain that year.

In New South Wales, the results from the second year of a three year trial at Old Junee are presented to determine the optimal row spacing and sowing rate for a hybrid Clearfield and an open pollinated triazine tolerant variety. Results so far have found that widening the row spacing from 18 to 22 to 30 cm tended to

reduce the number of plants established; despite this, yields and oil content were unaffected. The results to date demonstrate the ability of canola to compensate for lower plant densities in some environments which may have been influenced by wider row spacing and/or lower sowing rates. The authors caution that where target plant densities are high with wide row spacing, the number of plants per row may be too high, leading to taller, spindly plants at risk of lodging.

Time of sowing

A trial at Riverton in SA's mid-north high rainfall zone found delayed sowing in 2008 from 29 April to 12 May generally reduced canola yields and oil content. Crops sown later within the sowing window are more likely to experience hotter and drier conditions during pod filling, and later maturing varieties tend to be most affected.

Nutrition

Nitrogen (N) fertiliser is usually the highest single cost for canola growers, so getting it right is imperative. The Better Oilseeds trial at Kerang, Victoria, in 2008 aimed to determine optimal N rates and timing for irrigated canola. The "rule of thumb" for N rates for canola was that the crop needed 80 kg of total N (all sources) to produce one tonne of grain. The question of N rates arose over a number of years when canola trials at the site consistently outyielded the theoretical N-limited potential:

- was this due to later timing of the fertiliser application improving its efficiency?
- or have we overestimated canola's N requirements?

Results from the 2008 Kerang trial were consistent with variety trials in recent years (supported by the Victorian Irrigated Cropping Council). It was found that 60 kg/ha total N was sufficient to produce a tonne of grain at the irrigated trials site, regardless of timing. Higher rates did not improve yields. A new "rule of thumb" has now been established for irrigated canola assuming 60 kg/ha total N is required to produce a tonne of grain.

Timing of N application was also evaluated in dryland canola at Riverton, SA in 2008. In contrast to the Kerang irrigated trial, the trial found that N applied at stem elongation produced lower yields than N applied at sowing. Possibly, the dry finish to the season limited uptake of topdressed N in 2008 and results would be different in a wetter season.

Disease management

Management for the disease blackleg in canola focuses on strategic planning. Surveys of crops in south-east SA and Lower Eyre Peninsula in 2008 found internal infection of blackleg in many varieties. Infection levels of some varieties were higher than expected, including several varieties considered to have excellent blackleg resistance.

A Fact Sheet providing recommendations on management of these varieties in the 2010 season is on page 15. The Lower Eyre Peninsula survey showed most paddocks had internal blackleg infection levels below 10%, therefore unlikely to suffer a yield or oil content penalty. But 12 paddocks had average infection levels between 20 and 40%, potentially reducing yield by 7 to 14%, plus reduced oil content.

In the south-east, the level of yield loss at a certain level of internal infection was twice as high in 2008 (with its dry spring) as measured in the good spring of 2001.

A trial at Moyhall in south-east SA found the fungicide Jockey did not reduce yield loss in varieties with different levels of blackleg resistance in 2008, however work from previous year's has seen increased yields.

Grazing

Grazing of canola crops and bringing them through to harvest is a relatively new concept and taking off rapidly in the high rainfall zones, giving producers vital feed during the winter while still producing a crop. A trial at Riverton in SA found simulated grazing during the vegetative phase reduced grain yield by an average of 13% and oil content by 0.5 percentage points. In the 2008 trial, the effect of grazing on yield was not significantly affected by variety, but will be further investigated.

A similar trial was undertaken at Cummins on SA's Eyre Peninsula, but showed differences in the yield reduction with the five different varieties tested. On average, simulated grazing reduced grain yield by 35% in 2008. The best-performing varieties in the trial were Tarcoola and Hyola 76. Early dry matter production (80 days after sowing) was similar in all varieties, except in ATR-Marlin which was much lower. Note: In 2008 the dry spring did not allow the grazed crops time to recover, in other trials with average spring rainfall grazed crops had less or no yield reduction from grazing.

Case studies

A number of case studies are also presented from across Australia highlighting the adaptability of growers who have modified their sowing systems to suit their environments, evolving with increasingly dry conditions and modifying their methods as the season requires.

Most current canola growers in the high rainfall zone will not change their rotations. While canola growers in the medium to low rainfall zones generally adhere to rotations, their decision to sow canola is more likely to be influenced by factors such as grain prices, the timing of the autumn break and subsoil moisture levels, at the time of sowing. Those in the high rainfall zone often prefer not to dry sow, whereas in areas with less rainfall, dry sowing is more common and provides the opportunity to get the crop in early to make the most of the limited growing season rainfall. Some growers in these areas will "sow by the calendar". For one grower in southern NSW, if no soil moisture is present at the end of April, canola is sown dry.

Canola is usually grown after a cereal in a continuous cropping rotation or after a pasture, particularly if grass weeds are present, to allow for a break from grass weeds before sowing a cereal. One grower from the southern Wimmera typically grows canola after a legume crop to make the most of available nitrogen.

Minimum till and no-till have become increasingly popular. The growers case studied aim to retain as much stubble as possible, although this depends on sowing equipment and stubble loads. A number of factors driving minimum or no-till practices include: less wind erosion (in the low rainfall zone), timeliness of sowing, moisture conservation, less need for burning stubble, less cultivation and associated costs and better soil structure from increased organic matter. The desired result is timelier sowing and better crop establishment. Some growers are also trying integrated pest management with canola.

Knife points are most commonly used in the case studies. However, on some heavy soil types, growers may switch to inverted T-points if sowing into moisture to minimise smearing of the soil. One South Australian farming family uses disc openers to allow them to fully retain stubbles where there is high stubble load. Press wheels are considered ideal for canola to provide good seed-soil contact, particularly when sowing into marginal moisture, preventing the seed from drying quickly. Water from small rainfall events also enters the furrow more readily to improve germination. Growers state press wheels, combined with good stubble cover, have made a major difference to canola establishment in low rainfall areas.

Inter-row sowing is becoming more popular for growers in the low and medium rainfall zones, but can be difficult for growers in the high rainfall zone as wider rows may limit potential yields. Inter-row sowing with discs can also be difficult when discs wander.

Sowing rates used by growers vary from 2 to 5 kg/ha. Sowing rates for hybrids were lower, due to the cost of seed and the excellent early vigour of hybrids. One grower said he used a higher sowing rate when dry sowing, while another sowed at a heavy rate to compensate for early insect damage.

Growers may also alter their herbicide applications when dry sowing. Two growers case studied said they reduced their trifluralin rate and delayed the application of triazine herbicides. One grower would not compromise his weed management even if the plant population is low or patchy as a major reason for growing canola in a rotation is its usefulness in weed (and disease) control for subsequent crops.



Photo: Felicity Pritchard



BETTER OILSEEDS TRIAL

Effect of plant population and row spacing on the yield and oil content of a representative open-pollinated TT and a Clearfield hybrid

Don McCaffery, NSW Department of Industry & Investment, Orange; Chris Duff, Delta Agribusiness, Young; and Mark Harris, Rural Management Strategies, Wagga Wagga

Trial location: OLD JUNE, NSW

Key messages

- Widening row spacing reduced established plants per area for a given sowing rate.
- In 2008 there was no yield difference between 19 and 42 plants/m², or between 18 and 30 cm row spacing. Trials undertaken in 2009 will either validate or challenge this result.
- Plant population and row spacing had no effect on oil content.

Background and aims

In 2007 this project explored the influence of row spacing and plant population (crop architecture) on yield and oil content. In 2007, trials yielded very poorly with no worthwhile results but the crop architecture trial produced some interesting data on establishment rates. It was a three year trial commencing in 2007 and repeated in 2008 and 2009. The outcomes of the three year trial will be reported in a future publication.

A sharper focus of South West Slopes growers on groundcover management, stubble retention and moisture conservation, option of inter-row sowing, and sowing into high stubble loads makes the trial both relevant and timely. Positive or negative effects of row spacing need to be quantified and then managed.

This trial aimed to evaluate the effect of row spacing (18, 22 and 30 cm) and target plant population (20, 40 and 60 plants/m²) on yield and oil content of a representative Clearfield and TT variety.

Site details

<i>Paddock history:</i>	2007 wheat.	
<i>Sowing date:</i>	5 May 2008.	
<i>Plot size:</i>	5 m x 10 m.	
<i>Herbicide and insecticides:</i>		
Date	Crop stage	Product
5 May 2008	Incorporated by sowing	Roundup®
		Treflan®
7 May 2008	Post-sowing, pre-emergence	Dual®
		Talstar®
4 July 2008	Post-emergence (TT Canola only)	Atrazine + Hasten®
	Post-emergence (Clearfield Canola only)	Intervix® + Hasten
16 October 2008	Pod filling	Insecicide
		Sumi-Alpha Flex®
4 November 2008	65% Seed colour change	Desiccant
<i>Soil type:</i>	Red-brown earth (loam).	
<i>Soil pH_{Ca}:</i>	6.2.	
<i>Fertiliser:</i>	100 kg/ha MAP plus 100 kg/ha Gran-Am applied below the seed at sowing.	
<i>2008 growing season rainfall:</i>	190 mm (1 April – 31 October 2008).	
<i>Harvested:</i>	13 November 2008.	

Method

The trial was sown on 5 May 2008 into reasonable seedbed moisture, but the top 1 cm was dry. Seed was treated with Jockey and Senator®.

Trial design was a factorial of 9 treatments x 2 varieties x 3 replicates. The trial was blocked for herbicide tolerance for simplicity of herbicide application and to avoid spray drift, and blocked for row spacing.

Two representative varieties of the appropriate maturity were used; Bravo TT and the Clearfield hybrid 45Y77. These two varieties were popular with growers in the region in 2007 with similar maturity. Sowing rates were calculated based on seed weights, germination percentage and target plant population, ranging from 1.29 to 3.87 kg/ha for Bravo TT and 1.84 to 5.52 kg/ha for 45Y77.

Results

Establishment

Overall establishment was poorer in 2008 compared with 2007 (Table 1). Poorer seedbed moisture at the time of sowing is the likely reason.

Table 1: Average establishment for three plant population targets in 2007 and 2008.

Target plant population (plants/m ²)	Achieved plant population(/m ²)	
	2007	2008
20	21	19
40	38	31
60	52	42
Row spacing (cm)	2007	2008
	18	33
22	38	34
30	30	25

The trend of reduced establishment with wider row spacing was similar to that observed in 2007 (Figure 1).

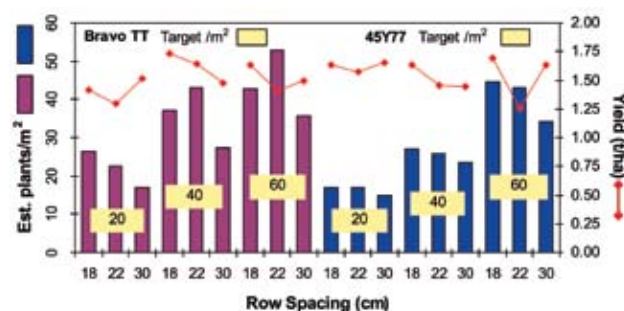


Figure 1: Effect of row spacing and target plant population on plant establishment and yield at June Better Oilseeds site in 2008.

Yield and oil content

The site mean yield of 1.53 t/ha is considered average to slightly below average for June and was probably as good as the season allowed. In the 2008 trial there was no statistical difference in yield between a target of 20 and 60 plants/m² (Table 2), although the achieved plant populations were 19 and 42 plants/m² respectively. Oil content was generally disappointing and a reflection of a very tough finish. Overall the oil content was 7 percentage points under the standard of 42%. Plant population had no effect on oil content.

There was also no significant difference in yield between 18 and 30 cm row spacing, yet a row spacing of 22 cm resulted in a significantly lower yield than 18 cm. The lower yield on the 22 cm row spacing appears to be an anomaly and was investigated again in 2009. Row spacing had no effect on oil content.

Table 2: Effect of target plant population and row spacing on yield and oil content.

	Treatment	Yield (t/ha)	Oil %*
Target plants/m ²	20	1.51	34.9
	40	1.57	35.1
	60	1.52	35.3
	LSD (p<0.05)	0.14 (nsd)	0.47 (nsd)
Row spacing (cm)	18	1.62	34.9
	22	1.44	35.1
	30	1.54	35.3
	LSD (p<0.05)	0.14	0.41 (nsd)

*Oil content at 6% moisture content; LSD = least significant difference; nsd = no significant difference.

Conclusion

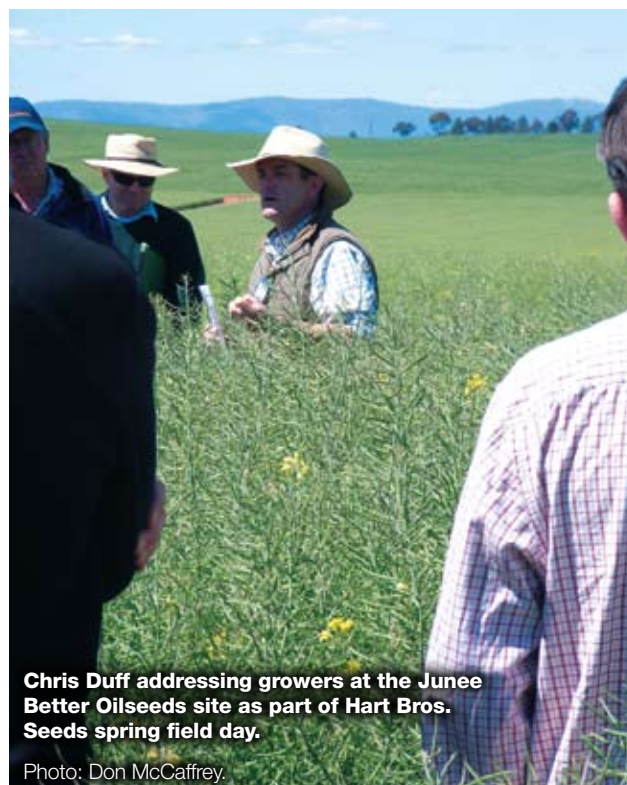
The phenomenon of lower establishment on wider rows for a given sowing rate has been measured in canola as well as other crops in the past. Assuming this phenomenon also occurs with commercial seeders; growers need to be aware that sowing rates may need to be increased to get the target plant population on wider row spacing. However, wider row spacing may result in too many plants established within the row if the target is too high, resulting in taller plants and an increased risk of lodging.

There is a huge difference in seed size between open-pollinated varieties and the hybrids. In this trial Bravo TT contained 275,000 seeds per kilogram, and the hybrid 45Y77 contained 190,000 seeds per kilogram. Therefore hybrids need a higher sowing rate to get the same plant population as open-pollinated varieties, assuming the same germination percentage and establishment potential. Observations with hybrids over the past few years however, suggest that sowing rates and hence plant populations can be lowered, especially when sowing is done on time. These observations require further investigation.

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Co-operator: Bernard & Adrian Hart, Hart Bros. Seeds Pty Ltd, Old June.



Chris Duff addressing growers at the June Better Oilseeds site as part of Hart Bros. Seeds spring field day.

Photo: Don McCaffrey.

IRRIGATED BETTER OILSEEDS TRIAL

Fertiliser sowing decisions



Damian Jones, Victorian Department of Primary Industries and Victorian Irrigated Cropping Council

Trial location: KERANG, VIC.

Key messages

- In this trial nitrogen (N) applied at sowing or topdressed did not affect yield. In dry years with uncertain irrigation allocations, topdressing may be the preferred method for nitrogen application for irrigated canola. This allows for N application if there is potential for high yields.
- This trial found that 60 kg N/ha to produce one tonne of canola was adequate, rather than the recommendation of 80 kg N/ha.
- If P soil levels are adequate, the amount of P applied can be reduced, but reducing P inputs indefinitely is unsustainable.

Background and aims

The rule of thumb derived from the 2001 Topcrop State Focus is: to grow 1 tonne of canola requires 80 kg N. Each year the irrigated canola variety trial nitrogen budget was calculated for a 3 t/ha yield target, or the trial was supplied with a total of 240 kg N/ha from all sources i.e. soil, fertiliser and an estimate of mineralisation.

Despite this, in 2007, the actual average yield exceeded 4 t/ha, with AV-Sapphire recording a yield of 4.5 t/ha and 41% oil content. Does this result mean we are overestimating the amount of N required? Or by applying a majority of the fertiliser N by topdressing, are we increasing the efficiency of N uptake?

Another factor in canola nutrition is supplying adequate phosphorus. With the relatively good P levels at the VICC trial block, do we need to apply P every year?

Site details

<i>Paddock history:</i>	2007 wheat crop failed and cut for silage.
<i>Sowing date:</i>	30 April 2008.
<i>Variety:</i>	AV-Sapphire – a popular variety for irrigation in the region.
<i>Sowing rate:</i>	3 kg/ha.
<i>Plant population:</i>	Target 50 plants/m ² . Very little canola emerged so the site was irrigated on 13 May. Four days later, 20 mm of rain fell, waterlogging the site and later resulting in surface crusting. Despite these setbacks, the establishment rate was 38 plants/m ² , lower than the target of 50 plants/m ² , but still adequate.
<i>Plot size:</i>	15 m x 2 m.
<i>Pre-sowing herbicide and insecticide:</i>	<ul style="list-style-type: none"> • 23 April 2008 knockdown, glyphosate (0.9 L/ha) plus Goal® (75 mL/ha). • 5 June 2008 sprayed for redlegged earthmite using Le-mat® (100 mL/ha). • June 18 2008, Lontrel® applied (0.3 L/ha).
<i>Nutrition/fertiliser:</i>	<p>2008 soil nutrient results showed 80 kg N/ha soil nitrate and 43 - 60 ppm P Colwell.</p> <ul style="list-style-type: none"> • 30 April 2008: Pre-drilled urea and 25 kg/ha P as triple super as appropriate. Starter N (50 kg/ha urea) was applied on all treatments. • 31 July 2008: First N topdressing. • 21 August 2008: Second N topdressing to complete the high rate treatment.
<i>Irrigation:</i>	<ul style="list-style-type: none"> • 9 April 2008: Pre-irrigated (1.8 ML/ha). • 13 May 2008: Second irrigation (0.25 ML/ha). • 11 September 2008: First spring irrigation (1.5 ML/ha) at early flowering. • 3 October 2008: Second spring irrigation (1.0 ML/ha) at the end of flowering. <p>Total water used was approximately 4.55 ML/ha.</p>
<i>2008 growing season rainfall:</i>	121.4 mm (exactly half long-term average of 242.8 mm).
<i>Windrowed:</i>	10 November 2008.
<i>Harvested:</i>	24 November 2008.

Method

Nutrient Budget

The trial was set up with a target yield of 3.5 t/ha. To test the required amount of N needed to produce one tonne of canola, the treatments were 60, 80 and 100 kg N for every tonne of grain targeted. (For example, if we assume 60 kg N/ha is required to produce 1 t/ha grain, then we would require a total of 180 kg N for a 3 t/ha crop.) All treatments received starter N at 25 kg N/ha. Applied N to reach the target was either pre-drilled or topdressed. P treatments were either 0 or 25 kg P/ha pre-drilled.

Treatment Summary

Treatment	N rate (kg N/t target yield)	Total* N rate applied kg N/ha	N application	P applied
1	60	210	Pre-drilled	Yes
2	60	210	Topdressed	Yes
3	60	210	Pre-drilled	No
4	60	210	Topdressed	No
5	80	280	Pre-drilled	Yes
6	80	280	Topdressed	Yes
7	80	280	Pre-drilled	No
8	80	280	Topdressed	No
9	100	350	Pre-drilled	Yes
10	100	350	Topdressed	Yes
11	100	350	Pre-drilled	No
12	100	350	Topdressed	No

*Total N rate includes N from all sources: fertiliser, N in soil at the time of sowing and estimated N mineralised during the growing season.

Design

The trial design was randomised plots with three replicates. The plots were 8 rows wide, sown on 17.5 cm spacing.

Measurements

In addition to grain yield, dry matter cuts were taken to see if there was a vegetative response to when the nitrogen was applied.

Results

- Canola yields did not respond to P due to existing high levels (43 ppm).
- Canola grain yields did not respond to increasing N rates (60, 80 and 100 kg N/t of expected yield) or timing (upfront or topdressed).
- However, dry matter at late flowering was increased by topdressing N compared with similar amounts of N applied up-front.
- Trial average yields were 13.2 t/ha of dry matter at late flowering and 3.52 t/ha for grain.

Table 1: Effect of nitrogen timing and rate on dry matter (DM) yield (t/ha) and grain yield (t/ha).

N rate	N timing	DM yield	Grain yield
60	Pre-drilled	10.57	3.65
	Topdressed	14.66	3.77
80	Pre-drilled	11.16	3.38
	Topdressed	14.30	3.38
100	Pre-drilled	14.66	3.28
	Topdressed	15.37	3.75
p		<0.001	0.12
LSD (p<0.05)		2.21	ns
CV%		9.7	15.1

Conclusion

In future, when calculating nutrient budgets for canola, the revised figure of 60 kg N/ha should be used.

Topdressing or up-front N applications both have their pros and cons, with both methods producing similar yields. In the current climate of uncertain irrigation allocations, not committing to a target yield at the beginning of the season, and incurring the expense, may make topdressing the preferred method.

If P soil levels are adequate, the amount of P applied can be reduced without fear of compromising yields, but be aware that you are “mining” the soil P reserves and reducing P inputs indefinitely is unsustainable.

Acknowledgements

Felicity Pritchard, former Oilseeds IDO; Better Oilseeds Project; Victorian Irrigated Cropping Council; DPI Victoria Northern Grains Team; data analysis by Jenny Smith, Plain Statistics.



Damian Jones with Growers Lindsay Gronow in the Better Oilseeds trial during the VICC field day, October 2008.

Photo: Felicity Pritchard

BETTER OILSEEDS CROP SURVEY AND FUNGICIDE TRIAL



Blackleg levels in south-east SA canola crops and effect of Jockey on yield

Trent Potter, SARDI

Trial locations: VARIOUS FARMS, MOYHALL, SA

Key messages

- Blackleg internal infection was found in many varieties including some varieties that had higher levels than expected.
- Due to the dry spring, the level of yield loss at a certain level of internal infection was twice as high as measured in the good spring of 2001.
- Jockey did not reduce yield loss in varieties with different levels of blackleg resistance.

Background and aims

The aim was to assess the level of blackleg on canola crops and varieties in the south-east SA, the effect of internal infection on yield and the effect of fungicide on blackleg.

Site details

2008 annual rainfall:	531 mm.
2008 growing season rainfall:	348 mm (April – October).
Plot size:	8 m long by 8 rows at 15 cm row spacing.

Method

Disease survey

A survey was conducted of canola crops in 2008. Twenty six canola paddocks across the south-east district were surveyed for blackleg infection within several days of windrowing.

One hundred stems were randomly sampled in each paddock, along 5 diagonal transects between windrows, and scored for % blackleg internal infection in the stem cross-section at the base or crown. Photographic standards of a range of infection levels from 0 to 100%, provided by Dr Steve Marcroft, were used to train scorers and provide consistency between scorers.

Internal infection effect on grain yield

To test the effect of internal infection on grain yield of canola, plants were sampled from a crop at Bool Lagoon. Plants were cut at ground level at windrowing time and were divided into categories of internal infection (Table 2). Lots of 25 plants were then dried and threshed to determine plant and grain yield. Grain weight and oil content were measured.

Efficacy of Jockey on varieties with different disease resistance ratings

A trial was conducted to measure grain yield when varieties with varying levels of blackleg resistance were grown with and without Jockey as a seed treatment. Eight varieties were grown in a split plot design with three replicates. The level of internal infection was determined by cutting and scoring 20 plants per plot at windrowing time. Grain yield was measured by machine harvest.

Results

Disease survey

Average blackleg internal infection scores in individual paddocks ranged from less than 1% to 58% (Table 1). Only at the highest levels of internal infection did external signs of blackleg disease, such as cankers and collapse of plants, become evident.

Table 1: Blackleg infection scores for canola varieties in 2008 south-east SA survey.

Variety	Blackleg resistance rating (2009)	No. of paddocks surveyed	Range of blackleg internal infection severity	Average blackleg infection
45C75	MS	4	24%-49%	42%
46C76	MS	6	24%-52%	42%
ATR-Marlin	MR	5	10%-19%	15%
Hyola 50	R	3	0%-5%	2%
46Y78	MR	3	5%-58%	32%

All varieties showed a wide range of internal infection levels, for example 46Y78 ranged from 5% to 58% infection. This variability is most likely linked to management factors such as proximity to previous year's canola stubbles. The lowest level of blackleg infection was found in Hyola 50. The fact sheet "Managing the risk of blackleg in your crop" is included in this booklet.

Internal infection effect on grain yield

Effect of blackleg internal infection was measured and reported in Table 2. Increasing levels of blackleg greatly reduced dry weight per plant and grain yield but had little effect on harvest index or grain weight. Any level of internal infection above 20-40% reduced grain yield to a high degree. This can be compared to a study conducted in 2001 by Steve Marcroft with a good spring where the level of yield loss was about half of that in 2008 with a poor spring (Table 3). There was surprisingly little effect of internal infection on oil content. This is a different result from the 2001 trial where oil content was reduced by increasing levels of blackleg.

Table 2: Effect of blackleg internal infection on plant yield (g/plant), yield components and oil content in 2008.

Blackleg internal infection %	Mean results				
	Plant dry weight (g)	Grain yield (g)	Harvest index	1000 grain weight (g)	Oil %
0-10	17.6	5.1	29.1	2.86	41.8
20-40	15.4	4.4	28.7	2.82	41.2
50-70	12.9	3.6	27.7	2.75	41.7
80-100	8.1	2.2	27.3	2.73	40.8

Table 3: Effect of blackleg internal infection on canola yield in differing seasons.

Internal infection	% yield loss 2001 (good spring)	% yield loss 2008 (bad spring)
0-10	0	0
20-40	7	14
50-70	12	30
80-100	30	57

Efficacy of Jockey on varieties with different disease resistance ratings

The Jockey trial at Moyhall showed significant blackleg lesions on the leaves early in the season, but low internal infection was found except for the most susceptible varieties (Table 4). This indicates why the use of the fungicide had little effect on grain yield in 2008. In other years we have found yield increases with Jockey applied to varieties with low levels of blackleg resistance. However, while Jockey has previously increased yields of varieties with low resistance, the yield increase has still not matched the yields of varieties with better resistance in past trials.

Table 4: Effect of Jockey on internal infection and grain yield (t/ha) in varieties with differing blackleg resistance ratings 2008.

Variety	Fungicide	Blackleg rating	Yield	Mean yield	Mean internal infection %
Trigold	Nil	VS	1.88	1.89	30.4
Trigold	Jockey		1.92		30.7
ATR-Stubby	Nil	S	1.86	1.88	48.2
ATR-Stubby	Jockey		1.91		33.3
CB Boomer	Nil	MS-S	1.62	1.85	18.5
CB Boomer	Jockey		2.09		14.6
ATR Banjo	Nil	MS	1.78	1.86	36.1
ATR Banjo	Jockey		1.94		29.2
Bravo TT	Nil	MR-MS	2.30	2.27	19.4
Bravo TT	Jockey		2.23		27.8
Rottnest TTC	Nil	MR	1.97	1.94	10.2
Rottnest TTC	Jockey		1.92		11.1
Tawriffic TT	Nil	MR	2.07	2.07	13.3
Tawriffic TT	Jockey		2.06		14.2
Tornado TT	Nil	MR	1.98	2.00	5.1
Tornado TT	Jockey		2.02		5.2
LSD (p<0.05)			ns*	0.19	Data not analysed

*Effect of fungicide and fungicide x variety interaction on yield not significant.

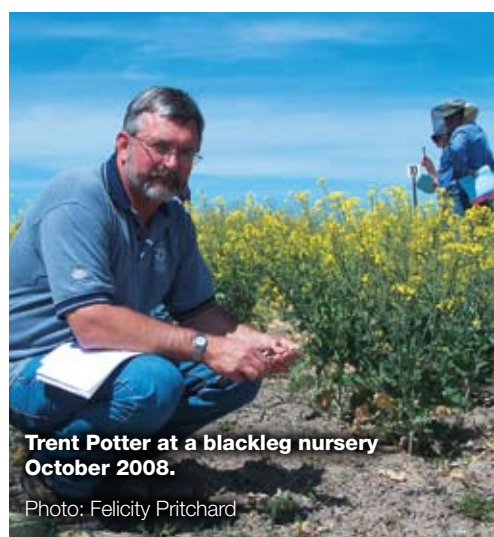
Conclusion

Blackleg is a serious disease of canola. Yield loss can be high in some years and in some paddocks. The crop survey showed how variable the amount of internal infection can be in the same variety in the same region. Yield loss associated with increasing levels of internal infection also shows how damaging blackleg can be even when there are few symptoms of disease on the exterior of the plant. Farmers are encouraged to check their crops for internal infection.

Farmers need to cut plants at windrowing stage to assess how much disease is present to help determine what variety to grow in future, whether to use a fungicide treatment and how well management such as isolation distance from previous stubble is working.

Acknowledgements

Trials and the survey were conducted by the SARDI New Variety Agronomy group at Struan. Farmer Cooperator: John Cooper. This work was funded by GRDC and the Australian Oilseeds Federation as part of the Better Oilseeds program.



**Trent Potter at a blackleg nursery
October 2008.**

Photo: Felicity Pritchard

BETTER OILSEEDS CROP SURVEY

Blackleg disease in Lower Eyre Peninsula canola crops



Jim Egan, Joanne Crouch and Trent Potter SARDI; Kieran Wauchope, Rural Solutions SA

Trial location: VARIOUS FARMS, LOWER EYRE PENINSULA, SA

Key messages

- More than half of the 75 paddocks surveyed had internal blackleg infection levels below 10%, and therefore unlikely to suffer a yield or oil content penalty.
- Twelve paddocks had average infection levels between 20 and 40%, which could cost around 7 to 14% in yield penalty, plus reduced oil content.
- Higher than expected blackleg infection levels in several varieties considered to have excellent blackleg resistance are of concern. These were closely monitored in 2009.
- A Fact Sheet providing recommendations on management of these varieties in the 2010 season is on page 15.

Background and aims

The aim was to determine the incidence and severity of blackleg infection in farmers' canola crops across the Lower Eyre Peninsula district.

Site details

Locations: Farmers' paddocks across Lower Eyre Peninsula: North Shields to Wangary in south, to Brimpton Lake to Ungarra in north.

Survey duration: October - November, 2008.

Soil Types: Various.

Method

Eighty two canola paddocks across the Lower Eyre Peninsula district were surveyed for blackleg infection within several days of windrowing.

One hundred stems were randomly sampled in each paddock, along five diagonal transects between windrows, and scored for % blackleg internal infection in the stem cross-section at the base or crown. Photographic standards of a range of infection levels from 0 to 100% were used to train scorers and provide consistency between scorers.

Paddock information was collected to assist interpretation of results, including canola variety, whether seed was treated or not, sowing date, canola history of paddock and proximity to canola paddocks in 2007.

Results

Average blackleg internal infection scores in individual paddocks ranged from less than 1% up to 38% (Table 1). But even at the highest levels of internal infection, no external signs of blackleg disease, such as cankers and collapse of plants, were evident.

All varieties showed a wide range of internal infection levels, for example Tornado TT ranged from 1% to 16% infection. This variability is most likely linked to management factors such as proximity to previous year's canola stubbles. The lowest levels of blackleg infection were found in Hyola 50, AV-Jade, Thunder TT and Tornado TT.

Table 1: Blackleg infection scores for canola varieties in 2008 Lower Eyre Peninsula survey.

Variety	Blackleg resistance rating	No. of paddocks surveyed	Range of blackleg infection	Average blackleg infection
AV-Garnet	MR	12	10-23%	14%
AV-Jade	MR	4	4-8%	7%
Hurricane TT	MR (provisional rating)	8	5-15%	10%
Hyola 50	R	12	1-13%	4%
Thunder TT	MR-MS	2	4-9%	6%
Tornado TT	MR	25	1-16%	8%
45Y77	MR	10	11-38%	24%
46Y78	MR	2	15-29%	22%

Conclusion

More than half the paddocks surveyed (44 of the 75 total) had average internal infection levels of less than 10%, which was unlikely to have any effect on yield and oil content.

But 12 paddocks had average infection levels between 20 and 40%. Work by canola pathologist Steve Marcroft showed that plants with this level of infection were about 7% lower yielding than plants with less than 10% infection. A study in the south-east of SA in 2008 (see report by Trent Potter on page 11) put the yield loss at about 14% in plants with 20 to 40% infection.

The clear majority of canola varieties sampled in the survey have high levels of blackleg resistance rating, most being in the Resistant (R) or Moderately Resistant (MR) categories. This indicates that Lower Eyre Peninsula growers recognise how serious the threat of blackleg disease is, and are taking action to minimise the potential damage to their crops.

The high levels of infection found in several Hyola 50 crops, and in 45Y77 and 46Y78 are of concern. These varieties are considered to have excellent blackleg resistance, through a combination of single major effect blackleg resistance genes and conventional polygenic resistance genes. These effects are additive. These varieties were closely monitored in 2009, to determine if the disease levels observed in this survey indicate a breakdown in their blackleg resistance levels.

A Fact Sheet providing recommendations on how to manage canola crops and varieties in 2010 to minimise potential blackleg damage is included in this book on the next page.

Acknowledgements

Paddock surveying was assisted by Brian Purdie, Ashley Flint and Neil Cordon. Dr Steve Marcroft provided advice on sampling and blackleg scoring techniques. Our thanks to the farmers of Lower Eyre Peninsula who allowed us access to their canola paddocks and provided paddock information to support this study. This survey was funded by SARDI and GRDC, through the *“Improving water use efficiency in Lower Eyre Peninsula farming systems”* project.



Photo: Felicity Pritchard

MANAGING YOUR RISK OF BLACKLEG IN CANOLA

In 2008, instances with higher than expected levels of blackleg have been identified on lower Eyre Peninsula (SA) and the South East of SA. These are the same regions where sylvestris resistance was overcome in 2003. However all regions that have intensive canola production and high rainfall are at risk.

High risk blackleg indicators

Higher rainfall regions (>330mm growing season rainfall). Higher rainfall means a higher risk of severe blackleg. Lower rainfall areas have lower risk.

Intensive canola production. The more canola that was grown nearby in the previous season results in more canola stubble that is available to infect this season's crop.

Growing the same canola cultivar for the third year or more. Fungal spores from stubble of a variety are more likely to infect the same variety more severely the following season (see below). Also a variety may have its resistance erode over a number of years (see over page).

Proximity to last season's canola stubble. Although spores from last season's canola stubble may travel a long distance, most of the spores only go a short distance and put the adjacent paddock at risk.

Recommendations for growers in high risk situations

Choose a canola variety with good blackleg resistance (use only the current year's ratings), blackleg ratings are available at www.australianoilseeds.com

Separate this year's canola crop from last year's canola stubble by a minimum of 500m.

Do not sow varieties within 500m of their own stubble for two seasons e.g. do not sow Variety X in 2009 within 500m of any Variety X stubble from a 2008 or 2007 crop (older stubble does not normally release enough spores to warrant concern).

Ensure that canola seed is treated with fluquinconazole or fertiliser amended with flutriafol as an insurance against blackleg.

Monitor blackleg severity within the 2009 crop to assist with decision making in 2010 (see over page).

Table 1: illustrates why growers should avoid stubble of the same variety that they plan to sow.

This data is the % blackleg severity of plants sown on their own stubble compared to blackleg severity when plants are sown into stubble of different varieties.

Plants sown in 2008 into canola stubble	Stubble source of varieties sown in 2007			Trial
	45Y77 (CL)	ATR-Beacon	AV-Garnet	
Percent blackleg severity				
45Y77 (CL)	53	33	37	Pot experiment - Nurcong
ATR-Beacon	35	52	34	Field trial - Kalkee
AV-Garnet	23	12	61	Field trial - Nurcong

Acknowledgements

Survey and data was provided by Lower Eyre Agricultural Development Association (LEADA) farming system group, MacKillop Farm Management Group, SARDI (Trent Potter, Jim Egan and teams) and Marcroft Grains Pathology. Funding for surveys, trials and research provided by the Grains Research and Development Corporation (GRDC) and Australian Oilseeds Federation.



MANAGING YOUR RISK OF BLACKLEG IN CANOLA (CONT.)

Table 2: illustrates that some varieties with good blackleg ratings (R and MR) have a high number of severely infected plants in some paddocks. Therefore this is warning to look at the 'risk indicators' to minimise risk.

Variety	CAA Blackleg Rating	Location	Number of surveyed paddocks	% highest paddock infection	% average paddock infection	% of severely affected plants within the worst affected paddock*
				Percentage internal infection		
Hyola 50	R	Lower EP	11	13	4	19
45Y77 (CL)	MR	Lower EP	10	38	24	66
46Y78 (CL)	MR	Lower EP	2	29	22	48
AV-Garnet	MR	Lower EP	12	23	14	36
TornadoTT	MR	Lower EP	24	16	8	24
Hyola 50	R	Lower SE	3	5	2	6
46Y78 (CL)	MR	Lower SE	4	59	37	72
46C76 (CL)	MS	Lower SE	6	52	15	27
ATR-Marlin	MR	Lower SE	5	19	14	36

Internal infection is determined by cutting the stem and visually scoring the percentage of blackened tissue (see Fig 2 and 3).

EP = Eyre Pen (SA), SE = South East (SA). *Severely infected indicates plants with 30% or more internal infection.

Why did some varieties have more blackleg in 2008?

The blackleg fungus *Leptosphaeria maculans* has the ability to overcome the disease resistance contained in canola varieties. Where single major resistance genes are used, previously resistant varieties can become completely susceptible (as seen on the Eyre Peninsula in 2003). Current varieties have a number of resistance genes, therefore if blackleg overcomes one resistance gene, other resistance genes remain effective and so the crops should not become completely susceptible. However, some varieties contain major and minor gene combinations and what happens when the blackleg fungus adapts to the variety is uncertain - but the results in Table 2 indicate that disease severity will increase as the fungus adapts to new varieties.

How does blackleg overcome resistance genes?

Unlike cereal rusts in Australia where all individual fungal spores are genetically identical, blackleg is a sexually reproducing fungal pathogen. The spores which attack crops each year are a result of sexual recombination occurring on canola stubble over the summer and autumn.

Blackleg spores are genetically different to each other, so there will always be individual spores that can attack each resistance gene in canola. If a blackleg spore is able to attack, it will colonise the canola plant and then reproduce on the stubble, releasing more spores in subsequent years capable of overcoming that resistance gene or genes. When you sow a particular canola variety which has specific resistance genes you will invariably select for blackleg spores that are able to attack your variety. The number of virulent (highly pathogenic) spores initially is low so that it takes a number of years before they increase to a frequency which can cause yield loss. This can be compared to the overuse of one herbicide group and the subsequent selection of herbicide resistant ryegrass plants. Past observations have seen that different varieties can differ in their resistance stability; some varieties lose resistance quickly while other varieties have not lost resistance to date. Blackleg will overcome the resistance in all varieties. However in varieties with only polygenic resistance the loss of resistance is normally gradual - termed an 'erosion of resistance'. Where resistance has been eroded a 'Reduced Resistance' warning has been placed on their blackleg rating.

How to monitor blackleg severity



Figure 1. Seedling death (highlighted blackleg pinched hypocotyl). If diseased roots are observed the likely cause is 'Damping-off fungi'.



Figures 2 & 3. Cut 50 random plants at the crown after windrowing. An average of 30% or more internal infection indicates yield loss.



Figure 4. Check for stem cankers at plant maturity.



BETTER OILSEEDS TRIALS

Effect of seed size and sowing rate on canola yield

Trent Potter, SARDI

Trial location: KEITH, BORDERTOWN AND MOYHALL, SA.

Key messages

- Seed size had no significant effect on yield.
- A sowing rate of at least 2 kg/ha provided near maximum grain yield. The only exception was the Moyhall site in 2008 where early weed competition resulted in reduced yields where lower sowing rates were used.

Background and aims

The aim was to assess the effect of seed size and sowing rate of open pollinated and hybrid canola.

Site details

2008 annual rainfall: Keith: 339 mm; Bordertown, 338 mm; Moyhall 531 mm.

2008 growing season rainfall: Keith: 272 mm; Bordertown, 229 mm; Moyhall 348 mm (April - October).

Plot size: 8 m long by 8 rows at 15 cm row spacing.

Method

Three replicates. All normal agronomic treatments were used.

Results

Seed size effect on grain yield

Seed size has not shown any statistically significant response for grain yield (Table 1) in this trial.

Table 1: Effect of size of sowing seed on grain yield (t/ha) of open pollinated variety Bravo TT at three site-years. Seed sown at 120 seeds/m².

Seed size	Struan 2008
Large (more than 1.8 mm)	2.21
Medium (1.4-1.8 mm)	2.11
Small (less than 1.4 mm)	2.11
Site mean	2.14
CV%	4.0
LSD (p<0.05)	ns



Photo: Stephen Marcroft

Sowing rate effect on grain yield

In most sowing rate trials (Tables 2 and 3), and in previous years, a sowing rate of about 2 kg/ha gave a good grain yield. In all cases weeds were not a problem and crop establishment had been good. However at the Moyhall site in 2008, where the open pollinated 45C75 and the hybrid 45Y77 were compared over a range of sowing rates, wild radish had to be hand-weeded after the herbicide gave less than optimal control. In this case, where weeds had a chance to provide early crop competition, sowing rate had a significant response - with 80 seeds/m² being the optimal rate.

Table 2: Effect of sowing rate on grain yield (t/ha and % site mean) of hybrids Hyola 50 at Keith and 45Y77 at Bordertown in 2008.

Sowing rate (kg/ha)	Hyola 50 at Keith		45Y77 at Bordertown	
	Yield (t/ha)	Yield (% site mean)	Yield (t/ha)	Yield (% site mean)
1	0.85	90	1.46	90
2	0.96	101	1.58	97
3	0.99	105	1.67	103
5	0.97	103	1.68	103
7.5	0.96	101	1.74	107
Site mean	0.95		1.46	90
CV%	5.0		7.8	
LSD (p<0.05)	0.09		0.24	

Table 3: Effect of sowing rate (seeds/m²) on grain yield (t/ha and % site mean) of the open pollinated variety 45C75 and the hybrid 45Y77 at Moyhall 2008.

Sowing rate	Yield	Yield % site mean
20	0.92 c	57
40	1.48 b	93
60	1.52 b	95
80	1.82 ab	114
100	1.98 a	124
150	1.86 ab	117

Note: Yields followed by the same letter are not significantly different. Effect of variety and variety x sowing rate interaction not significant. Also note: At this site, severe weed competition adversely affected the plots with lower plant numbers

Conclusion

If farmers decide to retain seed it is good practice to grade out the smallest seed as larger seed has a better chance of good establishment and early vigour. (Although seed size did not affect yields in this trial, larger seed increased yields at Cummins in 2007). This trial was repeated in 2009. If a good seed bed has been achieved and insect pests are properly controlled, a low sowing rate (as low as 2 kg/ha) appears to produce acceptable grain yields. If, however, weed competition is expected, higher sowing rates are recommended to provide greater early crop competition with weeds. Likewise, if insects are expected to occur in large numbers or if poor seed to soil contact is anticipated, increased sowing rates are also recommended.

Acknowledgements

Trials were conducted by the SARDI New Variety Agronomy groups at Struan and Port Lincoln and funded by the Better Oilseeds project which is jointly funded by GRDC and the Australian Oilseeds Federation. Farmer Cooperator: Bill Hender, Kraig Johnson and John Cooper.



Photo: Felicity Pritchard

BETTER OILSEEDS TRIALS

Effect of seed size, seed source, sowing rate and grazing on canola yield



Jim Egan, Joanne Crouch and Trent Potter, SARDI

Trial location: CUMMINS, SA

Key messages

- No yield response to increased sowing rates from 40 to 100 seeds/m², but higher yields with 150 seeds/m².
- Larger seed did not increase yields significantly in 2008 (but did produce a significant yield increase in 2007).
- Commercial seed was more often higher yielding than seed of the same variety retained by farmers.
- Slashing (to simulate early grazing) resulted in an average grain yield loss of 35%. (Grazing will delay crop development but crops will recover from grazing if there is adequate spring rainfall).
- Early maturing varieties did best in the dry spring conditions of 2007 and 2008.

Background and aims

The aim was to evaluate and demonstrate the effects of sowing rates, seed size grading, farmer-retained versus commercial seed and early grazing (simulated by slashing) on canola yields on Lower Eyre Peninsula.

Site details

<i>Paddock history:</i>	2007: wheat; 2006: faba beans.
<i>Sowing date:</i>	23 May 2008.
<i>Soil type:</i>	Medium clay.
<i>Plot size:</i>	10 m x 1.5 m (8 rows).
<i>Average growing season rainfall:</i>	342 mm.
<i>2008 growing season rainfall:</i>	223 mm. The site experienced a hot, dry spring - early finish.
<i>Harvested:</i>	10 November 2008 (direct headed following chemical desiccation).

Methods

All trials were direct-drilled into wheat stubble, with 150 kg/ha of "Croplift 19" fertiliser (19:13:0:9) drilled below the seed. Each trial had three replicates.

Weeds and insects were controlled with sprays appropriate to the canola type (conventional or triazine tolerant) in each trial, and in line with district practice, and label rates.

Plant density (establishment) was recorded 47 days after sowing in all trials.

Sowing rate trial

The open-pollinated variety 45C75 and closed pollinated (hybrid) Clearfield canola 45Y77 were both sown at a range of sowing rates, from 20 to 150 seeds/m².

Grading for seed size trial

Bravo TT canola seed was graded for seed size into three groups – large (more than 1.8 mm diameter), medium (between 1.4 and 1.8 mm diameter), and small (less than 1.4 diameter). Seed of each size group was sown in the trial at a constant density of 120 seeds/m².

Farmer-retained vs. commercial seed

Seed of three canola varieties (44C73, Bravo TT and Tornado TT) was sampled from seed retained at harvest by local farmers and sown in a trial to compare with commercial seed of the same varieties. All seed lots were sown at the rate of 4 kg/ha.

Recovery from grazing trial

Five canola varieties, covering a range of maturity times, were sown at 4 kg/ha, with two plots of each variety per replicate. Above ground dry matter yield was measured on each plot on August 11 (80 days after sowing), then one plot of each variety was slashed to 7-9 cm height, to simulate grazing. The other plot of each variety was left unslashed.

Results

Sowing rate trial

Varying the sowing rate from 20 to 150 seeds/m² resulted in a range of plant densities from 8 to 65 plants/m² (Table 1).

The highest sowing rate (150 seeds/m²) gave a significantly higher grain yield (1.14 t/ha) than the lower rates, while the lowest rate (20 seeds/m²) had a significant yield loss (0.7 t/ha) (Table 1). The mid range of sowing rates (40 to 100 seeds/m²) all resulted in grain yields of about 0.9 t/ha.

The hybrid (45Y77) was higher yielding than the open-pollinated variety (45C75) (data not shown), but both varieties responded in the same way to increasing sowing rates.

Table 1: Effect of sowing rate (seeds/m²) on plant density (plants/m²) and grain yield (t/ha) in two canola varieties, the hybrid 45Y77 and open-pollinated variety 45C75.

Sowing rate (seed/m ²)	Plant density (plants/m ²)	Grain yield (t/ha)
20	8 e	0.70 c
40	15 de	0.84 b
60	22 cd	0.87 b
80	35 b	0.96 b
100	30 bc	0.87 b
150	65 a	1.14 a
LSD (p<0.05)	11	0.14
Variety means across sowing rates		
45Y77	32	0.98 a
45C75	26	0.81 b
LSD (p<0.05)	ns	0.08
Mean	29	0.89

Note: Means followed by the same letter are not significantly different.



Sowing Better Oilseeds trial plots at Cummins, 2008.

Photo: Jim Egan

Grading for seed size trial

There was a trend for larger seed to give better establishment (higher plant densities) but differences in yield were not significant in 2008 (Table 2). (Note: large seed gave a 25% yield increase over small and medium seed in 2007. Data not presented here).

Table 2: Effect of grading for seed size on plant density (plants/m²) and grain yield (t/ha) of Bravo TT canola.

Seed size	Plant density (plants/m ²)	Grain yield(t/ha)
Large (more than 1.8 mm)	45	1.41
Medium (1.4-1.8 mm)	40	1.31
Small (less than 1.4 mm)	23	1.11
Mean	36	1.28
LSD (p<0.05)	ns	ns

Farmer-retained vs. commercial seed

Table 3 shows there was no consistent response in plant density (establishment) between farmer-retained and commercial seed of the three varieties, with counts ranging from 20 to 42 plants/m².

44C73 from either source was significantly higher yielding than all Bravo TT and Tornado TT seed lines. Commercial seed was higher yielding than farmer's seed for both 44C73 and Bravo TT, but one batch of farmer's seed of Tornado TT yielded just as well as the commercial seed, and better than the other two farmer seed lines of this variety.

Table 3: Commercial versus farmer-retained seed: effects on plant density (plants/m²) and grain yield (t/ha).

Variety	Seed source	Plant density (plants/m ²)	Grain yield (t/ha)
44C73	Commercial	36 ab	1.59 a
	Farmer	42 ab	1.41 b
Bravo TT	Commercial	24 cde	1.02 c
	Farmer 1	35 abc	0.79 e
	Farmer 2	23 de	0.75 e
Tornado TT	Commercial	33 abcd	0.87 de
	Farmer 1	20 e	0.78 e
	Farmer 2	29 bcde	0.74 e
	Farmer 3	25 bcde	0.95 cd
Mean		30	0.99
LSD (p<0.05)		11	0.13

Note: Yields followed by the same letter are not significantly different.

Recovery from grazing trial

Varieties differed in plant density, with Hyola 76 and Tarcoola best, and CB1206 the poorest (Table 4).

Early dry matter production (80 days after sowing) was similar in all varieties (1.3 to 1.6 t/ha), except in ATR-Marlin which was much lower (0.6 t/ha).

Grain yield of unslashed plots was highest with the earliest maturity variety Tarcoola (1.6 t/ha), and lowest in CB1206 (0.2 t/ha). Yields were significantly reduced by slashing in all varieties except the very low yielding CB1206. The mean percentage yield reduction caused by slashing was 35%, but varied between varieties, from 46% in Tarcoola, to 22% in ATR Marlin. As a result, final grain yield after slashing was similar in all varieties (about 0.8 t/ha average), except CB1206 (0.2 t/ha).

Table 4: Response of canola varieties to grazing (simulated by slashing 80 days after sowing).

Variety	Plant density (plants/m ²)	Dry matter yield (t/ha)	Grain yield (t/ha)		
			Control (not slashed)	"Grazed" (slashed on August 11)	Mean
Tarcoola	42 a	1.29 a	1.55 a	0.84 de	1.20 a
Hyola76	48 a	1.61 a	1.33 b	0.87 de	1.10 a
46Y78	29 bc	1.29 a	1.11 c	0.74 e	0.93 b
ATR-Marlin	39 ab	0.55 b	0.96 cd	0.75 e	0.86 b
CB1206	29 c	1.35 a	0.24 f	0.20 f	0.22 c
Mean	37	1.22	1.04	0.68	0.86
LSD (p<0.05)	11	0.40	Comparing control & "grazed" yield of same variety 0.07 Comparing varieties with different grazing treatments 0.16		0.12

Conclusion

A common feature of both the 2007 and 2008 seasons was the very low spring rainfall, resulting in a hard finish which favoured early maturing varieties.

Several similar trials were conducted in the “Better Oilseeds” project at the LEADA focus trial site in Cummins in 2007. In the sowing rate trial, there was no yield response to increased sowing rates. Sowing rates of 40 to 100 seeds/m² resulted in similar grain yields, but the higher rate of 150 seeds/m² gave a yield increase in 2008 only.

Grading out larger seed for sowing gave higher grain yields, but this response was statistically significant in 2007 only.

The 2007 seed source trial showed 44C73 to be higher yielding than Bravo TT and Tornado TT, and commercial seed generally gave higher yields (but not always) than farmer-retained seed. The hybrid 45Y77 outyielded the open-pollinated 45C75 in both years of “Better Oilseeds” trials on Lower Eyre Peninsula.

Recovery from slashing (simulated grazing) to produce grain was impeded by the harsh finish to the season in 2008. Slashing in mid-August resulted in an average final grain yield reduction of 35% across the five varieties.

Acknowledgements

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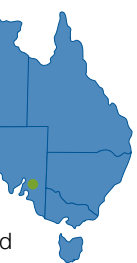
We also thank the Burns family for generous provision of land for the LEADA Focus site in 2008.

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LEADA group field day at Better Oilseeds site, September 2008.

Photo: Jim Egan



BETTER OILSEEDS TRIAL

Time of sowing, variety, nitrogen rate and grazing treatment effects on canola yield and oil content

Mick Faulkner, Agrilink Agricultural Consultants

Trial location: RIVERTON, SA

Key Outcomes

Sowing canola early (29 April 2008) produced the highest yields, but lower oil content in this trial.

Variety choice, nitrogen and grazing management all were highly significant in determining yield and oil content.

Background and aims

The aim was to determine optimum management strategies for different canola varieties based on time of sowing.

Site details

Plot Size:	4.8 m x 1.37 m.
Sowing date:	29 April 2008 and 12 May 2008.
Paddock History:	2006 Oaten hay, 2007 Oaten hay.
Herbicides and insecticides:	
Crop stage	Product
Incorporated by sowing	Insecticide
	Treflan
Post-sowing, pre-emergence	Chlorpyrifos
	Dual Gold®
Post-emergence	Clethodim as Select®
	Lontrel
	Dimethoate
Soil Type:	Heavy red brown earth.
pH _{Ca} :	7.4.
Fertiliser:	90 kg/ha triple super phosphate, N rates applied as sulphate of ammonia; nil plots supplemented with gypsum roughly 500 kg/ha equivalent.
2008 growing season rainfall:	314.5 mm (April –October); long term average 400 mm.

Method

The trial consisted of two times of sowing (TOS):

- TOS 1 – 29 April 2008.
- TOS 2 – 12 May 2008.

Four varieties: AV-Garnet, ATR-Marlin, 46Y78 (hybrid) and 46Y81 (hybrid). Two grazing treatments: Ungrazed and grazed. "Grazing" treatments were mown three times in 14 days to simulate grazing.

Four nitrogen treatments: Nil, 50 and 100 kg N/ha at sowing and 100 kg/ha N bolting (stem elongation).

All plots received N as sulphate of ammonia, Nil N plots were supplemented with gypsum to match sulphur rates. Three replicates of each combination were used in a split-split plot design, split by time of sowing and then by grazing treatment with varieties and nitrogen rates fully randomised.

Results

Grain yield

Time of sowing x variety

The earliest time of sowing was the highest yielding in all but one of the varieties (ATR-Marlin) (Table 1). Early sowing allowed the crop to flower and fill pods for longer, under conditions that were more favourable than those experienced by plants sown 2 weeks

later. The varieties AV-Garnet (conventional) and 46Y78 (Clearfield hybrid) were the highest yielding varieties at 2.5 t/ha. AV-Garnet has been a standout performer in paddock situations in the mid north over the past dry seasons. It does not have tolerance to triazine or "imi" chemistry and should be avoided in paddocks that contain weeds such as radish, charlock, salvation jane, silver grass or bifora. 46Y78 performed well in the trials, also topping the yields in the MNHRZ 2007 trials. However, exceptional early vigour can lead to increased water use and dry matter production (height) during vegetative growth which may reduce its yield in years with low spring rainfall. Trials investigating the management of hybrid canola were conducted in 2009, focussing on nitrogen timing and sowing rate.

Table 1: Grain yield (t/ha) of canola variety x time of sowing (average of all treatments/varieties).

Time of sowing	AV-Garnet	ATR-Marlin	46Y78	46Y81
1 (29 April 2008)	2.54 a	1.54 d	2.51 a	2.03 b
2 (12 May 2008)	2.15 b	1.67 cd	1.81 c	1.74 cd
LSD (p<0.05)	0.21			

Note: Yields followed by same letter are not significantly different.

Nitrogen

Yield responses favoured applying nitrogen at sowing compared with delaying applications, in this case during bolting. This is most likely related to the lack of spring rainfall and less nitrogen uptake (of later applications) by surface roots, as they were no longer active due to the drying profile. It would be expected in a year with better spring rainfall that later applications of nitrogen would be of benefit, particularly on hybrids.

Table 2: Effect of nitrogen treatment on grain yield (t/ha) (average of all times of sowing, varieties and grazing).

Nil N	50 kg/ha N at sowing	100 kg/ha N at sowing	100 kg/ha N at bolting
1.67 d	1.96 c	2.26 a	2.10 b
LSD (p<0.05)	0.15		

Grazing

Grazing reduced canola yield by 0.28 t/ha on average. Whilst the variety x grazing interaction was not significant, grain yield losses due to grazing ranged from 0.14 t/ha (ATR-Marlin) to 0.52 t/ha (46Y81). This suggests that there may be variety specific responses to grazing, which would require further investigation. When considering grazing, factor in the economic return from winter feed and the risk of low spring rainfall reducing grain yield of grazed crops.

Table 3: Effect of grazing on canola grain yield (average of all TOS, varieties and nitrogen treatments).

Grazed	Ungrazed
1.86 b	2.14 a
LSD (p<0.05)	0.11

Oil Content

Time of sowing x variety

The greatest variation in oil content occurred between varieties: the conventional and Clearfield canola had higher oil content compared with the triazine tolerant (TT) variety ATR-Marlin. This reflects paddock experience, where triazine tolerant varieties tend to be lower yielding and lower in oil. This is due to the photosynthetic inefficiency trait carried across in breeding for the TT trait.

For the variety AV-Garnet, time of sowing 1 also appeared to have slightly lower oil content than plots that were sown two weeks later. The reduction and price differential at delivery would be minimal. This result was in contrast to most other research in Australia where delayed sowing leads to reduced oil content due to increasing temperatures and drier conditions after flowering for later-sown canola crops.

Table 4: Effect of TOS x variety interaction on oil content (%) (average of all grazing and nitrogen treatments).



Photo: Mick Faulkner

TOS	AV-Garnet	ATR-Marlin	46Y78	46Y81
1	39 d	38.6 d	40.4 c	41.7 ab
2	41.3 b	39.6 d	40.5 c	42.4 a
LSD (p<0.05)	0.70			

Grazing

Grazing canola tended to reduce oil content as a result of the delayed maturity (that occurs due to grazing). The delayed maturity (7-10 days to first flower) forced grazed plots to flower and fill grain under less favourable conditions. Grazing can be a valuable tool for reducing early dry matter production (particularly hybrids) and delaying maturity in frost prone paddocks, filling feed gaps in autumn/early winter and opening the canopy of the crop in order to increase herbicide penetration and efficacy (particularly grass selective herbicides).

Table 5: Effect of grazing management on oil content (%) (average of all TOS, varieties and nitrogen treatments).

Grazed	Ungrazed
40.1 b	40.7 a
LSD (p<0.05)	0.35

Nitrogen

Oil content was negatively correlated with nitrogen application; however the differences were of no economic importance. The benefit of applying nitrogen to increase yield more than outweighs the slightly negative effect of reduced oil content.

The delayed application of nitrogen (bolting) further reduced oil content over the equivalent nitrogen rate applied at sowing. This is most likely due to the effect of late nitrogen being used for grain protein production at the cost of oil.

Table 6: Oil Content vs. nitrogen management (average of all times of sowing, varieties and grazing treatments).

Nil N	50 kg/ha N at sowing	100 kg/ha N at sowing	100 kg/ha N at bolting
41.4a	40.8b	40.1c	39.3d
LSD (p<0.05)		0.49	

Conclusion

Early sowing has resulted in highest yields in recent seasons. Growers are pushing the boundaries about how early canola can be sown and problems can be encountered. Unfortunately, when early sown, canola can germinate and die on heavy soils if initial rains are light and no follow up rains are received. This is why it is essential to manage sowing date according to 1: soil texture, 2: sowing rainfall and 3: plant available water at sowing.

Future trials will be aimed at:

- Earlier opportunity sowing (mid April) if moisture levels are appropriate.
- Management of hybrids (mainly nitrogen and sowing rate).

Early sowing of canola promotes high yields and good early growth for competition with weeds. However, we must be aware of the implications of early sowing such as frost risk potential, excessive early dry matter production and weed control and manage them accordingly.

Tools such as grazing, delayed nitrogen applications and reduced sowing rates may have a fit if the opportunity for early sowing presents in the future.

Acknowledgements

Pat Connell - for allowing the trials on his land, Rob Wheeler, SARDI - for windrowing the trial, Rural Directions for sowing and harvest. This trial was funded through the GRDC and AOF Better Oilseeds project.



Hundreds attended the MNHRZ field day, October 2008.

Photo: Felicity Pritchard

FARMER CASE STUDY

Canola diversifies business to lift profits

DINNINUP, WA



Paul and Simon Torrisi, Beelerup Grazing Co.

<i>Enterprises:</i>	Breeding and store (trading) cattle, hay and canola.
<i>Average Annual Rainfall:</i>	600 mm.
<i>Average GSR:</i>	Approximately 500 mm.
<i>Soil Types:</i>	Gravelly loam.
<i>Soil pH:</i>	pH _{Ca} 4.8-5.4.

History

Traditionally, Paul and Simon ran beef cattle, but with the reduced returns they looked to cropping to improve income from their 500 arable hectare, Dinninup property. With relatively limited experience in cropping, and high returns on offer when the decision was made (canola approximately \$750/t), Paul and Simon decided to move all cattle to some leased country and plant canola.

Although they had limited cropping experience, the country was all “croppable” and they believed with good agronomic support, growing a successful canola crop could be achieved, as long as they kept an eye on things and the right management was applied at the right time.

Negative aspects of canola growing

It seemed a shame to be controlling the clover and ryegrass they had worked hard to increase in their pastures. The “stress” period during the establishment phase was another negative. Having the crop under siege from pests such as slugs at establishment was the recipe for some sleepless nights.

Crops preceding canola

Canola is generally grown at the beginning of the rotation after a long (three or more years) pasture phase due to the weed and disease control benefits it offers for subsequent cereal crops.

Stubble management

All paddocks sown in 2008 to canola were onto pasture stubbles or paddocks cut for hay. Some residue scarified in prior to sowing on pastures while those cut for hay had an initial knockdown herbicide application before being drilled straight into the standing stubble.

System used

Canola was chosen as most of the country had been long-term pasture, and triazine tolerant canola offered the most robust weed control. Problem weeds in the area include capeweed and silvergrass, along with some geranium and radish. Clover and ryegrass were not seen as weeds until this point and as pastures were dominant in these species; good control of these was necessary which was also achievable in canola. Paul and Simon also believed they would crop the country for two to three years, so a good cleaning crop prior to cereal production was required.

Varieties

Thunder TT and ATR-Cobbler were chosen based on blackleg resistance, high yield and maturity to suit time of sowing.

Seed dressings

Proprietary seed used was dressed with Jockey for blackleg; no insecticide was applied on seed.

Sowing decisions

- Gross margin: Although all grain produced is not yet sold, gross margins from the canola crop are estimated to be around \$500/ha. In comparison to cattle enterprise gross margins of approximately \$100/ha, the move to canola production has been a financially positive move.
- Cost of production: Estimated costs of production including all seed, fertiliser, chemicals and operational costs was approximately \$450/ha.
- Economic benefit from growing canola: An initial return from canola is far better than current beef gross margins per hectare (approximately four to five times).
- Reliability/robustness of canola: Canola is found to be robust once it is through the establishment phase and reliably yields a profitable crop in the Dinninup (Boyup Brook) area.
- Canola compared to other break crops: Canola is really the only suitable break crop for the region. Lupins and field peas are not as profitable in the region. The other option is a legume dominant pasture, however low grazing returns make this an unviable option. Canola will leave the paddocks cleaner for subsequent cereal crops than other break crop options.
- Crop intensity: Canola will be cropped one year in three or four, depending on paddock fertility, weed history and disease outlook.
- Canola relative to cereals: Canola gives better grass weed control and equivalent gross margins for higher yielding cereal crops. Canola has increased operational costs due to swathing (windrowing), although with newer varieties being more suited to direct heading; this operational cost may be eliminated.

Fertiliser strategies

Soil tests showed the pH was applicable for canola, so lime was not necessary. MAP was used at sowing as this is allowed for a high rate of P (18 kg/ha) to be placed close to the seed while the lower N content of MAP made it safe for the fertiliser to be close to the seed. Early post-emergence an NS41 and muriate of potash blend was applied at 150 kg/ha (35 kg/ha N, 25 kg/ha K, 9 kg/ha S). Later plant testing confirmed trace element and macro nutrient status and a further N top up of 70 L/ha Flexi N (29 kg/ha N) was applied at the late vegetative / early flowering stage.

Pre-sowing and PSPE weed control

Knockdown applications of glyphosate were applied with pre-emergent triazine herbicides (550 g/ha each of simazine and atrazine 900 WG). A further 1.1 kg/ha of atrazine 900 WG applied at 6-8 leaf stage with 1% crop oil. Verdict® 520 was applied at 75 mL/ha 10 days after the atrazine top up. Weed control was very robust due to wet conditions allowing good triazine activity, with Verdict applied to clean up some residual grass to ensure a clean bed for next season's cereal crop.

Limited use of herbicides applied on these properties sees all Modes of Action working well at this stage, although agronomic advice has made Paul and Simon aware of the potential for resistance to develop if one group of chemistry is relied upon too heavily. Spraying operations were undertaken with a Hardi Commander 3424 spray unit with GPS guidance.

Sowing equipment

The crop was sown using a 23 run Duncan Renovator Pasture Drill fitted with Agmaster press wheels. Some rougher paddocks were also scarified to clean up rocky areas. A trailing roller was also used to improve seed to soil contact and to push rocks into the ground in some places. Starter fertiliser was drilled below the seed. Contractors were used to harvest the crop.

Row spacing

15 cm (6 inch) spacings.

Sowing rates

A target sowing rate of 4 kg/ha was used, with sowing starting around late April for longer maturing varieties such as Thunder TT. ATR-Cobbler was sown in late May.

Why did you choose your sowing system?

Paul and Simon used their existing pasture drill, which was already set up for direct drill, minimum till sowing. This suited the system for sowing canola.

Crop establishment

Initial insect control was achieved with the inclusion of alpha-cypermethrin with the knockdown herbicide at 125 mL/ha in the initial knockdown. Bare earth control for redlegged earth mite was achieved with 100 mL/ha of Talstar applied post-sowing pre-emergent.

The imidacloprid-treated seed appeared to emerge well and further reduce the impact of any sucking insects. Monitoring was required in the early emergence phase to check for slugs on areas of susceptible loamier soil types and baits were applied as necessary. Late season monitoring for diamondback moth larvae and heliothis revealed no large infestations, while the odd head was infested with cabbage aphid, although no control was necessary.

Validation

Plant counts and visual monitoring were undertaken in the two to three weeks after sowing.

Average yield and oil content

In 2008, the average yield was 1.7 t/ha which was below expectation as the crops appeared not to realise their full potential. This is however, similar in yield to other growers in the district, who were also disappointed that the average yield for canola for the season was not higher. Reasons for the lower than expected yield are thought to be weather conditions, where there was a four to five week period with no rain during August, several frosts, and some 40 mm late rain and hail on the swaths (windrows). Some losses also resulted due to the timeliness of swathing (waiting for contractors). Visual estimations of the crops prior to harvest certainly put them in the 2.0 to 2.5 t/ha bracket.



Photo: Felicity Pritchard

FARMER CASE STUDY

Early sowing with a profitable break crop for integrated weed management
NERIDUP, WA

Keith Green

Photo: Quenten Knight

Keith and Emma Green

<i>Enterprises:</i>	Grain production, cereals, canola, field peas and lupins.
<i>Average Annual Rainfall:</i>	450 - 475 mm.
<i>Average GSR:</i>	325 - 250 mm.
<i>Soil Types:</i>	Gravelly loam to alkaline grey clay.
<i>Soil pH:</i>	pH _{Ca} 4.8 to 7.5.

History

Keith began growing canola on a permanent basis around the year 2000. At this stage livestock were being removed from a large portion of the farm and continuous cropping adopted on these paddocks.

At the same time disc sowing was replaced by a knife point and press wheel system as crop establishment with discs was resulting in root disease in cereals and increased ryegrass, with noticeable yield losses. TT canola was seen as the ideal break crop for this environment to clean up weeds and root disease for subsequent cereal crops as well as provide healthy gross margins in its own right.

Canola is well suited to the Neridup area in terms of soil type, rainfall and length of growing season. Canola provides an excellent opportunity for early sowing from early April to late May. It also provides an opportunity to begin harvest early. Canola has been an ideal crop in the rotation for weed control particularly where there are populations of ryegrass which are becoming more resistant to 'fop' and 'dim' (group A) herbicides.

In 2008 Clearfield canola was grown for the first time undersown with SARDI TEN lucerne to help reduce rising watertables and encroaching salinity on one part of the farm. Canola is a break crop that has reliable yields, is relatively easy to grow and most importantly is profitable.

A negative aspect of canola growing is that it is a relatively high input crop that exposes the farm business to a higher level of risk if something goes wrong during the growing season.

Crops preceding canola

Canola is generally grown one year in four in a canola - barley - legume - wheat rotation. Occasionally this rotation is tightened where canola may be grown every second year.

Generally canola constitutes 25% of the rotation.

Stubble management

For paddocks to be sown with canola, the previous year's cereal stubble is usually cut high during harvest to minimise the amount of stubble handled by the header to obtain more capacity from the header and to speed up the harvest process. When harvest is complete the remaining cereal stubble is usually mulched to a height of 10 to 15 cm.

Keith uses guidance with 10 cm accuracy to sow canola in an "up and back" pattern. This system does not provide the required accuracy for inter-row sowing. Whilst not in a strict tramline system, all spraying traffic maintains the same run lines after sowing.

Systems used

Most of the canola program is sown using TT varieties as this provides them with the most robust weed control. On a small part of the program they use Clearfield varieties. These are used to under-sow lucerne on areas of the farm where they are trying to control a rising watertable and the associated salinity.

Varieties

For season 2008 three varieties were sown, two TT varieties and one Clearfield variety, CB Tanami on the heavy country with a shorter growing season and slightly less rainfall. ATR-Beacon was sown on the gravel loam soils with higher rainfall and 44C73 where lucerne is to be under-sown. For season 2009 two triazine tolerant varieties were grown, ATR-Cobbler and CB Tanami.

Seed dressings

No seed dressings are used. Impact® In-Furrow is used to control blackleg. This is applied via a dosetron into Flexi N at sowing where it is banded 2 cm below the seed.

Sowing decisions

Gross margin: Canola gross margins are generally 30 to 50% lower than those of cereals in the rotation, however they are still positive and profitable gross margins, in some years the gross margins are equivalent to cereals.

Cost of Production: For season 2009 with the high fertiliser prices and some herbicide price increases, cost of production on variable costs was approximately \$450/ha.

Economic benefit from growing canola: Canola is the one break crop that provides a good gross margin in the year of production; however it is often the subsequent years where the following cereal crops benefit from the canola phase. While it is difficult to put an exact dollar figure on the benefit of canola in the rotation it is estimated that it contributes additional cereal yields of between 300-500 kg/ha as a result of its weed and root disease control. Canola also allows them to maintain continuous cropping, without it they may have to consider pasture or a chemical fallow to control weeds and root disease.

Reliability and robustness of canola: Canola is becoming more reliable as new varieties are released. They feel that their long-term average yields will continue to increase as they adopt short to mid season varieties with indeterminate flowering to capitalise on the seasons with long cool finishes. Canola is a very robust crop once it gets past the early establishment stage, after this it is as tough as barley and perhaps tolerates periodic waterlogging better than barley. Canola has an amazing ability to compensate for low plant populations; it is very forgiving in this regard.

Canola compared to other break crops: Canola is definitely the most profitable break crop in the Greens' rotation as it performs well over all their soil types. By matching their other break crops to soil type, i.e. lupins on the sandy gravel soils and field peas on the alkaline loams; they are performing in terms of yield and profit. However their gross margins are still not matching those from canola.

Canola relative to cereals: Cost of production for canola is very similar to that of cereals. In a good season there is generally more upside in yield potential in cereals than canola. In theory cereal yields should be double that of canola. In practice this is true for wheat; however barley yields are generally 75% higher than canola yields.

Fertiliser strategies

On the gravel loams MacroPro Plus is drilled with the seed at 100 kg/ha plus Flexi N at 60 L/ha banded 2 cm below the seed at sowing. At eight to 10 leaf stage a top-up of Flexi NS at 100L/ha is applied by boomspray using streaming nozzles. This supplies the crop with 70 kg/ha nitrogen, 14 kg/ha phosphorus, 8.4 kg/ha potassium and 15 kg/ha of sulphur. On the heavier alkaline clay soils Agstar Extra is drilled with the seed at 100 kg/ha plus Flexi N at 60L/ha banded 2 cm below the seed at sowing. Flexi NS is also applied at 100 L/ha at the eight to 10 leaf stage, this supplies 70 kg/ha of nitrogen, 14 kg/ha phosphorus and 15 kg/ha sulphur. Potassium is not required on these heavier soils.

Pre-sowing and PSPE weed control

Summer weeds are sprayed early after any substantial summer rainfall event to conserve stored soil moisture and nutrients. All previous cereal stubbles are mulched during the summer months. Lime and gypsum are applied when and where required on the basis of soil test results.

Weed control normally comprises of at least one summer knockdown of Roundup, LV Ester and Garlon®. Prior to sowing there is another Roundup knockdown followed by Spray.seed plus atrazine. Immediately after sowing, top up atrazine is applied with a bare earth insecticide.

An early post-emergent spray of clethodim as Select is applied with a small spike of Targa. Spray topping occurs with knockdown herbicide at swathing (windrowing).

Sowing equipment

12.4 m John Deere 737 bar with knife points and press wheels coupled with a John Deere 2 bin air cart and a Burando Hill liquid cart.

Row spacing

25 cm row spacings.

Sowing rates

Canola sowing commences at the earliest sowing opportunity from mid April to late May depending on the season and variety. Canola is sown at 3.5 kg/ha.

Why do you choose your sowing system?

The Greens use a no-till system of knife points and press wheels, as their soils are very fragile and they farm in a very windy environment. The no-till system allows them to conserve moisture by sowing directly into mulched cereal stubbles which provide protection from wind erosion.

The furrow formed with their system is excellent at water harvesting, even small rainfall events of 5 mm or less run into the furrow and allow for good germinations on minimal rain.

Crop establishment

Ryegrass has developed widespread resistance to the 'fop' group of herbicides and some of the 'dim' group no longer work effectively. Presently high rates of clethodim appear to be working satisfactorily. However given that they don't have many chemical options left, canola has been an ideal crop to introduce the chaff cart system.

One of the major benefits of canola is that all ryegrass is swathed (windrowed) before it gets a chance to shed seed, once contained in the swath it is very easy to collect at harvest with the chaff cart. (After harvest all chaff dumps are burnt to ensure no ryegrass and other weed seeds are returned to the seed bank.)

Canola receives an application of alpha-cypermethrin with the last knockdown for vegetable weevil, redlegged earthmite and Balaustium mite control. Talstar is applied immediately after sowing for increased redlegged earthmite control. Depending on the season a late insecticide may be applied for aphids or budworm control.

Blackleg is the main disease threat, this is managed by variety selection with higher blackleg resistance ratings and the use of Impact In-Furrow that is banded 2 cm below the seed at sowing.

Validation

The success of their establishment is measured by plant establishment. The Greens are generally looking for 40 to 60 plant per m². Their system is consistently delivering them with these numbers.

Average yield and oil content

They feel that their average canola yields are increasing steadily, in the past their low production average in a poor year would 1 t/ha, in an average season 1.6 t/ha and in a very good year 2 t/ha.

FARMER CASE STUDY

Knife points and wider rows to keep stubbles

ARIAH PARK, NSW



Chris and Phillip Davey

Enterprises:	Winter cropping comprising approximately 70% cereals, 20% canola and a small area of lupins. A self-replacing merino flock is run on lucerne pastures.
Average Annual Rainfall:	450 mm.
Average GSR:	360 mm.
Soil Types:	Clay loam and light red clay soils.
Soil pH:	Unlimed, soil pH _{Ca} 4.5; Limed 5.0-5.5.

History

Chris began farming in the area during the early 1970's. He has always run a mixed farming operation incorporating cereals, legumes and a self-replacing merino flock. Canola was introduced to the system in the mid 1980's.

Initially canola comprised up to 45% of the total crop area. In the last eight years canola has comprised 25-30% of the total crop area. One of the most difficult aspects of growing canola has been unpredictable insect attacks which have significantly reduced yield. These include scarabs, diamondback moth and aphids.

Crops preceding canola

Canola is typically grown twice in a five year rotation. If high levels of grass weeds are present in a pasture prior to cropping, canola is grown as the opening crop. In this situation paddocks are cultivated, however all other canola crops in the rotation are direct drilled. Lucerne pastures are chemically fallowed in the spring prior to sowing the first crop.

Stubble management

Historically, all cereal stubbles have been burnt prior to sowing canola. This was necessary as the airseeder blocked easily. New sowing equipment was purchased last year to retain as much stubble as possible in the future.

Canola systems used

Triazine tolerant canola is grown as it provides superior weed control to other management systems.

Canola variety choice

2009 varieties were ATR-Cobbler; 2008 Bravo TT.

Seed dressings

Jockey seed treatment was used in 2008. No seed treatment was planned for use in 2009. Jockey seed treatment is used where blackleg risk is deemed to be high. Chris feels the impact of blackleg on canola yield in low rainfall years requires further investigation.

Sowing decisions

The area of canola in the rotation is kept at about 25 to 30%. This is to ensure that there is always some clean canola stubble to sow wheat into the following year, grass weeds are kept at a manageable level, grass selective herbicides are rotated and cereal disease levels are minimised.

Summer weed control to conserve moisture is a priority. If no soil moisture is present at the end of April canola will be dry sown.



Chris Davey

Photo: Mark Harris

Chris targets the end of April as the ideal time to sow, however he is comfortable with canola establishing through to late May / early June if a late break occurs. However the success of the crop is greatly influenced by spring rainfall.

When dry sowing, trifluralin rates are reduced and the application of triazine herbicides delayed. This allows for the paddock to be re-sown to a cereal in the event of an extremely late break or failed canola establishment.

In Chris' area canola has proven it can compensate if plant populations are low (10 plants /m²). Re-sowing would only take place in the event of a complete failure early in the season. Re-sown canola has rarely been successful.

Canola is preferred over other break crops because it is marketed domestically and internationally and the price is generally more stable over time. Other break crops such as pulses have more volatile demand and price.

Including canola in the rotation also spreads out the timing of sowing and harvest which spreads the workload.

Fertiliser strategies

Sulphur is applied in the form of gypsum prior to sowing canola. Enough gypsum is applied to supply two to three canola crops.

Phosphorous is applied at sowing as MAP. Historically, MAP rates have been about 80 kg/ha. Recently MAP rates have been determined by soil testing and paddock history and have been in the range of 40 to 50 kg/ha. Reduced rates have been in response to increased soil phosphorous levels (a result of reduced removal) and targeting economic yield rather than maximum yield.

Nitrogen is applied in the form of urea and is spread by ground if good soil moisture is present in July/August. Paddock history, crop inspection and deep soil N testing are used to make nitrogen application decisions.

Pre sowing and post sowing weed control

A knockdown herbicide is applied prior to sowing, trifluralin is applied at sowing and atrazine and simazine are applied after sowing. An early post-emergent grass weed control is applied where necessary.

Sowing equipment

Previously Chris has sown with a Case Airseeder, Keech points on 16 cm spacing and 3 row finger harrows.

The 2009 crop was sown using a Gason airseeder fitted with Harrington knife points on 30 cm spacings and Manutec press wheels. This change has occurred to retain more stubble for moisture conservation purposes that should result in more timely sowing and better crop establishment.

Sowing rate

Canola is sown at 2.5 kg/ha targeting a plant density of 30 to 40 plants per m².

Why do you choose your sowing system?

The new sowing system has been selected to maximise trash flow. This will allow more stubble retention. Retaining stubble is desirable for three reasons; timeliness of sowing, improved moisture conservation and reduced requirement for burning stubble.

Press wheels will aid in getting good soil to seed contact, especially in years when moisture at sowing is marginal, resulting in earlier crop establishment.

Crop establishment

Early sowing, and in particular dry sowing, have resulted in good plant establishment in the past. Controlling summer weeds maximises the retention of moisture from summer rainfall resulting in earlier sowing.

The application of a bare earth insecticide post-sowing has provided good control of insect pests. Chris anticipates that canola emergence and establishment will need to be monitored more closely under the new sowing system as retaining stubbles can create a physical impediment to germinating canola and provides an ideal habitat for insect pests.

Validation

Canola crops are inspected early to ensure adequate plant numbers are present. Canola compensates well when plant numbers are low and re-sowing canola is rarely undertaken.

Plant numbers as low as five to 10 plants/m² are acceptable provided the establishment is consistent across the paddock. Weed control is not compromised even if the plant population is low or patchy as an important outcome of growing canola is weed and disease control.

Average yield

The 18 year average canola yield is 1.39 t/ha while the 18 year median yield is 1.50 t/ha, and the average of 1998 to 2008 is 0.81 t/ha. The budgeted cost of production before interest for the 2009 season was \$349/t.

The new sowing system will lead to earlier establishment in dry years which, based on recent history, should benefit crop yield and oil content.



FARMER CASE STUDY

Sowing system gives good herbicide incorporation

LOCKHART NSW

Gerry, Dan & Matt Lane

Enterprises:	Winter cropping comprising approximately 70% cereals, 30% canola. A self-replacing merino flock and first cross lamb enterprise is run on lucerne pastures.
Average Annual Rainfall:	450 mm.
Average GSR:	300 mm.
Soil Types:	Heavy clay, clay loam and red clay soils.
Soil pH:	Unlimed, soil pHCa 4.3-5.0; Limed 5.0-5.8.

History

Gerry Lane began farming in the Lockhart district during the 1960's. Dan and Matt completed schooling and tertiary education before returning to the farm. Dan has been farming full time for 15 years and Matt for 8 years.

Canola has been grown since the early to mid 1980's. Historically canola has comprised up to 45% of the crop rotation, however the area has been reduced as a result of successive dry years. Since canola has been in the rotation changes in management systems and varieties have been significant. Triazine tolerant, Clearfield and Roundup Ready canola have improved weed control and ease of management of canola in the rotation.

Crops preceding canola

A typical rotation is wheat followed by canola then two wheat crops and a second canola. This rotation is repeated twice before the paddock is sown to lucerne pasture.

All crops are direct drilled. Lucerne pasture is chemically fallowed in the spring prior to the first crop being sown.

Stubble management

Heavy stubbles are burnt to prevent blockages at sowing and to facilitate incorporation of trifluralin. Light stubbles are retained as long as they will not compromise application of trifluralin or crop establishment.

Canola systems used

Triazine tolerant canola is grown to maximise the efficacy of weed control. Management systems such as Clearfield and Roundup Ready have been trialled and are used where appropriate.

Canola variety choice

Bravo TT and Tornado TT were grown in 2009.

Seed dressings

No seed treatments were used in 2009. Blackleg risk is minimised by using a block farming system, this enables canola crops to be grown in isolation from the previous year's canola stubble. Jockey seed treatment is used where blackleg risk is deemed to be high.

Sowing decisions

Canola is sown each year regardless of seasonal or price outlook. Maintaining canola in the rotation reduces cereal diseases and provides effective grass weed control. Canola is sown at the same time each year regardless of rainfall with the targeted sowing time being late April to early May. Summer weed control to conserve moisture is a priority. If no soil moisture is present at the end of April, canola is sown dry. When dry sowing, trifluralin rates are reduced and the application of triazine herbicides delayed. This allows for the paddock to be re-sown to a cereal in the event of an extremely late break or failed canola establishment.

In low rainfall areas canola has proven it will compensate well if plant populations are low (10 plants/m²). Re-sowing would only take place in the event of a complete failure early in the season. Re-sown canola is rarely successful.

Fertiliser strategies

Sulphur is applied in the form of gypsum prior to sowing canola. Gypsum also provides soil conditioning on heavy clay soil types. Phosphorous is applied at sowing in the form of MAP. MAP rates vary from 40 to 80 kg/ha depending on paddock history and tested Colwell soil P levels. Nitrogen is applied in the form of urea and is spread by ground if good soil moisture is present in July/August. Paddock history, crop appearance and deep soil N are used to make decisions on nitrogen applications.

Pre-sowing and post-sowing weed control

A knockdown herbicide is applied prior to sowing if possible. Trifluralin is applied to all canola paddocks at sowing.

Atrazine and simazine is applied early post emergence to triazine tolerant canola. An early post-emergent grass weed control is applied where necessary.

Sowing equipment

- Simplicity Airseeder
- Flexicoil bar
- Keech knife points on 22.5 cm spacing
- Harrington rotary harrows

Sowing rate

Canola is sown at 2.5 kg/ha to achieve a target plant density of 30-40 plants/m².

Why do you choose your sowing system?

The sowing system provides good trash flow where light stubbles are retained and also provides good incorporation of soil applied herbicides. This system works well over a range of moisture conditions and on varying soil types. Heavy stubbles require burning prior to sowing to achieve effective establishment.

Crop establishment

Early sowing, and in particular dry sowing, has resulted in good plant establishment. The application of a bare earth insecticide post-sowing has provided good control of insect pests. With a range of soil types it is important to have sowing equipment that will consistently achieve a plant stand in dry or wet conditions on both heavy and light soils.

Validation

A successful establishment is determined using plant numbers and experience. Canola compensates well when plant numbers are low. Re-sowing canola is rarely undertaken. Plant numbers of 5 to 10 plants/m² are acceptable provided the establishment is consistent across the paddock. Weed control is not compromised even if the plant population is low or patchy as an important outcome of growing canola is the weed and disease control.

Average yield

The 15 year average canola yield is 1.07 t/ha, while the 15 year median yield is 1.28 t/ha and the average of the last 10 years is 1.01 t/ha.

The budgeted cost of production before interest for the 2009 season was \$390/t.



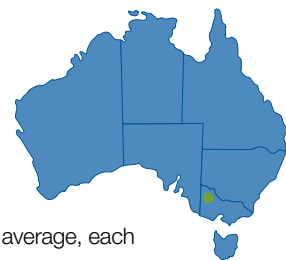
Matt Lane

Photo: Mark Harris

FARMER CASE STUDY

Direct drilling improves emergence for Mallee crops

HOPETOUN and YARTO, VIC.



Don and Darrell Bellinger

Enterprises:	Wheat, barley, canola, lentils, oats, chickpeas, lupins, ryecorn (cereal rye).
Average Annual Rainfall:	365 mm.
Average GSR:	240 mm. In last two years, average GSR at Hopetoun approximately 165 mm.
Soil Types:	Range from non-wetting sands on Yarto property (between Patchewollock and Hopetoun) to 'good' red Mallee loams, which predominate the Hopetoun property.
Soil pH:	Approximately 8.0.

History

The Bellinger family has farmed the Hopetoun property since the 1930s. They have been undertaking continuous cropping for about 15 years. Canola has been grown for six years, and 2009 was the fourth cropping season where direct drilling was used.

Crops preceding canola

Cereals, normally wheat.

Stubble management

Darrell and Don leave stubbles standing. They used to disc them in. They now use guidance for inter-row sowing but don't have controlled traffic yet.

Systems used

Mainly Clearfield open pollinated varieties. Last year the Bellingers grew triazine tolerant (TT) varieties, but they weren't really happy with the TTs.

Varieties

In 2009 they grew 44C73 and 44C79. Seed is retained for one year at the most. The Bellingers buy enough seed to produce enough seed for the following year's crop and keep it for only one year. They always clean it.

Seed dressings

Sometimes the Bellingers treat seed with Jockey, but Darrell believes it is overrated. They have used Gaucho (imidacloprid) in the past, but normally don't use it. As they keep their own seed (for one season maximum), they don't have to dress it.

Sowing decisions

The father and son team aim to stay close to their planned rotations. In 2009, they put in a third of their canola before the rain on Anzac Day. They sow their canola from mid to late April.

Grain prices will play a role in sowing decisions - if prices are "ridiculous" (i.e. very low), they reduce their acreage sown to canola. The Bellingers don't place huge emphasis on subsoil moisture, because they will alter the plan as required to minimise risk.

The Bellingers have never re-sown canola. In most years where they have dry sown, the canola emergence can be patchy. With a small rainfall event (e.g. 5 mm), the canola will emerge on the hills, but not on the heavy soils, resulting in staggered emergence when it does rain - which they feel is not a big issue. In 2009, the early rain had been good and it had all come up.

Canola is normally sown at 20 mm depth.

Fertiliser strategies

Gypsum is normally applied at 500 kg/ha. Around 50 to 80 kg/ha of 29:12 (N:P) is applied down the tube at sowing. Normally, they come back with urea or SOA (ammonium sulphate) as the crop starts to run up. Urea is normally topdressed at 60 to 80 kg/ha.

The Bellingers often soil test before sowing - on average, each paddock is tested about every four years.

Pre-sowing and PSPE weed control

Normally a knockdown of 1.0 L/ha glyphosate is applied with 1.5 to 1.7 L/ha trifluralin. OnDuty® is applied at 40 g/ha as soon as the crop reached the two-leaf stage.

The main weeds targeted are mustard, capeweed, turnip, volunteer legumes, medic, wild radish, annual ryegrass and brome grass. Skeleton weed used to be a problem.

The main reason they have used OnDuty is they find it is excellent on wild radish, and consider it to have better residual and do a better job than the triazines.

Sowing equipment

The tractor is a CAT 95E pulling a Simplicity 9000 bin and Flexicoil bar fitted with knife points and Forward Farmer press wheels. The only thing they vary with the conditions is sowing depth - sometimes canola is sown deeper to chase moisture.

Row spacing

30 cm (12 inch).

Sowing rate

If dry sowing, canola is sown at 3 to 4 kg/ha. If sowing into moisture, they use 2 to 3 kg/ha.

Why do you choose your sowing system?

Darrell and Don mostly no-till. The benefit to them in their Mallee environment is to minimise wind erosion and improve soil moisture retention. The stubble gives more protection from the wind for the crop and also benefits soil structure and health.

They also achieve better emergence with direct drilling for all their crops, especially if sowing when soil moisture is marginal. The press wheels and stubble cover have made a big difference.

Crop establishment

The Bellingers normally monitor the canola closely as it comes out of the ground for insect pests. They are mainly redlegged earthmite and lucerne flea. In terms of diseases, Darrell says that "canola's pretty good up here" (in the Mallee). He thinks it has been too dry for blackleg to be an important issue.

Validation

They drive over every paddock at emergence. They also constantly monitor their crops for weeds, insects, nutrition and diseases. The pair also validate their canola gross margin against their other crops.

Average yield and oil content

The average oil content is 39%.

They don't very often get 40%.

In their worst year, the average canola yield over the whole farm was 0.25 t/ha.

In their best year, it was 1.36 t/ha. They average between 0.86 to 1.09 t/ha.



FARMER CASE STUDY

Improving the soil with inter-row sowing

NORADJUHA AND TOOAN, VIC.



John Heard

Enterprises:	In 2009, the crop and pasture mix was: pasture (24% of area), wheat (22%), barley (17%), canola (16%), faba beans (10%), field peas (9%) and 4500 merino sheep.
Average Annual Rainfall:	Long-term average approximately 430 mm; last 10 year average approximately 380 mm.
Average GSR:	Long-term average 300 mm (April-October); last 10 years approximately 250 mm.
Soil Types:	At Noradjuha: heavy sodic "difficult" clays. At Tooan, a mixture of heavy grey self-mulching cracking clay and sandy loams.
Soil pH:	pH _{water} range 5.0 – 5.5 at Noradjuha and 5.5 – 6.0 at Tooan.

History

John's family have farmed in the area since around the 1860s, when the region was first settled, and were traditionally woolgrowers. However, the family started becoming large croppers since approximately 1995, when the seasons became drier and the soils became easier to crop. Before then, the farm was under water most of the time. The family have bought more land - increasing in 2000 from 600 ha in crop to 2200 ha cropped in 2009. They have also improved pastures allowing them to maintain the level of their wool enterprise. In recent years, John has taken over management of the farm. Initially, the family were minimum-till farmers, but are now no-till. They first grew canola in 1994.

Crops preceding canola

In the past, canola has followed pasture. But with the increased cropped area, canola always follows a legume - clover pasture, faba beans or field peas.

Stubble management

All stubbles are retained and John aims to inter-row sow. In the first year he had autosteer with 23 cm (9 inch) spacings with a 10 m (32.5 ft) bar. In the second year they had 30 cm (12 inch) spacings in 10.7 m bar (35 ft). The Heards have bought a new seeder, and 2009 was the first year where 100% of crops were inter-row sown. John is trying tramtracking (i.e. controlled traffic farming) but is currently 'semi' tramtracking. John and his family haven't burnt stubbles for the last two years.

Systems used

Clearfield hybrids.

Varieties

In 2009, 45Y77.

Seed dressings

Jockey is used for blackleg and Gaucho for insects such as redlegged earthmite. John would rather use Cosmos®, but didn't have the option of the seed being treated with it.

Sowing decisions

If canola fits with the rotations, then they will grow it. John says he does not care about the other factors (e.g. timing of the autumn break, amount of subsoil moisture etc.), the decision just depends on the rotation.

Fertiliser strategies

Gypsum is applied up front at 1 to 2 t/ha, depending on the soil and paddock history. They use a MAP/urea mix of 25:12 N:P sown through a single shoot and topdress 80 kg/ha urea before stem elongation (around August) depending on moisture.

RAISING THE BAR WITH BETTER CANOLA AGRONOMY

Pre-sowing and PSPE weed control

The Clearfield hybrids are sprayed with 1.7 L/ha trifluralin pre-sowing if it is dry. If an autumn break has occurred, he applies 1.7 L/ha trifluralin and 1.0 L/ha glyphosate as a knockdown. Around July, Intervix is applied at 600 mL/ha, Lontrel at 150 mL/ha and clethodim as Select at 250 mL/ha.

Sowing equipment

Tractor is a John Deere 9420, towing a 12 m (40 ft) Simplicity Allrounder on 30 cm (12 inch) spacings, with knife points and press wheels with a 9000 L Simplicity bin including a small seeds box.

If it is really wet, John switches from using knife points to inverted T points. On sodic clays these points help reduce smearing in wet conditions.

Row spacing

30 cm (12 inch).

Sowing rate

2 kg/ha for hybrid seed. Specific plant densities are not targeted.

Why do you choose your sowing system?

No-till and controlled traffic farming are cost-effective, because the paddock is only driven over once. Crops are sown on-time over a broader window, also because he does not need to go over paddocks more than once.

Using knife points and press wheels gives a lot better establishment with lower sowing rates. Another reason John uses this system is that it improves the soil - it's also a reason John grows canola, as canola also improves the soil.

Crop establishment

Redlegged earthmite and lucerne flea are sprayed after sowing. In 2008 John relied only on Gaucho and "paid the price". The Heards have not had any problems with diseases of emergence, and Jockey is used, as if it gets blackleg, "you can't stop it once it's there".

Validation

John says his crop establishment probably won't look as good as others' because he sows it lighter. This is because he sows hybrids which can "fill out" later in the season.

He compares his crops with other growers when it goes to cabbage. He just looks at it to see if there is enough there. He thinks a good rule of thumb is a boot width between plants at the seedling stage.

Average yield and oil content

Target yield John hoped for was 2 t/ha in 2009 and 43% oil. The average yield over the past 10 years was 2 t/ha, but this has varied from 1.0 t/ha to 2.5 t/ha.



John Heard (right) with worker Niall Sharkey from Dundalk, Ireland.

Photo: Felicity Pritchard

FARMER CASE STUDY

No-till canola in the high rainfall zone

INVERLEIGH, VIC.



Ross and Ewen Peel

<i>Enterprises:</i>	Crops on the property include canola (25% of the cropped area), with the remaining 75% split evenly between barley and wheat. Ewen and his father Ross also run a flock of 1200 merino ewes and has recently swung over to a Dohne ram, which may reduce the requirement for mulesing in the future.
<i>Average Annual Rainfall:</i>	525 mm (although much less in recent years).
<i>Average GSR:</i>	300 mm long term average.
<i>Soil Types:</i>	Grey loam.
<i>Soil pH:</i>	pH _{water} about 5.0 to 6.0.

History

The family has farmed in the area for around 100 years. Canola has been grown regularly for about 15 years. Two of the major changes have been the move to more crop and less stock, and the swing to direct drilling. Ewen classes changes in sowing, chemicals and their applications as some of the most important changes. Direct drilling was first tried about 25 years ago with limited success, but in the last 10-15 years Ewen changed his sowing equipment and adopted direct drilling again. In more recent years, he has upgraded his seeder and is direct drilling more successfully.

Seeding technology, better boomsprays, better chemicals and their application as well as better agronomic information have all made a big difference.

Crops preceding canola

Either wheat or barley, but generally barley.

Stubble management

Ross and Ewen try to retain all stubbles. They haven't burnt for 3-4 years now, but do occasionally. They don't mulch stubbles, but leave standing if they can. They have a chopper on their header that spreads straw and chaff. If harvest contactors are employed Ewen likes to see similar choppers used. They use guidance but only partially tramtrack, as the header and seeder aren't completely lined up, whereas the boomspray and spreader are. The Peels aim to inter-row sow, but it is a bit hard as the machinery is on 20 cm rows, which is a bit narrow. In this area (with high rainfall) they don't want to go out to really wide row spacings, so they will persist.

Systems used

In 2009, only Clearfield hybrid canola was grown. They are growing them for their hybrid vigour rather than their chemical tolerance. He has grown all types except Roundup Ready.

Varieties

In 2009, the majority of the canola was 46Y78. A small area of 46Y81 was also sown.

Seed dressings

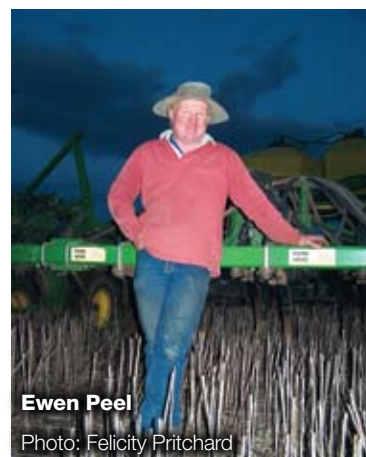
The seed is treated with Jockey and Gaucho when bought. Birds are not a huge problem.

Sowing decisions

Canola is a part of the rotation, so the Peels are not too price sensitive with it (as in recent times canola has been at least \$400/t, so the price has not been a factor). Subsoil moisture is not a factor either, but moisture at sowing is the biggest issue. Ewen has not had much success with dry sowing canola, resulting in staggered germination. They sow canola during May for best results. Occasionally canola has been re-sown, but generally by the time Ewen has realised that the paddock needs re-sowing, the season is too late.

Fertiliser strategies

About 80 kg/ha DAP is sown down the same tube as canola. If plant population and weed control are good and there is adequate moisture and rain is forecast, the Peels apply urea or amsol (sulphate of ammonia) before stem elongation. It is too risky to go later than that. Ewen and Ross stopped pre-drilling urea eight to 10 years ago as they get big crops too early on.



Ewen Peel

Photo: Felicity Pritchard

Pre-sowing and PSPE weed control

When growing Clearfield varieties, they don't normally use the Clearfield chemicals, just Select (clethodim). Radish is not a huge issue. Triazine tolerant varieties are normally grown on radish country, but in 2009 they only used a Clearfield on radish country and used OnDuty. Ewen has also used Dual® Gold as a post-sowing pre-emergent herbicide for toadrush, but he did not use much in 2009 as it looked like it would be dry and also it needed to be applied to bare soil.

Sowing equipment

Tractor is a CAT Challenger 75 pulling a John Deere 735 seeder bar with inverted T-points and press wheel gangs at the back with a John Deere box.

Row spacing

Everything is sown on 20 cm row spacings.

Sowing rates

The hybrids are sown at 3 to 3.5 kg/ha and TT (open pollinated) varieties sown at 4 kg/ha. They aim for 50-70 plants/m².

Why do you choose your sowing system?

Ross and Ewen no-till everything, for economic reasons due to not cultivating the soil, better soil structure, moisture conservation and all the other benefits of no-till. It seems to be working reasonably well.

Crop establishment

They normally target 50 to 70 plants/m². Good early establishment is the key to canola growing. They are really impressed with the early vigour of the hybrids as early vigour of canola is so important. In TT varieties, the establishment is slow and it leaves the plants vulnerable to pests etc. They normally put out Talstar for redlegged earthmite, but are trying to go down the IPM path, and will in future try to avoid insecticides in most cases. But they do bait for slugs with SlugOut®, a water resistant slug bait.

The Peels have not seen a lot of problems with disease for a few years now. Ewen thinks this is because it has been dry. Blackleg has lately not been a big problem, and he thinks the Jockey helps. He has not seen as much blackleg as in past years. Variety resistance has also played a part in blackleg management.

Validation

Ewen undertakes plant counts and believes it is the only way to determine if establishment is adequate. He also says it is a lot easier to make correct decisions when it comes to fertiliser spreading time.

Average yield and oil content

Last year, the average yield was 1.8 t/ha, with a very small amount of frost damage (and a dry finish). The average yield over the years is 2.0 t/ha. The oil content last year averaged 40% (ranged 39 to 41.5%), but normally is 41 to 43%.

FARMER CASE STUDY

No-till success with heavy stubble loads

TARLEE, SA



Jason Branson

<i>Enterprises:</i>	Wheat (60% of area), faba beans (15%), canola (15%) and pasture (10%). 450 merino ewes crossed to White Suffolk terminal sire.
<i>Average Annual Rainfall:</i>	450 mm.
<i>Average GSR:</i>	350 mm (April-October).
<i>Soil Types:</i>	Loamy red brown earth through to some areas of heavy black cracking clay.
<i>Soil pH:</i>	pH _{Ca} range 6.5 - 8.0.

History

Jason is a third generation farmer on the property. Canola has been grown for a long time, at least 15 years.

Crops preceding canola

Canola is grown as a break crop and generally follows two years of wheat. Other break crops are beans and pasture, which are rotated with canola to provide an adequate disease break on each paddock.

Stubble management

Fertiliser is pre-drilled prior to sowing canola, and the paddock is then prickle chained prior to sowing to provide some till to sow into. Following sowing a prickle chain and roller is run over the paddock to firm it up and enhance seed/soil contact. An Ezysteer system is used at sowing which has sub 10 cm accuracy.

System used

TT canola is grown because of the options available to control ryegrass.

Varieties

ATR-409 was grown in 2009, previously ATR-Signal was grown.

Seed dressings

Jockey is applied to improve blackleg control. The 2009 ATR-409 seed also had Gaucho on it.

Sowing decisions

Canola is in the rotation as a break crop for cereals, so the sowing decision is pretty straightforward. It also provides Jason with a chance to burn the windrows at the end of the year as an extra ryegrass control.

Ideally canola will be sown by the end of April. It has been successfully dry sown in years with a late autumn break. Sowing canola early takes the pressure off sowing the remainder of the program. Some soil types are best waiting until after a rain especially if the sheep have packed the soil down a bit hard.

Fertiliser strategies

50 kg/ha of both DAP and urea are pre-drilled prior to sowing canola. A gypsum application is also spread prior to sowing, the rate varies from 2 t/ha to 500 kg/ha, depending on the soil type and whether they are purely after its sulphur or its soil structure benefits as well.

Urea is applied as a post-emergence approximately 6 weeks after sowing at approximately 80 kg/ha. A further top-up may be required in good years, but this is re-evaluated as the season goes on.

Pre-sowing and PSPE weed control

A knockdown is used if there are green weeds present at sowing. Atrazine and metolachlor are applied post-sowing pre-emergence, prior to a rainfall event. Post-emergence weed control relies on Select (clethodim) with some atrazine to control late germinating radish.

Sowing equipment

The sowing equipment is a Case PTX600 bar with a Horwood Bagshaw air cart. The bar is 10.7 m (35 ft) wide, and they sow with knife points and 'walking' press wheels. The machine has double shooting capacity, although they tend not to use this facility much anymore. The rig is pulled by a Case International 9250 tractor.

Row spacing

All crops are sown on 23 cm (9 inch) row spacing.

Sowing rates

Sowing rate for canola is 3 kg/ha. Snails and slugs can be a problem on some country so they bait with Metarex® (metaldehyde) to control these.

Why do you choose your sowing system?

The Bransons have been no-tilling the rest of the program for some time now, and the seeder works well and handles heavy trash loads. However, they feel that the pre-drilling and prickle chaining with canola provides a finer seedbed though, which helps with establishment on some of their soil types.

Crop establishment

They have had some trouble in the past with false wireworm, redlegged earthmite, lucerne flea, snails and slugs, so these are the main threat at emergence. The Bransons don't have any trouble getting plants to come up, but if these pests aren't managed they can damage the crop in a short timeframe.

Validation

Each year when the crop is emerging Jason scouts over each paddock on the motorbike to check emergence and look for any issues. This is a great way to get a feel for the crops and enables any problems to be identified early on.

Average yield and oil content

The worst yields they have had for a while were in the 2006 drought when they grew between 1.2-1.5 t/ha. The last couple of years they have averaged between 1.6-1.8 t/ha, with reasonable oil levels, usually above 42%.



Photo: Patrick Redden

FARMER CASE STUDY

Reaping the benefits from disc seeder system

OWEN, SA



Ben and Ray Marshman

<i>Enterprises:</i>	Durum (20% of area), bread wheat (15%), malt barley (20%), faba beans (15%), canola (15%) and lentils (15%).
<i>Average Annual Rainfall:</i>	425 mm - 475 mm
<i>Average GSR:</i>	325 mm (April - October).
<i>Soil Types:</i>	Loamy red brown earth through to some areas of heavy black cracking clay.
<i>Soil pH:</i>	pH _{water} range 7.0 to 7.5.

History

The family has been farming on the property for three generations. Canola has been grown for as long as Ben can remember, as part of a continuous cropping rotation for the past 20 years. Livestock have not been run on the property during this time. The business has used a zero-till disc sowing system for the past seven years.

Crops preceding canola

The basic rotation followed is two years of cereal followed by two years of a break crop. Either durum or bread wheat is grown, followed by barley as a second cereal. Either faba beans or lentils are then grown as a pulse, followed by canola before beginning the cereal phase.

Stubble management

Full stubble retention is practiced, forming a mulch on the soil. The disc system allows sowing to be completed despite high levels of residue. Machinery is equipped with 2 cm autosteer, however inter-row sowing is difficult due to the disc machine tending to wander slightly.

Systems used

TT canola is grown because of the weed spectrum covered by triazines.

Varieties

In 2009 Thunder TT and ATR-Cobbler were grown.

Seed dressings

Cosmos applied to seed provides some protection against redlegged earthmite. Due to the mulch on the soil, earwigs and millipedes can be a problem if not managed.

Sowing decisions

Canola is grown primarily as a rotation crop, for the disease and weed break it provides for the following cereal crop. The gross margins have improved since it has been grown following a legume, and there does not appear to have been an adverse impact on cereal yields following canola compared to a legume.

Canola is generally in by the end of April and is sown dry if required. The Marshmans have had to re-sow once before, following a false break, where the crop emerged on a small rain front and was then hit with some unseasonably hot weather and died. In general establishment has been OK, though, with dry sowing.

Fertiliser strategies

80 kg/ha of 29:11 (N:P) with 1% zinc is applied at sowing, half with the seed and half above the seed. A post-emergence application of urea at bolting of up to 160 kg/ha is also targeted. The rate is determined by the seasonal outlook and subsoil moisture at the time.

Pre-sowing and PSPE weed control

Weed control pre-sowing is dependent upon the break of the season. No knockdown is applied if the canola is dry sown. A mix of simazine and atrazine is applied post-sowing pre-emergence prior to a rainfall front, along with an application of alpha-cypermethrin. Grasses are controlled in-crop with an application of Select (clethodim).

Sowing equipment

The sowing program is completed in one pass using a Case SDX disc sowing system, with a Simplicity air cart. The seeder is 12.2 m (40 ft) wide, and pulled by a 425 hp New Holland Versatile tractor. Soil throw is minimal, and the machine can handle heavy stubble loads.

Row spacing

Cereals and lentils are sown on 19 cm (7.5 inch) row spacing. Canola and beans are sown on wider rows of 38 cm (15 inch) spacing.

Sowing rates

Sowing rates are 4 to 5 kg/ha. This is a little higher than necessary to provide some margin for insect damage.

Why do you choose your sowing system?

There had been trials of disc seeders on the property, which gave them some confidence. The benefits are now starting to show with excellent soil aggregation, earthworm activity and moisture infiltration. There have been yield benefits in the canola and beans from the wider row spacing allowing more branching and better water utilisation.

Crop establishment

Emergence has generally been pretty good. Keeping on top of the earwigs and millipedes can be a challenge, but a combination of Cosmos and alpha-cypermethrin is having an impact.

Validation

There are variable soil types within paddocks and establishment is adequate when there is a good, even cover of plants across the paddock.

Average yield and oil content

The Marshmans tend to aim for 1.7 to 1.8 t/ha. Last year was dry, however, and they only averaged 1.1 t/ha with oil content of around 40%, which is quite low for oil compared with usual production.



Ray (left) and Ben Marshman.

Photo: Patrick Redden



Photo: Felicity Pritchard

