Australian Government

Grains Research and Development Corporation

RAISING THE BAR WITH BETTER SUNFLOWER AGRONOMY

Sunflower case studies and demonstration site activities

AUTUMN 2009

AOF better OILSEEDS

GRDC Grains Research & Development Corporation

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The Better Sunflower advisory group consisted of:

- Robert MacDougall-Australian Grain Accumulation Services Pty Ltd and Chairman Australian Sunflower Association
- Annie Pfeffer-Grower
- Stephanie Belfield- HMAg Pty Ltd, former NSW DPI Agronomist, Moree East
- Loretta Serafin- NSW DPI Agronomist, Tamworth
- Maree Crawford- Pacific Seeds
- Pat McKey-BettaCrop
- Phil Albury- Philp Brodie Grains
- Scott Gibson-Pacific Seeds (part)

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Grower involvement

The Better Sunflower advisory group are grateful for the invaluable contribution of the following growers who allowed the publicity of their crop production data for the betterment of the sunflower industry: David Ronald, Peter Winton and Keith Harris, Ian Bailey, James Keen, Kevin and Loretta Charlesworth, Ivan and Karen Gowlett, Scott and Alicia Dunbar, Ross and Irene Ingram and Hedley and Fiona Watt.

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Copies of this publication are available from
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THE BETTER OILSEEDS PROJECT

The Better Oilseeds project was jointly funded by the Grains Research and Development Corporation and the Australian Oilseeds Federation. The project provided much needed support for oilseed growers and aimed to increase the volume and consistency of oilseeds produced.

Australian oilseed production peaked in 1999, but the peak was less than what many analysts believed was the potential Australian oilseed production. In recent years poor seasons and/or lower prices have seen the area decline.

This project aimed to put aside the weather and price factors and looked at ways the industry could be supported. The project outcome was for the industry to improve the skill level of advisers and growers so that they can more reliably produce oilseeds under current climatic conditions and also be able to take advantage of more favourable conditions when they return.

Specific project aims

1. *To capture all existing knowledge and place relevant information into an easily accessed website.*
2. *To utilise the knowledge of successful growers through sharing information with other growers in their region.*
3. *The project addressed common problems/issues through demonstration field sites. Issues were determined by the crop Advisory Groups and included issues such as: cost of production; rotational benefit/farming system approach; decision support on when to grow an oilseed given a range of grain prices and dates of the opening rains; disease management etc.*
4. *Regular forum and field days were used to build capacity of advisers/growers and to get them thinking about what the possibilities were for their clients/farms.*
5. *The project also identified and highlighted ways that growers can improve grain quality making the industry more competitive.*

INTRODUCTION

This booklet has been produced by a team of experienced agronomists and researchers. It is one of the outputs from the Better Oilseeds project funded by the GRDC and AOF. The project was initiated to revitalise the Australian sunflower industry. While the sunflower and its products are sought after by a range of markets, the industry has been adversely impacted by drought and a decline in research and development support. The Better Oilseeds (sunflowers) program is aimed at rebuilding grower confidence in sunflowers and repositioning the crop as a crop of choice for growers.

Sunflowers are one of the very few crops that offer market flexibility for growers through hectare contracts. The availability of hectare contracts allows growers to take advantage of any favourable pre season prices, while knowing that they only need to supply what they produce. A great advantage should adverse conditions prevail during the season.

Many people need to be thanked for their efforts and contributions to this publication. Specifically I would like to thank the efforts of the two NSW agronomists; Loretta Serafin (NSW Dept of Primary Industries, Tamworth) and Stephanie Belfield (HMAg P/L, formerly NSW DPI, Moree).

I encourage you to view further agronomic information from the Better Oilseeds project for sunflowers on the Australian Oilseeds Federation website at www.australianoilseeds.com and we look forward to a larger and more prosperous sunflower industry.

Robert MacDougall
Chairman, Sunflower Committee,
Australian Oilseeds Federation.

Better Sunflower demonstration site and case study locations

BETTER SUNFLOWERS DEMONSTRATION SITE RESULTS

The effect of row spacing and plant population on the yield and quality of dryland sunflowers Moree, NSW, 2007/2008

Stephanie Belfield, HMAg Pty Ltd - former NSW DPI District Agronomist

What happened?

Yield suffered when sown on narrow (75cm) row configurations at Moree in a tough season.

Oil content was maximised at higher plant populations. Oil percentage was reduced when sunflowers were sown on wide row spacings.

Low plant population produced the heaviest seed weight.

Background

Following on from plant population work the Australian Sunflower Association and NSW DPI funded across Northern NSW in the 2004/05 and 2005/06 seasons, there were requests for work on plant population and row spacing interaction.

The concept of a 'wide row' has been adopted particularly around Moree and the north west when growing dryland cotton and sorghum, so there is a need to learn more about sunflower root architecture and the plants ability to use the inter-row water in a wide row situation.

Demonstration site aims

To investigate the effect of row spacing and plant population on the yield and oil content of dryland sunflowers.

Site details

Location	Merinda Farms Grattai East Biniguy (30km SE Moree, NNSW)
Sowing date	6 September 2007
Harvest date	22 February 2008
Soil	Heavy grey vertosol
Starting soil moisture	67mm plant available water
In crop rainfall	320mm
Row configuration	0.75m on solid and single skip, 1m on solid and single skip, 1.5m solid
Target plant population/ha	27,000, 37,000, 46,500
Variety	Hyoleic 41 (mono-unsaturated oil type hybrid)
Nutrition	70kgN/ha available in the soil, 35kg/ha Starter Z
Plot size	16m x 100m
Replicates	2
Field day	30 January 2008

Method

The trial was sown with the Pacific Seeds trial planter which was a 4 row disc Monosem planter. Each treatment was 16 m wide. The NSW DPI small plot header with Sullivan reel and sunflower trays was used to harvest the trial. A strip was harvested up the middle section of each plot, leaving a buffer of outside rows to ensure no bias from the neighbouring treatment. The trial was sown on 75cm and 1m row spacings with the skip row treatments 'skip row' sprayed out after crop emergence.

Results

There was very little rain in crop during the early vegetative stages. The season was mild so growth stages were delayed hence the trial was not harvested until late February. As the soil did not have a full profile of moisture at sowing, the crop struggled at critical development periods.

Table 1. Effect of row configuration on yield (t/ha)

Row spacing (m)		Yield (t/ha)*
LSD = 0.15t/ha	Solid - 1	1.19[a]
	Single skip - 1	1.14[a]
	Single skip - 0.75	1.11[a]
	Solid - 0.75	0.78[b]

Table 2. Effect of row configuration and plant population on oil content

Row spacing (m)		Oil content (%)*
LSD = 1.01%	Solid - 1	43.92[a]
	Single skip - 1	42.40[b]
	Single skip - 0.75	44.02[a]
	Solid - 0.75	43.73[a]
Plant population (/ha)		
LSD = 0.78%	46,500	44.18[a]
	37,000	43.79[a]
	27,000	41.82[b]

Table 3. Effect of target plant population on hundred seed weight (HSW) of sunflower

Plant population (/ha)		HSW (g)*
LSD = 0.22g	46,500	3.95[c]
	37,000	4.41[b]
	27,000	4.89[a]

** Means within column followed by the same letter do not differ significantly at P=0.05.*

Commercial practice

Currently the practical recommendation for the Moree district is to aim for 25,000 to 30,000 plants established per hectare on 1 m spacings. This trial is supporting the current practice with an awareness that these practices may impact on oil content of the crop in certain years.

Acknowledgements

The trial was conducted and managed by NSW DPI with particular assistance from Ian Brown, Trevor Philp, Scott Gibson and Rob Johnston from Pacific Seeds. Thanks also to Bernadette Wenner and staff from Cargill who tested all the treatments for oil content at their laboratory in Narrabri, NSW. Statistical analysis was carried out by Bruce McCorkell, Biometrician with NSW DPI Tamworth.

Trevor Philp and Stephanie Belfield

BETTER SUNFLOWERS DEMONSTRATION SITE RESULTS

Plant population and row configuration in dryland sunflowers on the Liverpool Plains, NSW, 2008

Loretta Serafin, District Agronomist, NSW DPI, Tamworth

What happened?

Highest yields were obtained from planting at a target population of 27,000 plants/ha on a 75cm row spacing using a solid planting configuration.

The highest oil content was achieved from planting using a target population of 37,000 plants/ha on solid 75cm row spacing.

Background

In the 2003 – 2007 sunflower seasons the Australian Sunflower Association and NSW Department of Primary Industries funded a project titled Sunflowers in Northern NSW and Southern Qld – Tools for Success. During this project a series of trials evaluating plant population were run across northern NSW. Conclusions from these trials showed the optimum plant population to be between 25-35,000 plants/ha but only evaluated 91cm row spacings on a solid planting configuration. However, many growers are using 75cm or 100cm row spacings and some experimentation using single skip or wider row spacings has also occurred. It became apparent that further investigation of the effect of varying plant population and row spacing and their interactions was needed.

Demonstration site aims

The demonstration aimed to evaluate the effect of varying plant populations and row spacing on final sunflower yield and oil content under dryland conditions using a mono-unsaturated hybrid.

Site details

Location	Yarranvale Quirindi
Sowing date	3 January, 2008
Harvest date	28 May, 2008
Soil type	Black Vertosol
Hybrid	Hyoleic 41
Treatments	Target 27,000, 37,000 and 46,500 plants/ha
Row configurations	75cm rows – solid plant, single skip and wide row 100cm rows – solid plant and single skip
No of replicates	2
Treatment area	8m x 100m long
Nutrition	70kg N (supplied as urea) and 50kg Starter Z

Rainfall (mm):

2007/08	Dec 07	Jan	Feb	March	April	May	June	Total in-crop
	139	59	135	15	8	24	99	479

Method

The site was sown using the Pacific Seeds four row Monosem precision disc planter. Each treatment was sown using two passes of the planter. Following establishment the rows not required for the single skip and wide row treatments were sprayed out using glyphosate. The trial was harvested using a small plot header fitted with a Sullivan reel and sunflower trays. One pass the width of the header was taken from each plot. Samples were then weighed, moisture tested and a sub sample collected for oil analysis.

Results

The trial yielded very well as a result of the combination of starting with a full profile of moisture and excellent in-crop rainfall until post budding. Very little rain fell during flowering and grain fill until harvest but mild conditions prevailed.

Table 1. Effect of target population (/ha) on yield and oil content

Target plant population	75 cm Row spacing		100 cm Row spacing	
	Yield (t/ha)	Oil content (%)	Yield (t/ha)	Oil content (%)
27,000	2.25	39.69	1.83	36.87
37,000	2.24	40.03	1.79	38.31
46,500	2.04	40.41	1.93	40.73
Mean:	2.18	40.04	1.85	38.63
LSD:	0.37	4.46	0.22	2.19
CV (%):	8.3	4.2	6.0	1.6

There was no significant difference between the populations on 75cm row spacing for yield or oil content (Table 1). There was no significant difference between the populations for yield on 100cm row spacing. Populations of 27,000 and 37,000 produced significantly lower oil contents than the 46,500 population on 100cm row spacing.

Table 2. Effect of row spacing on yield and oil content

Row spacing	75 cm Row spacing		100 cm Row spacing	
	Yield (t/ha)	Oil content (%)	Yield (t/ha)	Oil content (%)
Solid plant	2.39	41.29	2.19	39.49
Single skip	2.15	39.79	1.51	37.78
Wide row	1.99	39.05	nd*	nd*
Mean:	2.18	40.04	1.85	38.63
LSD:	0.26	2.39	0.20	1.13
CV (%):	8.3	4.2	6.0	1.6

** nd- Indicates no data, these treatments were not included in the trial.*

The solid plant and single skip treatments yielded significantly better than the wide row treatment on 75cm spacing. There was no significant difference for oil content.

Solid plant performed significantly better for yield and oil content than single skip on 100cm row spacing.

Table 3. Effect of plant population x row configuration on 75cm row spacing yield and oil content

Plant population	Solid plant		Single skip		Wide row	
	Yield (t/ha)	Oil content (%)	Yield (t/ha)	Oil content (%)	Yield (t/ha)	Oil content (%)
27,000	2.47	40.07	1.94	39.83	2.36	39.18
37,000	2.44	42.52	2.21	39.10	2.07	38.47
46,500	2.28	41.28	2.30	40.44	1.55	39.52
Mean:	2.18	40.04				
LSD:	0.39	4.03				
CV (%):	8.3	4.2				

The highest yield was achieved from a population of 27,000 plants/ha on a solid plant configuration on 75cm row spacing, however there was no significant difference between this treatment and the other populations or the 37,000 plants/ha and 46,500 plants/ha populations on single skip or the 27,000 plants/ha and 37,000 plants/ha populations on the wide row spacing (Table 3). The lowest yield was obtained from a population of 46,500 plants/ha on wide rows.

There was no significant difference between any of the treatments for oil content except 37,000 plants/ha on a wide row which had significantly lower oil content. The highest oil content was obtained at a population of 37,000 plants/ha on solid plant rows.

Table 4. Effect of plant population x row configuration on 100cm row spacing yield and oil content

Plant population	Solid plant		Single skip	
	Yield (t/ha)	Oil content (%)	Yield (t/ha)	Oil content (%)
27,000	2.18	38.31	1.49	35.43
37,000	2.08	40.05	1.51	36.56
46,500	2.31	40.10	1.55	41.35
Mean:	1.85	38.63		
LSD:	0.24	1.79		
CV (%):	6.01	1.6		

There was no significant difference between any of the populations for a solid plant on 100cm row spacings; they all yielded significantly better than the single skip configurations (Table 4). The highest oil content was obtained in the single skip configuration at a population of 46,500 plants/ha; however this was not significantly different to the solid plant populations of 37,000 plants/ha and 46,500 plants/ha.

Commercial relevance/Economic analysis

Current practice of sowing solid plant on 75cm row spacing has been confirmed as the most consistent for high yields and optimising oil content in dryland sunflowers. There is however opportunity to reduce plant populations down to the range of 27,000 plants/ha – 37,000 plants/ha, in line with previous trial work conducted.

There is also scope to utilise 100cm row spacings on solid plant for sunflowers without too much yield decline.

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- The Barwick Family (Neil, Kay, Geoff & Kellie) for providing the site.
- Pacific Seeds for sowing the trial in particular Ian Brown, Tony McCumstie and Trevor Philp.
- Cargill Narrabri who provided the oil analysis, in particular Bernadette Wenner.
- Dr Phillip Stahlman, Kansas State University for trial collaboration and assistance.
- Brad Welsh, Bruce Haigh, Dougal Pottie & Alan Bowring NSW DPI for assistance with site management and harvest.
- Steve Harden, NSW DPI for biometrical analysis of results.

Loretta Serafin

BETTER SUNFLOWERS DEMONSTRATION SITE RESULTS

Sunflower tolerance to soil-applied and foliar-applied herbicides, Tamworth, Moree and Quirindi, NSW, 2007/08

Dr. Phil Stahlman, Kansas State University Agricultural Research Center-Hays – (former Visiting Scientist, NSW DPI, University of New England, Armidale)

Loretta Serafin, NSW DPI District Agronomist, Tamworth

Stephanie Belfield, HMAg Pty Ltd - former NSW DPI District Agronomist, Moree East

What happened?

Averaged over three trials, some soil-applied herbicides caused as much as 20% early-season crop injury expressed as foliar chlorosis, necrosis, and/or stunting.

Stomp® Xtra (pendimethalin) applied alone or in mixture with other herbicides visibly injured sunflowers in two of three trials and caused ~10% crop stand loss in the trial near Moree. Because of bird damage, it is not known if the stand loss was significant enough to reduce seed yield.

Sunflower exhibited tolerance to two new herbicides (sulfentrazone, Spartan® and pyroxasulfone, KIH-485) that are not currently registered for use in sunflowers in Australia. Neither herbicide caused more than 5% visible injury when applied alone in any of the three trials, but injury increased by tank mixing with other herbicides.

Seed yields ranged from 2.0 to 2.9 t/ha. Yield differences between herbicide treatments were not significant either within or between trials at Tamworth and Quirindi.

Intervix® [imazamox & imazapyr (2.2:1)] and Raptor® (imazamox) herbicides applied post emergence severely damaged a non-Clearfield® sunflower variety and resulted in crop failure.

Background

Australian growers have few herbicide options for selective broad spectrum weed control in sunflowers and some of the herbicides registered for this use occasionally cause crop injury. While on sabbatical in New South Wales, a weed scientist with Kansas State University collaborated with NSW DPI district agronomists to assess the potential of some herbicides not currently available in Australia but which are registered or have performed well in sunflower trials in the United States.

Trial aims

To compare crop response to several soil-applied and foliar-applied herbicide treatments under conditions of low weed density in dryland sunflowers.

To assess the potential and crop tolerance under local conditions of two herbicides (sulfentrazone, Spartan® and pyroxasulfone, KIH-485) with proven performance in sunflower in other countries but not yet available in Australia.

To demonstrate that conventional, non-Clearfield® sunflowers are not tolerant to imidazalinone herbicides.

Site details

Tamworth location	Richard & Michael Bowler Wheatacres Bithramere
Sowing date	14 November 2007
PRE spray date	15 November 2007
Harvest date	17 March 2008
Soil	Brown clay
Variety	Sunoleic 06
Nutrition	80 kg N (urea) and 35kg/ha Starter Z
Replicates	3
Field day	15 February 2008
Moree location	Merinda Farms Grattai East Biniguy
Sowing date	21 November 2007
PRE Spray date	21 November 2007
POST spray date	18 December 2007; sunflower 8 leaves, 30 cm tall
Harvest date	Not harvested due to excessive bird damage
Soil	Heavy grey vertosol
Variety	Sunoleic 06
Nutrition	66 kg N (urea) and 35 kg Starter Z
Replicates	3
Field Day	n/a

Quirindi location	Barwick Family Yarranvale Quirindi
Sowing date	3 January 2008
PRE Spray date	6 January 2008
POST spray date	22 January 2008; sunflowers 4 leaves, 10-12 cm tall
Harvest date	28 May 2008
Soil	Black vertosol
Variety	Hyoleic 41
Nutrition	70 kg N (urea) and 50 kg Starter Z
Replicates	4
Field Day	25 February 2008

Methods

Trials at Tamworth and Moree were sown with a four-row, gravity fed plot planter equipped with rigid deep-furrow shank openers and furrow closing wheels. Trials at Quirindi were sown with a Pacific Seeds four-row Monosem disc planter. Nitrogen and starter fertiliser were applied in furrow at the time of sowing. Individual plots were 3.0 m by 16 m and encompassed four rows. Herbicide treatments were applied with a compressed-gas, backpack-type sprayer and hand-held boom. The centre two rows of plots were harvested with a small-plot header equipped with Sullivan reel and sunflower trays. Harvested seed weights and moisture content were determined and subsamples were taken for oil content determination.

Results

Pre-emergence trials. Sufficient rainfall (>12 mm) for herbicide activation was received prior to crop emergence at each trial site. Averaged across trials, Stomp® Xtra applied alone or in combination with Dual® Gold, KIH-485 or Spartan® caused more than twice as much foliar injury (chlorosis and stunting) than solo applications of each tank mix partner (11-14% vs. 3-5% injury) (Table 1).

Table 1. Sunflower injury 15-20 days after herbicide application

Herbicide treatment	Product per hectare	Tamworth sunflower injury (%)*	Moree sunflower injury (%)*	Quirindi sunflower injury (%)*	Mean sunflower injury (%)*
Stomp® Xtra	2.5 L	15 *	13 ab	9 b	12
Dual® Gold	1.5 L	3 cd	10 bc	1 d	5
Prometryn 900 DF	2.0 kg	13 ab	8 bcd	6 c	9
Spartan®	187 g	0 d	5 cde	-	3
KIH-485	246 g	5 cd	3 de	1 d	3
Stomp® Xtra + Dual® Gold	2.5 L + 1.5 L	15 *	8 bcd	9 bc	11
Prometryn 900 DF + Dual® Gold	2.0 kg + 1.5 L	7 bcd	18 *	0 d	8
Spartan® + Dual® Gold	187 g + 1.5 L	3 cd	0 e	14 b	7
Stomp® Xtra + KIH-485	2.5 L + 218 g	10 abc	13 ab	10 bc	11
Stomp® Xtra + Spartan®	2.5 L + 187 g	13 ab	8 bcd	20 *	14
Non-treated control		0 d	0 e	0 d	0
Site means with non-treated omitted		8.4	8.6	7.8	

** Means within columns followed by the same letter do not differ significantly at P = 0.05.*

Tank mixtures that included Stomp® Xtra were no more injurious than Stomp® Xtra alone at Tamworth and Moree, but Stomp® Xtra plus Spartan® injured sunflowers more than any other treatment at Quirindi. At Moree, all treatments that included Stomp® Xtra caused 5-10% stand loss (data not shown) as a result of plant damage just below the soil surface (Figure 1). Crop stand was not affected in the two other trials. Sunflowers response to Prometryn 900 DF treatments varied among trials. Prometryn alone generally caused greater injury than Prometryn plus Dual® Gold at Tamworth and Quirindi, but the tank mixture caused greater injury than the solo treatment at Moree.

Except for plants that died in Stomp® Xtra-treated plots in the Moree trial, sunflower plants exhibiting foliar chlorosis or stunting recovered fully prior to formation of terminal buds and seed yields were not affected. Seed yields did not differ significantly among treatments within or between trials at Tamworth and Quirindi and oil content at Tamworth was not affected by herbicide treatment (Table 2).

Table 2. Sunflower seed yield and oil content

Herbicide treatment	Product per hectare	Tamworth (t/ha)[1]	Quirindi (t/ha)[1]	Mean (t/ha)	Oil content (%)[2]
Stomp® Xtra	2.5 L	2.20	2.47	2.35	39.6
Dual® Gold	1.5 L	2.38	2.44	2.42	40.1
Prometryn 900 DF	2.0 kg	2.18	2.70	2.48	40.0
Spartan®	187 g	2.13	NA[3]	2.13	40.5
KIH-485	246 g	2.41	2.35	2.37	39.8
Stomp® Xtra + Dual® Gold	2.5 L + 1.5 L	2.21	2.92	2.62	39.7
Prometryn 900 DF + Dual® Gold	2.0 kg + 1.5 L	2.20	2.35	2.28	39.9
Spartan® + Dual® Gold	187 g + 1.5 L	2.27	2.37	2.32	39.9
Stomp® Xtra + KIH-485	2.5 L + 218 g	2.16	2.13	2.14	39.9
Stomp® Xtra + Spartan®	2.5 L + 187 g	2.25	2.55	2.40	39.8
Non-treated control		2.03	2.25	2.16	39.7
LSD (P= 0.05)		NS	NS	NS	NS
Site means		2.20	2.46		

[1] Yield adjusted to 9% moisture.

[2] Tamworth location only.

[3] Yield not reported because of spraying error.

Post-emergence trials. Solo applications of Fusilade®, Factor® WG, Verdict® 520, Assure®, or Sertin® 186, each plus an oil adjuvant, did not visibly injure sunflower at Moree (data not shown) and caused little or no injury at Quirindi (Table 3). Sequence® plus Hasten™ caused 7% stunting, but was the highest yielding treatment at Quirindi. In both trials, Intervix® or Raptor® plus Chemwett 1000 non-ionic surfactant (NIS) severely damaged non-Clearfield® sunflowers. At Quirindi, sunflowers were stunted 50% at 9 days after treatment (DAT), ≥95% at 19 DAT, and 98% at 27 DAT (Figure 2). Results were similar at Moree. Sunflowers sprayed with Intervix® or Raptor® plus NIS did not recover; thus, no seed was produced. Yields of other herbicide treatments at Quirindi ranged from 2.09 t/ha for Sertin® 186 plus Hasten™ up to 2.79 t/ha for Sequence® plus Hasten™. Whereas the yield difference between those two treatments was significant, yield differences between herbicide treatments and non-treated sunflower were not significant. Yields at Moree were not determined because of excessive bird damage.

Table 3. Sunflower stunting and seed yield, Quirindi, NSW

		Stunting, days after treatment (%)[1]			
Herbicide treatment	Product per hectare	9	19	27	Seed yield (t/ha)[1 2]
Sequence® + Hasten™	250 ml + 1% v/v	7 [b]	7 [b]	7 [b]	2.79 [a]
Fusilade® + Hasten™	500 ml + 1% v/v	0 [c]	3 [bc]	2 [bc]	2.65 [ab]
Factor® WG + Hasten™	180 g + 1% v/v	2 [bc]	0 [c]	0 [c]	2.17 [ab]
Verdict® 520 + Uptake®	150 ml + 1% v/v	2 [bc]	2 [bc]	2 [bc]	2.68 [ab]
Assure® + Hasten™	500 ml + 1% v/v	0 [c]	2 [bc]	0 [c]	2.48 [ab]
Sertin® 186 + Hasten™	1.0 L + 1% v/v	2 [bc]	2 [bc]	3 [bc]	2.09 [b]
Intervix® + Chemwet 1000	1.0 L + 0.5% v/v	50 [a]	96 [a]	98 [a]	0 [c]
Raptor® + Chemwet 1000	290 ml + 0.5% v/v	50 [a]	95 [a]	98 [a]	0 [c]
Non-treated control		0 [c]	0 [c]	0 [c]	2.15 [ab]

[1] Means within columns followed by the same letter do not differ significantly at P = 0.05.

[2] Yield adjusted to 9% moisture.

Figure 1. Constriction and decay of a sunflower stem below ground in plots treated with Stomp® Xtra at Moree; severely affected plants broke-off and died.

Figure 2. Results of spraying a non-Clearfield® sunflower variety with Raptor® (foreground) or Intervix® (background) herbicides at 34 days after treatment.

Commercial implications and relevance

These trials indicated that sunflowers can tolerate as much as 20% early-season foliar injury and minor stunting without affecting seed yield or oil content. However, under certain conditions, Stomp® Xtra can cause stand loss resulting in reduced yield potential. The trials also demonstrated the promising potential for two soil-applied herbicides not currently registered for use in sunflower in Australia. Additional data are needed to support possible registration. Lastly, it was convincingly demonstrated that non-Clearfield® sunflowers are not tolerant to imidazolinone herbicides. Thus, the trait conferring imidazolinone tolerance must be incorporated into locally adapted varieties before Clearfield® technology can be made available to Australian sunflower growers.

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- The Bowlers (Richard, Gai & Michael) for providing the Tamworth trial site.
- The Ledingham Family (Michael & Marianne) for providing the Moree trial site.
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Dr Phil Stahlman

FARMER CASE STUDY, *THE POINT* QUIRINDI, NORTHERN NSW

Take home message:

- If the price of sunflowers is competitive with sorghum then sunflowers are as good as any other crop to grow.
- As with any summer crop, soil must have a good moisture profile or irrigation water must be available prior to planting.
- Ensure the planting rates and timing are right for your region.
- Weed control prior to planting is essential. Plant sunflowers into clean country.

Farmer's name Owner David Ronald, Farm Manager Chris Wirth

Property size 1,600 ha farmed

Location Tamarang, 65km west of Quirindi, Northern NSW

Enterprises

- 800ha summer crop. Approximately 600ha sorghum, 200ha sunflowers.
- 800ha winter crop primarily wheat, triticale and faba beans.
- 216ha irrigation area. Three 72ha pivots, used for both summer and winter cropping.

Average annual rainfall Approximately 635mm

Soil type Black vertosol

Soil pH_{Ca} 8

History of property:

The Point has been owned by the Ronald Family for a number of generations and the family has employed no tillage farming systems for many years. David is a member of AgVance Farming; a farmer member owned company utilising the services of agronomist Peter McKenzie as their facilitator and adviser.

Crop details

Sunflowers were planted under irrigation in 2008 in both the early and the late plant sowing windows. 120 ha of greystripe sunflowers for the confectionary/ birdseed market were planted in the early window and an additional 72 ha were planted late on the 15 January with Hyoleic 41 mono-unsaturated sunflowers, of which 16 ha had to be replanted on 25 January due to poor establishment.

Crops grown in the irrigation area are usually sold using fixed tonnage contracts, which the reliability of irrigation allows for. This season's crop was forward sold last season.

Why grow sunflowers?

The three main reasons for growing sunflowers on *The Point* are:

- Economics David states strongly. Sunflowers are another option financially. We grow sunflowers when the price is good. They were first grown on the property in the 1980's and they have been grown every season since 2000 due to strong prices.
- Sunflowers offer flexibility in planting windows comments Chris.
- In addition, both David and Chris agree that sunflowers handle deep sowing which gives them the opportunity to moisture seek when planting in the heat of summer, which they see as an advantage over sorghum.

Negative aspects of growing sunflowers

The lack of stubble cover following harvesting of sunflowers is an issue.


David Ronald

Sowing window

The Point takes advantage of the dual sowing window commencing sowing in early September and continuing until the first week in November for early plant crops.

The late planting window commences at the start of December and continues until January. David says he avoids planting too late and after the poor results in 2007/08 with sowing in January, Chris says they will now set a cut off date for sunflowers at 1 January to avoid the risk of cool growing conditions and frost damage.

Paddock preparation

No tillage with a focus on thorough weed control in the fallows, particularly with respect to broadleaf weeds before planting sunflowers.

Sowing and establishment

Planting is carried out using a Ground-Hound planter on 75cm rows spacings. This planter allows the opportunity to chase moisture if necessary. This season, following recommendations from the breeder, the early plant greystripe irrigated sunflowers were planted at 50,000 seeds/ha with approximately 46,000 plants/ha established. However, Chris said, the plants grew very tall and did not grow like they should have which we believe reduced the crop yield to 2.1t/ha. The previous season we had only 26,000 plants/ha and the crop yielded 2.7-3t/ha. According to Chris other than the planting rate, all other conditions were pretty similar to other years. Consequently, the late plant crop was sown with a lower rate to establish 35,000 plants/ha, which is the establishment rate normally recommended for dryland crops. In future crops they will aim for 35,000 plants/ha for irrigated sunflowers.

Varieties

In the 2007/2008 season varieties used were:

- Early plant – Sunbird 7 (birdseed)
- Late plant – Hyoleic 41 (mono-unsaturated)

Crop nutrition

Soil testing is carried out before every crop. In the irrigation areas soil tests have revealed that there is usually no nitrogen left after each crop. In order to maintain available levels of nitrogen and sulphur, urea is applied pre-sowing at up to 300kg/ha depending on soil test results and a starter blend containing nitrogen and sulphur is sown with the seed.

The starter blend contains approximately 6kg N. Chris says as a rule of thumb, sunflowers require 42kg N/t according to their likely yields and the amount of nitrogen needed.

Weed control

It is imperative that the crop is planted into a clean paddock. David recommends starting the rotation with sorghum using atrazine to get the paddock set up and reduce the weed seed bank. Then control weeds during the fallow period to clean the paddock prior to planting. With irrigation areas Stomp® is used pre-emergent and Verdict® is applied for in-crop grass weed control.

Insect management

Rutherglen bug is an issue and sunflowers normally need to be sprayed 2 to 3 times but with their value this season (2007/08), it's worth it says David. Heliothis is a minor problem and will be sprayed if the population becomes high enough. Insect control is carried out according to agronomist Peter McKenzie's recommendations.

Disease management

Diseases have not been a significant issue to date at *The Point*.

Irrigation management

Irrigation timing is based on David and Chris' knowledge of the crop's requirements together with data on available soil moisture using an electronic C-probe. Irrigation is carried out at a 'set point'.

David says that according to the C-Probe data, irrigated sunflowers draw on moisture down to around 0.6 m. They budget on 3.5 ML/ha for a sunflower crop but may use more or less depending on the season. The last watering is timed to coincide with grain fill and takes into account factors including the day temperatures.

For the early planted crop of greystripe sunflowers Chris explains that starting moisture was pretty good and there was significant rainfall in-crop so we only used approximately 2ML/ha. The first irrigation followed an application of Stomp post-plant pre-emergence and only a small amount of water was used, equivalent to 25mm rainfall. No further irrigation was required then until budding when we put on equivalent to about 75mm of water, which was the last irrigation.

Harvesting equipment

The crop was harvested with a Case header with Sullivan reels. Some of the late plant sunflowers had to be harvested with high moisture and dried due to the cool wet conditions. Greystripes are normally stored on-farm until delivered and with monounsaturated sunflowers it depends on receival times with Cargill, storage is used to manage harvest timing with receival timing.

Management of sunflower residue

David remarks that he does not see sunflower stubble as an issue but it does need to be managed. This year a stubble cruncher was used as an experiment and David says he was not completely happy with the results as it just lay the stubble down. David's preference is to knock down the stubble and mulch it up.

Approximate cost of production and economic benefit from growing sunflowers

Normally the income from sunflowers is better than sorghum however this season sorghum yields were above average at 9.8t/ha (for both irrigated and dryland crops that were planted in the early sowing window) with very high prices of up to $360/t. Sunflowers were around $900/t but yields were down on average ranging from 2.1t/ha on the early plant irrigated crop to 1.5t/ha on the latest sown irrigated sunflowers. Chris says that if the price of sorghum is unusually high at around $300/t, sunflower prices need to be around $1,000/t to be economically competitive.

Sunflowers are cheaper to grow under irrigation than sorghum at *The Point*. David comments that seed is more expensive in comparison to sorghum but Dual does not need to be used. In addition, fertiliser is often cheaper for sunflowers than for sorghum as sunflowers are not as hungry for nitrogen as sorghum. Sunflowers also use less water.

Reliability/robustness of sunflowers

Generally sunflowers are a winner here says Chris.They fit into the rotation very well and they are pretty tough.

Crop compared to other crops

As sunflowers have been grown at Tamarang for many years, their agronomic requirements are well understood and managed. Therefore, sunflowers are viewed as comparable to any other crop – the decision to plant and what area is to be planted depends largely on prices.

Crop intensity

Cropping is carried out as frequently as possible when moisture is available in both summer and winter in order to maximise returns. There are no set rules on rotations although David mentions they do not plant wheat on wheat or sunflowers on sunflowers. Also, faba beans are usually grown in the winter after a short fallow from sorghum. Basically all agronomic factors are considered and then the crop that is expected to be most profitable in the situation is planted. In the dryland country double cropping is rarely carried out due to moisture limitations but if there were an opportunity to plant it would be taken.

Crop yield

In the 2007/08 season the early plant greystripe sunflowers yielded 2.1t/ha. The late plant monounsaturated sunflowers planted on the 15 January yielded 1.7-1.8t/ha with oil contents ranging from 37-38%. The 16ha of replanted sunflowers yielded 1.5 – 1.6t/ha with an oil content of 37%. Admixture with the crops was low.

David Ronald & Loretta Serafin

FARMER CASE STUDY, *WINDY STATION* LIVERPOOL PLAINS, NSW

Take home message:

- Sunflowers normally have a slightly better gross margin than sorghum on *Windy Station.*
- Flexible sowing windows allow the workload and cashflow to be spread; which complements sorghum production.
- Sunflowers provide biological benefits particularly as the root system acts as a natural soil ripper.
- Adequate moisture availability is critical and sunflowers allow summer crop planting to commence at least a month in front of sorghum.
- Early planted sunflowers can usually take advantage of summer rain and they are often past flowering before the extreme heat days occur in late January / February.


Peter Winton

Farmer's name Property Manager Keith Harris, Cropping Manager Peter Winton, *Windy Station*, Romani Pastoral Co.

Property size 21,500ha

Location 30km west of Quirindi

Enterprises

The property is split into cropping and livestock areas with a small area that is mixed. The average area farmed annually is 10,000 hectares, of which some may be forage crops for the livestock enterprises.

Summer crop area is approximately 6,000 ha: 75% sorghum, 25% sunflowers.

Winter crop area is approximately 4,000 ha including wheat, canola, barley, triticale and forage crops.

Average annual rainfall 610mm

Soil type Black vertosol

Soil pH_{Ca} 7.5-8.0

History of property

Sunflowers have been grown at *Windy Station* in the past, however, since taking over cropping management in 2003 Peter has grown them every year. Previously sunflowers have been sold to the de-hulling market and more recently to Cargill on a fixed hectare contract basis through Australian Grain Accumulation Services (AGAS) or Quirindi Grain & Produce.

Peter and Keith always consider crop gross margins, soil moisture reserves, ability to plant on time and world stocks movements, before finalising planting and marketing decisions.

Table 1. Details on 2007/08 sunflower crops at Windy Station

Paddock number	Previous rotation	Planted	Harvested	Yield (t/ha)	Oil content (%)
Paddock 1 (34)	Long fallowed from wheat in 2006	Early September 2007	End of February	2.6	38 – 40
Paddock 2 (24)	Short fallow from sorghum	Early September 2007	End of February	2.6	38 – 40
Paddock 3 (1)	Sown to pasture in spring 2007. After poor establishment sunflowers were planted late when monounsaturated price reached $885/t as the soil had a good moisture profile	Christmas 2007	June	2.2	35 – 37
Paddock 4 (7)	Directly into wheat stubble from 2007.	First week in January 2008	July	1.8 - 2.0	36 – 38
Paddock 5 and 6 (15 and 16)	Short fallow from sorghum	Early September 2007	March	2.5	38 – 41

The target yield used for budgeting purposes is 1.75t/ha, which is considered achievable even in a dry year at *Windy Station* which has an average dryland yield of around 2t/ha. Average oil content is approximately 38 to 40% and admixture is usually less than 1%.

Why grow sunflowers?

- Economics. Generally sunflowers have a better gross margin for us says Peter.
- Both Keith and Peter find the flexible sowing window a great advantage. This not only allows for maximum utilisation of available moisture, but Keith also explains that sunflowers spread Peter's work load as sunnies can go in early when soil temperature is a bit cool and they are all off before starting sorghum harvest. The flexible planting window means that sowing and harvesting sunflowers can be staggered with sowing and harvesting of sorghum.
- Sunflowers are important in providing another viable option for their cropping rotations.
- With the livestock enterprises at *Windy Station*, Peter says that he will grow sunflowers where they have had cattle to break up potential compaction as they are a good natural ripper.
- Less handling of product. We handle one third the tonnes for the same return as sorghum. *Windy Station* has limited storage so this is a big advantage Keith explains.

Negative aspects of growing sunflowers

The negatives are manageable says Peter. He adds that sunflowers are a nice crop to grow but you can be left with horrible weeds. Broadleaf weeds may set seed unless you dessicate which we haven't done and with the price of chemical now we would rather wait and use mechanical control .

Sowing window

Normally sunflowers are sown early in the sowing window at *Windy Station*, otherwise there is sometimes a possible late plant option around Christmas. Planting at the right time is considered important in achieving high quality sunflowers and crops planted early in the past have done well so this timing will be aimed for in future. However, they will plant late if an opportunity arises.

As with any crop at *Windy Station* sunflowers are not grown if the soil moisture profile is inadequate. Particular care is taken to ensure the crop is planted with sufficient moisture in the soil profile. Agronomist Pete McKenzie takes cores to assess the profile. As a rule of thumb early plant crops must not have less than 80cm of moist soil and late plant crops must have a full soil moisture profile.

Paddock preparation

Preparation is no till and the fallow period is used to reduce the weed seed bank. Stubble from the previous crop is conserved and left standing to provide protection for sunflower seedlings which improves the establishment rate.

Sowing and establishment

Sunflowers are planted using a Max-Emerge precision planter on 75cm row spacing. Seeds are planted at 31,000/ha aiming for a target plant population of 29,000 in early planted crops which produces a good head size. Late plant crops are sown at a higher rate of 35,000 seeds/ha sown to get 32,000 established.

Soil temperature at sowing is not a concern. Stephanie Belfield, former NSW DPI agronomist in the region, explains that sunflowers will germinate under low temperatures and that the greater concern is that they are frost sensitive from 4 leaf onwards.

Varieties

- Peter believes that choosing the right variety is one of the keys to achieving high quality.
- Late plant and early plant crops were Ausigold 62, which Peter says have done well.

Crop nutrition

Soil testing was conducted prior to planting at 0 – 10cm and 10 – 90cm depths. A full analysis of the soil was carried out with particular attention to the nitrogen and sulphur levels. Optimising nitrogen availability is considered very important in achieving high quality sunflowers at *Windy Station*.

In 2007/08 400kg/ha of sulphate of ammonia was applied presowing for nitrogen and to boost sulphur levels. A pre-mix fertiliser is applied with any other nutrients required. This year's blend contained 7% nitrogen, 17% phosphorus, 17.5% sulphur, 1.6% calcium, 2.3% iron and 2.16% zinc. Soil testing will be conducted after the sunflower crop prior to planting wheat.

Weed control

The main weeds on *Windy Station* are thornapple, thistles and bladder ketmia. Sunflowers are always planted into a paddock that is clean for weeds. No pre-emergent residual weed control is used. In-crop grass weeds are controlled using Verdict®.

Pest management

Rutherglen bug is the major insect pest with sunflowers usually sprayed once each season for control. This season however, 3 sprays of Fastac® have been applied for Rutherglen bug and heliothis – every time the Rutherglen bug population became too high.

Disease management

Sclerotinia is managed through rotations and otherwise diseases are not an issue on the property. This year's crops have been very healthy with leaves at the bottoms of the plants right through to physiological maturity.

Harvesting equipment

All harvesting is carried out by contractors. The Ausigold 62 variety this year had a stalk size that was too big for the harvesting equipment. The gaps in the sunflower trays were too small so the sunflowers kept jamming up. The Sullivan reel also posed a problem as Peter said it takes vision away and it takes the driver a while to see that he is blocked up. Peter feels that the equipment needs to have bigger gaps and a different reel for less jamming and better vision.

Management of sunflower residue

The stubble is knocked down after harvest and can be a bit difficult to manage. This year a Stubble Cruncher was used which Peter thought had done a good job, although he would like to compare it to a multidisc.

Cost of production and economic benefit from growing sunflowers

Gross margins are updated on the computer and used all the time to help with crop selection, taking into account moisture.

Approximate gross margins:

Sorghum:	Income 6.0 t/ha x $240/t.	Less $880 (approx. cost) = $560 /ha
Sunflowers:	Income 1.8 t/ha x $750/t	Less $755 (approx. cost) = $595 /ha

In the past sunflowers have often been sold to the de-hulling market however in 2007/08 their prices weren't as high as Cargill. Australian Grain Accumulation Services (AGAS) had higher sunflower prices on hectare contracts of which they sold a large portion of the crop on and also forward sold some of the crop on cash contracts. If AGAS dropped the hectare contracts it may influence our decision to plant sunflowers remarks Peter.

Reliability/robustness of sunflowers

In terms of robustness, sunflowers are like any other crop. If they are planted on 80-90cm of moist soil they will yield, however with severe moisture stress they will fail. Sunflowers are fairly reliable on *Windy Station* and Peter says they utilise available moisture well.

Crop compared to other crops

- Sunflowers have biological benefits such as their deep penetrating root system that acts as a natural soil ripper.
- If sorghum prices went up to $250/t the gross margin would be better than sunflowers at $750/t.
- We need to apply a lot more nitrogen on sorghum than sunflowers, therefore sorghum is more expensive in terms of nitrogen.
- Chemical costs for sunflowers are around $100/ha more than sorghum.

Crop intensity

There is no fixed rotation on *Windy Station*, rather, they aim to utilise moisture when it is available. This year the early plant sunflower paddocks will be double cropped back to wheat. Normally they short fallow to sorghum or will double crop to wheat depending on moisture availability.

An example of a typical crop rotation on *Windy Station* including sunflowers is as follows:

- Long fallow to sorghum then a short fallow to sorghum the following summer.
- The paddock would then be long fallowed to canola and short fallowed to wheat which has a moderately low Arbuscular Mycorrhizal Fungi (AMF) dependence but will help to build up AMF after canola for subsequent crops. AMF may aid the plant uptake of nutrients particularly phosphorus and zinc.
- The paddock would then be long fallowed and sunflowers planted, which have a high AMF dependence.

This rotation sequence would be dependent on commodity prices each season as well as what the markets want.

Crop yield and summary

Early plant:

- 2007/08 average yields 2.6 t/ha.
- Oil contents were variable from 38 to 41%.
- No trouble with quality specs. Once we got the header set up right we were 0.3 – 1.1% admix.

Late plant:

- Average yields were down on early plant to 1.8t – 2.2 t/ha. Peter says this was a little disappointing as they had looked as though they may have yielded a bit better.
- Oil contents were variable from 36 to 38%.

FARMER CASE STUDY, *LIVINGSTON FARM* MOREE, NSW

Take home message:

- Sunflowers are a good opportunity crop when there is adequate moisture available and relatively high prices.
- Soil moisture is critical. In a dryland situation it is critical to plant on a full soil moisture profile.
- Start with a clean paddock.
- Sowing practices greatly influence yield and quality.

Farmer's name Ian Bailey, manager of *Livingston Farm*, Carossa Farming

Property size 4,000 ha, including 400 ha of flood irrigation

Location Newell Highway, Moree

Enterprises

- 85% winter crop. Mainly wheat (bread and durum), also barley and chickpeas.
- 15% summer crop. Sorghum, sunflowers grown as an opportunity crop, usually once every 3 to 4 years.
- Small areas of cattle production.
- 400 hectares of flood irrigation. What and when to sow depends on the profit opportunities of possible crop options.

Average annual rainfall 600mm, slightly summer dominant.

Soil type Grey, self-mulching, cracking clay.

Soil pH Alkaline.

History of property

Carossa Farming started growing sunflowers in the Moree area about 15 years ago. Since then they have been grown as an opportunity crop when prices are high and there is sufficient soil moisture available. *Livingston Farm* was previously owned by Sydney University and was purchased recently by Carossa Farming. The farm is no-till. When the property was purchased in 2007, the owners decided to plant an opportunity crop of late sunflowers into the irrigation area where no atrazine had been used the previous year. With sunflower prices being very attractive, the plan was to take advantage of a refilled soil moisture profile following harvest of a chickpea crop that winter and top it up with irrigation later in the season.

Crop details

130 hectares of the irrigation area that did not have residual atrazine in the soil was sown with mono-unsaturated sunflowers in early January 2008. The crop was grown on a moderately full soil moisture profile following a winter chickpea crop with plans to irrigate the sunflowers at flowering (late March/early April) with 1.2ML/ha. The target yield was 2t/ha.

Why grow sunflowers?

Profitability. In an irrigation situation Ian would grow sunflowers if there was a profit opportunity compared to other crop options. In a dryland situation, sunflowers would be grown as an opportunity crop if the price was relatively high and there was a full soil moisture profile available.

Summer crops are grown to provide a disease break and sunflowers are grown as part of the summer rotation when prices are good.

If the sunflowers are planted early in August/September, there is a chance that there will be sufficient time for rainfall to recharge the soil profile to double crop back to a winter cereal to maximise water use and returns.

Negative aspects of growing sunflowers

Sensitive to moisture stress compared to sorghum. Moisture stress greatly reduces yield and quality. Ian only plants sunflowers if the soil moisture profile is full prior to planting. This risk is minimised with irrigation.

Ian Bailey

Ian says that sunflowers can leave the country dirty as it is hard to control broadleaf weeds in-crop. Fleabane can particularly be a problem after sunflowers unlike sorghum where atrazine can be used. Sunflowers are planted in paddocks that are clean of weeds.

Sowing window

If moisture is adequate, early planting (August/September) is preferred so there is a greater chance of refilling the soil moisture profile after harvest in December to allow double cropping with a cereal in winter.

Paddock preparation

No-till with thorough weed control maintained during the fallow. No irrigation was necessary prior to planting.

Sowing and establishment

It is considered very important to set the crop up for a successful outcome. Seed is planted using a Kinze precision planter on 1m rows at 2kg/ha aiming to establish 30,000 plants/ha for both irrigated and dryland crops.

Sunflowers are planted relatively deep if necessary to chase moisture.

Ian says that frost knocks sunflowers but does not kill them so planting is carried out early if moisture is available regardless of soil temperature and frost risk.

He always uses treated seed.

Varieties Hyoleic 41

Crop nutrition

Previously chickpeas were grown in the paddock so no fertiliser was used under the assumption that the legume crop had fixed adequate nitrogen. Ian explains that in dryland areas, fertiliser is not normally used on summer crops as the paddocks have usually come out of a long fallow from a winter cereal so nitrogen availability is adequate from mineralisation and surplus from the previous winter crop. However, in future with irrigation we are pushing for higher yields so we may decide we need to fertilise. Fertiliser was used to boost soil nutrition prior to planting the subsequent durum wheat crop.

Weed control

It is very important that sunflowers are planted into a clean paddock that has had good fallow control as broadleaf weeds are difficult to control in-crop explains Ian. No residual herbicides were used at sowing. After establishment the paddock was interrow cultivated to control volunteer chickpeas and reform the furrows for irrigation.

Insect management

The crop was sprayed for Rutherglen bug once with deltamethrin. Heliothis pressure was moderate during flowering but an insecticide application was not required.

Treated seed was used to prevent damage from cutworm and wireworm during establishment of the crop. If not managed these insects can be a problem says Ian.

Disease management

This is well drained country so the risk of disease is not too bad although we may get a bit of head rot, explains Ian.

Irrigation management

According to Ian there was approximately 60cm of moisture in the soil profile prior to planting so the crop did not need to be irrigated at sowing. The crop was flood irrigated at flowering with 1.3ML/ha. To achieve the target yield of 2 t/ha it was expected that some in-crop rainfall would also be required. Unfortunately, the in-crop rainfall was virtually zero. With limited irrigation water available and very dry conditions, the crop yielded less than originally hoped.

Harvesting equipment

The crop was harvested then aerated in silos on-farm. Contractors were used with sunflower tray attachments on their headers.

Management of sunflower residue

The stubble needs to be chopped down for future plantings. This irrigation paddock will have a set of offsets run over it and will then be hilled up ready for planting durum in winter Ian explains.

In a dryland situation, Ian would use offset discs or a Kelly Prickle Chain to bust the stubble up straight after harvest. This has the added benefit of chopping up any weeds left over from the sunflower crop.

Approximate cost of production and economic benefit from growing sunflowers

Table 1. An estimate of the gross margins for irrigated sunflowers in the 2007/8 season for Carossa Farms

Sunflowers (Irrigated)	Yields (t/ha)	Price ($/t)	Total ($/ha)
Income	1.3	800	1,040
Costs		300	300
Gross margin			740

Sunflowers are grown by Carossa Farming as an opportunity crop in the summer when the expected return is competitive with other crop options. The target price is around $600 per tonne relative to sorghum at $200.This is relevant to both dryland and irrigation situations. In the future, Ian says they will look closely at all market options to get the best price seed before quality, particularly for the irrigation area where he can have greater control over quality by reducing moisture stress during flowering and seed fill.

Reliability/robustness of sunflowers

They are tough, says Ian. Once you get them in, if they have good moisture they are hard to kill but to make a good crop you need a kinder finish than we had this year.

Quality and yield results are seasonal and depend strongly on starting soil moisture and availability of water for irrigation. Ian says that the 2007/08 irrigated sunflower crop, which did not have a full profile at sowing, grew well on the moisture it had available. If there had been some in-crop rainfall or more water available for irrigating then the yield would have performed much better.

Crop compared to other crops

Sunflowers are the only other alternative summer crop to sorghum that Ian would grow at *Livingston Farm* at present due to prices and agronomic factors. From an agronomic perspective early planted sorghum works well in the rotation. With an early plant sorghum crop atrazine can be used for broadleaf control followed by a chickpea crop in the winter where nitrogen is not required. However financially, sunflowers are often competitive and can be worked into the rotation.

Crop intensity

The typical rotation including sunflowers used by Carossa in this irrigation system would be: sorghum, chickpeas, sunflowers followed by durum wheat.

Crop yield

The crop yielded 1.3t/ha, which was disappointing however not unexpected given that there was no in-crop rainfall and there was not enough water available to do a second irrigation. Ian says that the crop utilised every drop of moisture .

FARMER CASE STUDY, *TREMAYNE* BELLATA, NSW

Take home message:

- When prices are high and the paddock has a full moisture profile, sunflowers are an excellent opportunity crop as they can provide good returns, give you flexibility in planting timing and can allow for double cropping.
- Every measure must be taken to minimise moisture stress.
- Targeting good yields and high quality sunflowers, James only plants at *Tremayne* on a full soil moisture profile, targets a low plant population, and is vigilant in controlling Rutherglen bug.

Farmer's name James Keen, manager *Tremayne* for Holbud Pty Ltd

Property size 5,000 ha

Location 3km south of Bellata, NSW

Enterprises 20% durum wheat, 20% bread wheat, 20% chickpeas, 10% barley, 20% sorghum, sunflowers opportunity cropped in summer

Average annual rainfall 600mm, slightly summer dominant

Soil type: Grey cracking clay with some sodic soil areas

Soil pH_{Ca} 8.6

History of property No-till system

Crop details

360ha of mono-unsaturated sunflowers planted 1 January 2008. The paddock had been long fallowed from wheat in 2006 with good weed control providing a full moisture profile at planting. The target yield was 1.5t/ha with oil yield expected to depend on the finish (climatic conditions during seed fill).

Why grow sunflowers?

Can provide excellent returns when prices are high and there is a full moisture profile. It has good water use efficiency compared with other alternative summer crop options (other than sorghum).

Negative aspects of growing sunflowers

James explains that with the soil type and hot exposed position of *Tremayne* that if sunflowers are going to be planted he needs to do everything he can to minimise moisture stress. Sunflowers have a relatively short seed fill period so if very hot conditions persist during this time the plant has difficulty drawing moisture and oil content can be significantly affected.

Sowing window

Late August through until early January when moisture is adequate. James says that he prefers to plant early when conditions are suitable as harvest is then carried out in late December, which allows more time to get moisture into the soil, increasing the probability of double cropping to a winter cereal. If the sunflowers are planted late, he will usually long fallow to a cereal the following winter. This allows time to refill the profile and provides a chance to control volunteer sunflowers over the following summer period.

Paddock preparation

The no-till paddock had been long fallowed from wheat in 2006 and the 2007/08 crop of Ausigold 61 and 62 was planted in the late sowing window on one metre rows on a single skip configuration.

Sowing and establishment

James aims for a low, even plant stand of 20,000 established plants/ha using a John Deere Max-Emerge planter.

The aim of planting with single skip was to minimise the risk of the crop running out of soil moisture late in the season during the oil and seed filling period. The result set the crop up very well. At flowering, the crop consisted of large, evenly sized heads and the soil in the skip row had only just begun to crack at the end of flowering suggesting that there was still some subsoil moisture in reserve.


James Keen

In areas of low to moderate sodicity, the establishment was fair with plants stunted with small heads at flowering. In areas of moderate to high sodicity the sunflowers failed to establish.

Varieties

Ausigold 61 and 62

Crop nutrition

The crop is planted with a granular starter fertiliser containing nitrogen, phosphorus, sulfur and zinc. No other fertiliser is applied either before or in-crop as there is usually adequate fertility from mineralised nitrogen and previously applied fertiliser.

Weed control

Weed control is essential in fallow. A post-plant pre-emergent herbicide mixture of Spray.Seed® for knockdown and a low rate of a residual herbicide for continued in-crop weed control was applied this season. The results have been fantastic and James says that he will use the same mixture again next time although he is unsure how it will work in an early plant situation. Fleabane is usually the most difficult weed to manage in-crop but this season control has been excellent.

Pest management

The main problem is Rutherglen bug which must be controlled when targeting high quality, says James. This year two applications of a synthetic pyrethroid and dimethoate mixture have provided knockdown and systemic control. These applications have also controlled Helicoverpa spp. According to Stephanie Belfield, agronomist HMAg, heliothis only becomes a problem if pressure is very high or if their damage increases the risk of secondary disease infections. Due to this risk James is particular about controlling heliothis in late planted sunflowers. Birds have not been an issue on the open plains country.

Disease management

Heliothis control is important in late plant sunflowers to minimise the risk of head rot infection.

Harvesting equipment

Harvest was carried out by contractors in March using a Case 8010 with sunflower trays.

Management of sunflower residue

Prickle chains or disc harrows are used to chop up the stubble prior to planting the following crop.

Cost of production and economic benefit from growing sunflowers

James sold the crop on a hectare contract to Cargill when the market peaked at over $900/tonne. With the crop costing approximately $370/ha to grow, the returns were good.

Reliability/robustness of sunflowers

With sunflowers you have to have everything going for them because unlike sorghum, they have a relatively short seed filling period and are less likely to compensate once the weather eases. James explains that because of the grey, cracking soil type and hot, exposed location of the paddock, sunflower yields and quality can suffer if very hot dry conditions occur during seed fill.

Crop compared to other crops

If prices are right, sunflowers are an excellent option to have in the rotation as they offer flexibility in planting timing which is valuable in maximising opportunities in summer when other crops such as sorghum may be out of their optimal sowing window explains James.

Another advantage to consider when comparing sunflowers to other summer crops is that they are less rapacious (of nitrogen relative to sorghum) and have good water use efficiency James comments. Based on current prices and expected yields James expects that sunflowers will be as profitable or slightly more profitable than sorghum this season.

Crop intensity

Typically, sunflowers are grown after a long fallow from a winter cereal. If they are planted early they will be followed by a winter cereal if the soil moisture profile has had time to recharge otherwise the paddock would be long fallowed to a cereal the following year. James would not plant a summer crop again following the winter cereal as it would be unlikely that there would be sufficient soil moisture and he would need to control volunteer sunflowers.

Crop yield

The crop yielded an average of 1.22t/ha. Oil content ranged from 36 to 41% averaging 38.5%. According to the yield monitor the non-sodic soil areas yielded extremely well at around 1.6t/ha whereas the sodic areas brought the average down by only yielding around 0.8t/ha. James was a little disappointed in the outcome as he thought that with the starting moisture and excellent fallow preparation the crop would have performed even a little better overall. However, tough finishing conditions and the variability in soil type caused greater variability in yield than he expected.

Despite this James says if he could go back he would do everything the same again as the sunflowers performed well compared to sorghum planted at the same time.

In the future James expects he will continue using single skip, as he believes, he will not be losing much off the top (yield) but will lift his bottom end (yield and quality) by having the extra moisture. James says he does not believe it was the skip row that caused the lower than expected average yield, the sunflowers just did not perform well in the poorer soils. According to James, other growers in the area who planted at the same time using skip rows with the same soil as his non-sodic areas had average yields of 1.6t/ha, on par with the non-sodic soil areas at *Tremayne*.


James Keen

FARMER CASE STUDY, *MIRRADONG* CLIFTON, SOUTHERN QUEENSLAND

Take home messages:

- With greystripes it's the quality of the sample that gives you the edge.
- On-farm storage is an essential part of producing for the birdseed market.
- Plant sunflowers like a normal crop – not an opportunity crop. Provide the crop with the best possible chance of succeeding because if you think you can cut corners, you will pay the price at the end of the day.

Farmer's name Kevin & Loretta Charlesworth

Property size 400ha

Location 10kms west of Clifton, SE Qld.

Enterprises 280-300ha of summer crop, usually 240ha sunflowers and 40ha sorghum

280-300ha of winter crop, split equally between wheat and canary

276 head piggery – being closed down due to increasing fees.

Average annual rainfall 720mm

Soil type Elphinstone Waco

Soil pH_{Ca} 8 - 8.7

History of the property

Kevin started farming *Mirradong* approximately 30 years ago. However most of the country was cleared in the late 1940's. Smaller portions totalling around 20ha have been brought into cropping in recent years.

Originally Kevin started planting the sunflower hybrid Hysun 10 but continued to progress with other hybrids until Sunbird 7 was released. Since then he has rarely planted any other hybrid. Occasionally, like in the 2007/8 season he has included a small area of a hybrid for oil production but the results were less productive. As such he has continued to grow Sunbird 7.

Why grow sunflowers?

Sunflowers provide an attractive gross margin and sowing time flexibility. Risk can be spread by varying the sowing time over a number of months and sunflowers are a very efficient crop in terms of water use.

Sunflowers also suit double cropping. Kevin considers planting on a limited profile of stored soil water a low risk if all other aspects of crop management are in order.

Sunflowers are also a positive when considering logistics. There are less tonnes to cart per/ha and you don't require as much storage when compared to sorghum.

Negatives of sunflowers

Like every crop there are always a few negatives. Volunteers in the following sorghum crop are a drawback as is the lack of crop residue following sunflowers.

Controlling birds in sunflowers can also pose a problem, particularly if you are within a few kilom of water or tree lines. Kevin uses three scare guns and says it requires commitment to being there at sunrise and sunset to move the birds on to protect the crop. Sowing a reasonable area of sunflowers also spreads any bird pressure.

Crop details

Sunflowers are sown each season commencing in October and continuing until the second week of February each year. A portion of the crop is planted every few weeks using a John Deere Max Emerge on 80cm row spacings. The greystripe hybrid Sunbird 7 is sown at 32,000 seeds/ha with a target of 30,000 plants/ha established.

Kevin Charlesworth
Photo courtesy of Pacific Seeds

Sowing window

The planting window is staggered over the summer to minimise the risk of total crop failure. The start of sowing is mostly based on predicted weather for the coming weeks and planting moisture. This also spreads the period for harvesting from mid February through to Mid June.

Sunflowers in the rotation

The crop rotation on *Mirradong* usually consists of:

Wheat > short fallow> Canary seed> short fallow> wheat> double cropped> sunflowers> short fallow> sorghum>short fallow> sunflowers>double cropped> wheat

This rotation includes a high proportion of double cropping which aims to increase the water use efficiency and profitability of the property. Kevin plants sunflowers regardless of the stored moisture profile, preferring to use varying sowing date to mitigate risk rather than a stored profile.

Crop nutrition

Fertiliser plays a large role in successful crops at *Mirradong*. Paddocks are soil tested usually every 3 years to a depth of around 90cm. Pre-sowing urea at 205kg/ha is applied using a trashworker fitted with spearpoints. Starter Z at 45kg/ha is applied with the seed at sowing. Nutrition is part of the whole package with sunflowers, you need to do everything right or you shouldn't bother planting them. A crop which is only half supplied with nutrients or any other factor is at a disadvantage from the start.

Weed control

Post sowing/ pre emergence Stomp Xtra® is applied at a rate of 3.0L/ha for weed control. Inter-row cultivation is also used once the sunflowers reach 300-400mm high or the 6-8 leaf stage being careful to throw sufficient dirt against the sunflowers to suffocate any weeds in the intra-row area.

Insect & disease management

The main insect pests are Rutherglen bug and Helicoverpa sp, however they have never warranted control. It is a similar story with diseases; powdery mildew is occasionally noted but has not warranted control. Sclerotinia is controlled by rotation.

Harvesting equipment

Harvesting is carried out using a Case 2388 header. Sunflower stalks are often said to be hard on equipment but Kevin has made some minor adjustments to minimise any effects.

I have made some changes to my equipment such as changing the grid protecting the gearbox under the machine to a solid plate to prevent stalks from entering the machine. Otherwise I try to minimise the amount of reversing I do and use sunflower trays, Kevin explains.

I prefer to harvest on time, harvesting the day before the crop is ripe. That is commencing harvest when the moisture content is just above receival standards. This helps ensure a clean, bright sample.

Greystripes are similar to wheat in their harvest timing, you need to harvest them when they are ready; otherwise you leave yourself open to the risk of rain and shattering.

It's important to ensure a quality sample. That means using a slow drum speed and checking to see what is left on the ground behind the header. You want to leave behind any empty hulls and maximise the quality of the sample.

Management of sunflower residue

The stubble is slashed as soon as the ground is dry, that is when the soil starts to crack open. After that the fallow is left under a no tillage system with spraying used to control any weeds. Occasionally cultivation is used as part of the system.

Approximate cost of production and economic benefit from growing sunflowers

The variable costs for sunflowers are very similar to sorghum if you manage the crop properly Kevin says.

However sunflowers offer a more profitable return and that is why they are maintained as such as important part of the rotation on *Mirradong*.

Kevin comments on the profitability of sunflowers simply as, sunflowers have been very good to me over the years, so I can't turn my back on them.

Sunflower compared to sorghum

Generally sunflowers yield close to 1/3 or a little better when compared to sorghum. That is for 2.0t/ha of sunflowers you would expect to harvest 6.0t/ha of sorghum.

Marketing

Kevin places a strong emphasis on the marketing of his crop. However due to the continuity and size of his production the marketing is in some ways a little easier.

I usually receive at least one call a week from an agent looking to source quality greystripes for the birdseed market because I am known as a regular grower.

However I consider that because I am selling into an open market I need to know what the market is doing. The best way to do that is through talking with people.

I am also a strong believer in needing to have storage on farm if you are contemplating growing greystripes and always trying to deliver the best quality possible. With greys it's the quality of the sample that gives you the edge.

BETTER SUNFLOWERS DEMONSTRATION SITE RESULTS

Tobacco Streak Virus sunflower variety tolerance screening, Capella, Central Queensland, 2008

Maree Crawford, Pacific Seeds Summer Grain Business Manager, Toowoomba, Qld
Trevor Philp, Pacific Seeds Summer Grains Agronomist, Toowoomba, Qld

What happened?

Sunflower varietal difference in tolerance to Tobacco Streak Virus (TSV) varied from 4-22% of plants infected in a season considered to be of low TSV risk. This data differed considerably from previous data collected at the same site which illustrates the complex interaction between the virus and the host plant with the environment and management practices.

Background

The sunflower industry in Central Queensland has been impacted by the incidence of TSV disease and to a greater extent concern at farmer loss of confidence and income through yield decline in TSV affected plants. As a major stakeholder in the sunflower industry Pacific Seeds agreed to run a demonstration plot in conjunction with our formal research and development program to screen for variations in hybrid tolerance, to provide informal support to other GRDC funded projects through larger plot trials in an environment conducive to the disease.

Trial aims

To compare TSV incidence in dryland sunflower hybrids in Central Queensland locations with known TSV host Parthenium weed.

To assess the potential for tolerance of current hybrids to TSV

To demonstrate that disease levels and impacts of TSV can be minimised through management strategies such as control of thrips, green mirids and weed hosts from seedling to early bud stage of the crop.

Site details

Location	Ivan Gowlett, *El Dorado*, Capella, Central Queensland
Sowing date	5 March 2008
Soil type	Downs clay
Check variety	Hysun 39
Nutrition	80 kg N (urea) and 40kg/ha Starter Z
Farming system	No tillage
Paddock history	Wheat crop 2007, 4 month fallow period

Methods

- Planted trial on 5 March 2008 with Pacific Seeds Monosem Planter at a rate of 38,000 plants/ha; average establishment 26,000 plants/ha.
- All seed in the trial was treated for protection against soil insects and showed good seedling vigour and even establishment.
- Nitrogen and starter fertiliser were applied at the time of sowing, starter fertiliser was applied with the seed and the urea placed in the middle of the row.
- Row configuration; 100cm solid
- Individual plots were 8.0 m by 150 m and encompassed eight rows with buffer plots on each perimeter.
- Plots experienced low levels of thrip and green mirid damage; no sprays were used for control of insects
- Site received good rainfall and the crop had adequate moisture in critical growing phases.
- Trial was harvested commercially by the Gowlett family contractor.

Table 1. TSV sunflower assessment results (as assessed on 26 May 2008 with a low degree of infection)

Variety	Plant count/5m	Infected plants	Plant population	Infection (%)	Comment
Hysun 39	16	3	27,000	22.2	8 rows BUFFER
Hysun 39	12	2	23,000	17.4	8 rows
Hysun 38	13	0	26,000	3.8	8 rows
Hysun 39	16	1	30,000	10.0	8 rows
Hysun 39	14	1	22,000	13.6	8 rows
Sunbird 7	11	1	28,000	3.5	8 rows
Competitor	14	2	28,000	17.8	8 rows
Hysun 39	12	1	27,000	18.5	8 rows
Hyoleic 41	11	0	25,000	4.0	8 rows
Hyoleic 41	12	2	29,000	6.9	8 rows
Competitor	14	1	27,000	7.4	8 rows
Hysun 39	14	2	30,000	13.3	8 rows
Hysun 39	15	3	32,000	18.7	Buffer 4 Rows
Average infection of check variety Hysun 39 = 16.2%					

Assessment methods

The plants were assessed on 26 May 2008 both visually and methodically by measuring the number of infected plants within 5 m of each row and repeated once. Using the normal calculations of plant population a percentage of infection was calculated.

Most plants were well advanced in growth stage at the time of assessment. A count of mirids was also carried out at the same stage and assessed to be within the threshold limits, however evidence of mirid damage was noted and recorded in the trial. This was considered to be a low impact site in terms of TSV infection at the time of assessment.

Summary

Varying levels of infection incidence was seen in the selection of sunflower hybrids which is supported by data obtained from 3 other Pacific Seeds research sites in 2008 and in GRDC/QDPI funded research site in 2006/07 with consistent data indicating some varieties were more susceptible than others even at lower levels of infection. Outside buffers of Hysun 39 were most affected but it was difficult to determine what impact this had on the other hybrids as the buffer variety appeared more susceptible. Further research is needed into buffering, seed quality and timing of pest control impacts on TSV as part of a management program to reduce losses in commercial crops. Yield data was not obtainable due to accidental harvest of trial plot together with surrounding commercial paddock by the contractor.

Acknowledgement

Ivan Gowlett is acknowledged for the provision of the trial site.

Photo courtesy of Pacific Seeds

FARMER CASE STUDY *EL DORADO & MORAN DOWNS* CAPELLA, CENTRAL QUEENSLAND

Take home messages:

- TSV is a manageable part of growing sunflowers in the Central Highlands, however Ivan, like other growers, is still very uncertain about how to go about it.
- Sunflowers hang on to provide yield when rainfall is low or doesn't happen at all – with little inputs required.
- Harvest management is key to avoid overly dry seed.

Farmer's name Ivan & Karen Gowlett

Property size *El Dorado* 769 ha & *Moran Downs* 506 ha

Location Capella, Central Queensland

Enterprises

- Dryland sorghum, wheat, chickpeas and sunflowers
- Harvest and planting contracting in the Peak Downs district

Average annual rainfall

El Dorado's records average approximately 625mm a year, characterised by dominant summer rainfall in which nearly half of the annual rainfall is received during December to February.

Soil type

- Open Downs, self mulching cracking clay (Coolibah Scrub soils)
- Average soil depth of 1m
- Gentle sloping country of 0.5 to 3% gradient

Soil pH Neutral

History of property

Ivan and Karen purchased their home block *El Dorado* in 1993. *Moran Downs*, the site of this year's sunflower crop, has been share-farmed by the couple for three years before its purchase in August 2008. The Gowletts use conservation cropping techniques on both farms; Ivan converted to zero-tillage in 2001 on *El Dorado,* and *Moran Downs*' previous owner farmed conventionally until around 2003. Ivan estimates that his farms were first developed around the early 1970s. Ivan and Karen have grown sunflower crops (predominantly oilseed) every year at *El Dorado* until the emergence of TSV.

Crop details 101ha of sunflowers were planted 15 February

Why grow sunflowers?

- When the price of sunflowers sits at $800, they are an attractive, viable crop option.
- The Gowletts were unable to plant the whole property to sorghum before the window closed; sunflowers gave the Gowletts another summer crop option which allowed them to take advantage of their full soil moisture profile

Negative aspects of growing sunflowers

Like many other growers on the Central Highlands, Ivan is challenged by the limited information available on the management of TSV. The key reason that Ivan has shied away from planting more sunflowers in 2008 year was the risk of TSV infection. He believes if the price drops back to $500-600/tonne, the uncertainty surrounding TSV would make sunflowers marginal.

Paddock preparation

Ivan is a no-till practitioner, the limited ground cover left by sunflower crops is also a consideration. Ground cover is considered integral to conserving soil moisture and retaining soil during the region's high impact, high energy summer rainfall events.

Ivan Gowlett

Sowing system and establishment

- Planted no-till into a full soil moisture profile, into last season's wheat stubble which had been fallowed for 4 months
- Ivan plants using a modified AFM Eureka bar equipped with Janke press wheels, with a Simplicity 6000 air seeder.
- Planted 32,000 seeds per ha on 0.90 m rows

Variety

Hysun 39, supplied by CQ Ag Services, Emerald

Crop nutrition

Compost tea was applied at planting at 27L/ha. The planter is modified to apply the liquid via a tube down the back of the planting tynes. The liquid is injected by a squeeze pump from a trailing tank.

No other fertiliser was applied. Soil tests were not undertaken as *Moran Downs* is a share-farm block, but are planned once purchase of the property is completed later this year.

After many years of growing sunflowers, the Gowletts consciously choose not to apply urea. Ivan has trialled applying 10kg/ha MAP and 60kg/ha of urea in previous years, but received no yield improvement.

In our conditions, at the end of the day we've found we are no better off from applying fertiliser, any increase in yield we've achieved has been matched by a drop in oil content, Ivan says.

This is the first season the Gowletts have applied compost tea with sunflowers and are very pleased with the results. Ivan says that they are looking to use compost tea as a long-term strategy.

Weed control

- Prior to planting, the country was sprayed twice with a mixture of Roundup CT and 2,4-D amine for summer weeds such as grasses, parthenium and native jute.
- No treatments were required in-crop; only 12mm in-crop rain was received in 2008.
- Ivan comments that he has never needed to use in-crop herbicides for sunflowers.

Insect management

While mirids were observed in the crop this year at higher numbers than last year, their numbers did not reach control thresholds.

Disease management

Parthenium is considered to be a host for thrips. Thrips are a major carrier for TSV. Few thrips were observed in the crop, however Ivan observed between 10 -15% of the crop was affected by TSV.

Ivan says, everybody's in the dark really about TSV. I've noticed that once the plant is in flower, TSV doesn't affect it as badly. We've found so far spraying at the early bud stage is not worthwhile.

Ivan is concerned about the potential range of plant hosts for TSV as parthenium is well-controlled within his property boundaries: we don't have parthenium within ½ a km, and that's downwind.

This year's crop has been significantly affected by powdery mildew which has been observed to be worse than usual in both this season and last season's sunflowers. Ivan feels the Central Highland's unusually mild summer and autumn season contributed to the level of infestation.

We've always had a little bit, but not to the extent we saw this year. The first signs were showing just before bud stage. It had a major effect on yield, and resulted in a disappointingly small seed size, Ivan says

Harvesting management

The Gowletts harvest their own sunflower crops using a John Deere 9610 with sunflower trays.

Ivan comments that harvest management of sunflowers is integral. Last year the harvest was delayed by a late sorghum crop and as a result the sunflowers were so dry they combusted in the header repeatedly.

Management of sunflower residue

Ivan cuts sunflower stalks low during harvest, and any following crop is direct drilled into the sunflower residue. This year there is a high level of wheat stubble ground cover, which is ideal to have with a sunflower crop. The previous year there was very little other stubble remaining. Fallow sprays containing 2,4-D amine is used to successfully control any volunteer seedlings.

Cost of production

Table 1. Moran Downs gross margin*

Variable cost	Actual ($/ha)
Pre-plant fallow weed control	34
Compost Tea	37
Treated seed	41
Gross income	**720**
Gross margin	**608**

** Gross margin does not include fuel and labour costs.*

Sunflower gross margins compared extremely well to other dryland crops in the Central Highlands this season (Table 1 and 2).

Table 2. Central Highlands dryland cropping gross margins summary (May 2008)*

Crop	Gross price @ depot (D) or gin (G) $/bale or (F) farm $/t		Yield (t/ha or bales/ha)	Direct growing costs ($/ha)	Gross margin ($/ha)
Sorghum (single-skip or 1.5 rows)	205	D	2.5	237	240
Mungbeans	700	D	0.8	235	142
Sunflower (mono)	800	F	0.8	164	436
Sunflower (poly)	774	F	0.8	167	414
Corn (feed)	250	D	2.0	261	211
BGII RR Cotton (super single)	440	G	1.8	623	241
Wheat	300	D	2.0	211	361
Chickpea	620	F	1.2	322	422

Source: Graham Spackman & Associates Pty Ltd

** Gross margins summary assumes average conditions, does not include labour or fuel costs, and uses long-term average yields. It is also assumes that farmers are harvesting their own crops, with the exception of corn and cotton.*

Reliability and robustness of sunflowers

Providing you have a full soil moisture profile, Ivan says that he can grow a crop of sunflowers without in-crop rain, and expect at least 0.75 t/ha. This year's crop has only received 12mm in-crop rain and still returned an average yield of 0.9 t/ha in spite of diminished yield from powdery mildew infection.

Crop yield

The Gowletts sold their sunflowers into the horsefeed market, for $800t on-farm. A total of 91t were harvested off 101 ha giving an average yield of 0.9 t/ha, and a gross income of $720/ha. The crop test weight measured 41kg/hL.

FARMER CASE STUDY, *KINGOWER* EMERALD, CENTRAL QUEENSLAND

Take home messages:

- Sunflowers provide an important option for summer and spring dryland plantings.
- We aim to manage TSV damage to 5% of total crop as an acceptable loss.
- Sunflowers are a low input crop which can provide superior returns to high yielding grain crops.
- Be aware of contract conditions (eg. Grain Trade Australia (formerly NACMA) standards) and also be aware of who contracts are written through; keep a 1 to 2.5kg sample bag of each and every load taken away, as you can seek independent quality assessments.

Farmer's name Scott & Alicia Dunbar: Jack, Kavan, Angus & Digby

Property size *Kingower*, 3,267ha

Location Emerald, Central Highlands, Queensland

Enterprises

- Irrigated cotton, wheat, sorghum, chickpeas and mungbeans 570ha.
- Raingrown cropping; wheat & sorghum chickpeas, sunflowers 1010ha.
- Store and fat cattle.

Average annual rainfall

637 mm; characterised by summer dominant rainfall in which 45% of annual rainfall is received during December to February.

Soil type

- Self-mulching cracking clay; uniform clay soils.
- Soil depth ranges from 60cm to 12m across the property.
- Minimal slope on dryland country.

Soil pH Neutral to alkaline

History of property

The Dunbar family partnership purchased *Kingower* in 1978, with Scott and Alicia acquiring total ownership in 1992. Originally a cattle grazing block with some dryland cultivation, Scott and Alicia commenced the development of irrigation fields and infrastructure in 1998. *Kingower* produced dryland sunflowers most years until 2002. This last crop experienced moisture stress which resulted in bad areas of disease - later identified as TSV.

Our first irrigation crop was seed sunflowers in 2000, a Pioneer trial, and they were absolutely terrific. Prior to TSV, sunflower was always a main summer crop at Kingower.

Crop details

- The past season's crop was replanted: initially 250ha of crop was planted 6 February 2008 over three days in flood inundated country. However just after planting, *Kingower* was flooded again, and the crop didn't emerge.
- A total of 96ha was replanted 20 February 2008, still within recommended planting time for Central Queensland; essentially as soon as conditions had dried out enough for the growers to get a tractor on the paddock.

Why grow sunflowers?

Sunflowers provide an alternative rotation and source of income that can be grown in the Central Highlands region at two different times of the year. The end of February window extends growers' planting options for summer crops and if planting of winter crops such as corn or sorghum is delayed, it gives growers another option to plant spring sunflowers.

Alicia Dunbar

Negative aspects of growing sunflowers

- Since Dunbar's last dryland sunflower crop in 2000, market competition has dropped from eight or nine potential buyers to a limited number of companies. The family consider marketing options are now limited.
- Sunflower farmers and industry in the Central Highlands have been aware of a problem with the crop since 1998. Despite trials on TSV, there is still limited agronomic evidence to place sunflowers back in the forefront of farming systems, despite their current potential high returns. Agronomy service providers are cautious in dealing with sunflowers, and Dunbars have relied heavily on advice from other farmers this season.
- Emerald has no bulk storage for sunflowers since TSV dropped tonnage produced in the Highlands. Storage has been an issue for the Dunbars this year; the crop did not leave the property when expected and the storage still occupied by sunflower seed had been allocated for the incoming chickpea and wheat harvests.

Paddock preparation

2008 sunflowers were planted into irrigated wheat stubble.

Sowing system and establishment

- Sunflowers are planted with a John Deere MaxEmerge 1700 disc planter at 1m row spacings with water injection on raised beds. A GPS is used to allow inter-row cultivation if needed.
- The Dunbars planted 35,000 seeds/ha and estimate a 95% strike on the second plant.
- Beetle bait was applied after the crop emerged due to soil insect pressure from earwigs and crickets.

Variety

This season the polyunsaturated hybrid Hysun 39 was sown. There are at present few seed suppliers in Central Queensland as the majority of growers have not grown sunflowers for 9 years. Seed was purchased through Ag'N'Vet, Emerald.

Crop nutrition

- No pre-plant fertiliser was used.
- Water injection at planting with MAP (and insecticide)
- Growers generally undertake in-crop sap tests as opposed to pre-soil test to calculate crop nutrition requirements.

- Sunflowers are planted into country which is periodically inundated by Retreat Creek in flood. Sunflowers have yielded well without fertiliser which the Dunbars attribute to sediment dropped by floodwaters.

Weed control

- Week before plant: glyphosate @750mL/ha with ammonium sulphate, 2,4-D amine at 600mL/ha, wetter at 0.02% (200mL per 100L of water) by air.
- No inter-row cultivation or spraying after emergence.
- Due to the sunflowers being planted in flood country, the Dunbars were unable to control weeds such as the TSV host parthenium around paddock boundaries prior to planting.

Insect management

- Spread beetle bait after planting – (treated cracked sorghum).
- Key pest management to control thrips, suspected TSV carriers.
- 2 Dimethoate sprays at label rates have been applied to control thrips; once at 4 leaf, and once after 10 leaf and within 14 days from the initial spray.
- Dunbars sprayed 15 days earlier than the suggested thrip threshold, on advice from other Central Highlands growers
- They recommend aiming to control thrips early in the vegetative stage of the crop, rather than relying on an insect number threshold.
- Rutherglen bugs have been recorded but numbers have been below threshold.
- Dunbars use Spackman & Associates, Emerald for agronomic advice: checks are carried out weekly by agronomists, and also by growers.

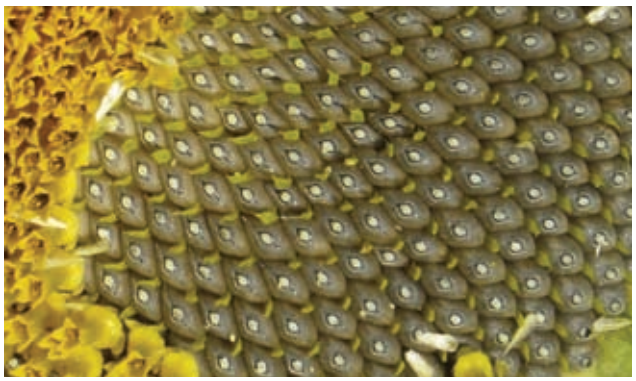
Disease management

The crop has been essentially disease-free. Less than 5% of the crop was affected with the few cases of TSV, which the growers deem an acceptable loss, powdery mildew was noticed in the crop but not controlled. Dunbars feel that in the future Powdery Mildew would be controlled and are seeking chemical options to be used if it is found again.

Harvesting management

Sweet Victory Contract Harvesters, Andrew Keily & Sam Dawson use a rotary header using sorghum fingers.

In past years, Dunbars have waited for crop to dry down to 9%. This year they trialled harvesting at a slightly higher moisture content (11 to 12%) but not so that the seed required drying. From discussion with other growers, they aimed to avoid wastage out the back of the header. The growers plan to return to harvesting at 9% moisture for their spring sunflower crop as their harvesters reported that the crop fed better into the header front at this level.



Management of sunflower residue

The Dunbars planned to slash the sunflower stubble to leave it as ground cover, and plant a spring or summer sorghum crop to follow, when they receive planting rain.

Gross margin

Dunbars lost their tractor in the floods and needed to hire a contractor to plant, but estimate little difference in planting costs taking their own labour into account.

Table 1. Kingower sunflower gross margin 2008*

Variable costs	Actual ($/ha)
Pre-plant fallow weed control	35
Treated seed	65
In-crop insect control	34
Harvest	64
Gross income	
Harvest income (ha contract on-farm)	675
Gross margin	**477**

** Gross margin does not include fuel and labour costs.*

Sunflower gross margins compared extremely well to other dryland crops in the Central Highlands this season.
Refer to Central Highlands Dryland Cropping Gross Margins Summary on page 28 (May 2008).

Economic benefit from growing sunflowers

At the current price, sunflowers provide just as competitive returns as high yielding grain crops.

Reliability and robustness of sunflowers

Dunbars believe that sunflowers seem to do best after a flooding event where country has a full profile of moisture; they are not a crop that is planted on a limited or opportunistic rainfall.

The country we planted this year to sunflowers had a full moisture profile and has used ever little bit of that moisture. The early Spring sunnies, although planted into a full moisture profile, have suffered from no in-crop rain prior to flowering.

Dunbars consider sunflowers comparable to sorghum in a dry situation. However if heat and lack of moisture are an issue, a failed sorghum crop may have greater benefit for their enterprise as they can feed it to their cattle.

Crop compared to other crops

Dunbars consider sunflowers' deep tap root improves their soil structure by opening up soil at depth, and provides a break from cereal crops which have a higher nitrogen requirement.

Even when sunflower yields were lower, we found there was a better potential gross margin than grains.

Crop intensity

Like other Central Highlands growers, Scott and Alicia opportunity crop rather than follow planned rotations.

Sunflower yield

The crop yielded a total of 78.5 tonnes from 93 ha averaging a yield of 0.84 t/ha.

Producing for the bird seed market, the Dunbars sought independent assessments of the test weights, producing above current Grain Trade Australia (formerly NACMA) standards of 39 kg/hL. The crop was sold for $800/t on-farm, giving a gross income of $62,800 or $675/ha.

FARMER CASE STUDY, *KRONJE* AND *BARTON DOWNS* ORION, CENTRAL QUEENSLAND

Take home messages:

- Sunflowers extend the summer planting window.
- Soil moisture and seasonal conditions imperative at plant.
- Price is critical.
- On-farm storage provides marketing benefits.

Farmer's name Ross & Irene Ingram

Property size

Arcturus Downs 7,950 ha

Barton Downs 3,803 ha

Kronje 3,848 ha

Pindari 19,343 ha

Location Orion via Springsure, Queensland

Enterprises

- 947 ha dryland sunflowers.
- Irrigated cotton, wheat, sorghum and chickpeas 810 ha.
- Raingrown cropping; wheat, sorghum, chickpeas and sunflowers 6,475 ha.
- 4,600 store and fat cattle 27,660 ha.

Average annual rainfall

650 mm characterised by dominant summer rainfall in which 45% of annual rainfall is received during December to February. (*Arcturus Downs* has been a Bureau Of Meteorology monitoring site for over 100 years.)

Soil type

- There is a range of soil types across *Kronje & Barton Downs* where sunflowers are planted. *Barton Downs* is characterised by open downs soils with an average depth of 1 m. *Kronje* soils range from soft red clay to alluvial river flats – black cracking clays to a depth of up to 3 - 4m.
- Both properties have minimal to gentle slopes of between 0.5% to 3%. *Barton Downs* has farm-over contours, and part of *Arcturus* is contoured.

Soil pH Neutral to alkaline

History of property

The Orion cropping area is relatively new country, and *Arcturus* was not cleared for cultivation until the early 1990s. Prior to the emergence of TSV, *Arcturus* grew an average of 3,240 ha of sunflowers over a period of 7 years. Post TSV, Ross has still planted more than 400ha each year of mainly bird seed and monounsaturated varieties.

Crop details 947 ha planted on 20 – 27 February 2008.

Why grow sunflowers?

Despite having some soil loss issues, it was still considered an attractive summer option compared to sorghum.

Sunflowers fit perfectly with the whole operation:

Once we get a rain event, we try to get as much sorghum in as we can as it gives us a back-up for our cattle, should the season turn poor. Then once our sorghum in, our next step is sunnies.

With the exception of seed, Ross says that sunflowers are a low cost crop to grow regarding insect and weed costs, and believes sunflowers provide good weed suppression.

Ross & Irene Ingram

Negative aspects of growing sunflowers

Mono and polyunsaturated sunflower varieties are sold under forward contract and collected quickly at harvest. However, the inability of the market to collect birdseed contracts in bulk is a source of frustration to Ross. Generally seed is taken in a single 25 tonne trailer, and the maximum that may be collected at any one time would be 50 tonne. Last season, it took nearly 9 months after harvest for all sunflower seed to leave the *Arcturus* storage. While *Arcturus* has a maximum of 6,000 tonne of storage, it is also needed for sorghum, chickpea and corn crops.

Paddock preparation

- Sunflowers were planted into last year's wheat stubble in an area that had been double cropped from sorghum the previous summer – however Ross points out that dryland double cropping is a rare event in the area.
- Sunflowers were planted into a full moisture profile in 2008. Ross comments that if the early prospects of in-crop rain are likely they occasionally take a calculated risk and plant into a limited moisture profile.

Sowing system and establishment

- Ross uses a 20m planter modified for minimum till operations. Converted from a Simons cultivator, the planter is equipped with narrow points, Garnell press wheels running behind on a separate bar, with a Simplicity air seeder.
- Planted 42,000 seeds/ha on 1m row width, aiming for 30 - 40,000 plants/ha.
- *Arcturus* always plants within the recommended window for the Central Highlands. Planting this season started on 20 February and ran for a week. Ross plants summer sunflowers no later than mid-March.
- Ross believes that planting doesn't have to be perfect as sunflowers have a tendency to compensate.

Varieties

Hysun 39 – polyunsaturated, purchased through BettaCrop, Emerald.

Crop nutrition

Anytime we've done soil tests here, we've come up with a similar reading. We've trialled fertiliser here, such as urea, MAP and so on, and we don't on average gain a benefit for the cost, so we just don't fertilise, except on the irrigation. This is as much as a reflection of the seasons and good quality soils.

In Central Highlands conditions, Ross considers rain a far more critical contributor to yield than fertiliser applications. The higher risk of receiving little or no rainfall, also limits the efficacy of fertilisers as there may be no soil moisture for their utilisation.

Weed control

The properties have most of the common summer weeds found in the Central Highlands. In contrast to common practice, Ross sprays a mixture of 2,4-D amine and Roundup CT after rain events when weeds are slightly larger. The likelihood of rain and weed germination dictates their spraying regime. He has not had any problems so far with resistance but is monitoring emerging weeds such as Feather Top Rhodes Grass.

Insect management

Grain is treated with Gaucho for insect control at planting. Insect pressures are generally low and have required no pest control. In previous years, higher numbers of Rutherglen bugs have been observed but not sprayed.

Disease management

Last year up to 3% damage from TSV was observed on the outer edges of the crop, however levels of TSV in the crop this season are too low too measure. Ross has observed that the amount of TSV damage present in his crops have reduced each year, and is surprised but assumes there is a link to dry season stress.

Powdery mildew was ubiquitous in this season's crop, however the plant was physically mature by the time it was infected. It was not treated as it was considered to have little effect on yield at that stage.

Harvesting management

Arcturus use their own headers, Case International 2388 rotary equipped with 36ft McDonald fronts and sunflower trays.

Management of sunflower residue

Ross treats volunteer sunflowers as part of his normal weed management program, depending on rainfall. Sunflowers are cut low at harvest, and the next crop is planted directly into stubble without any problems.

Gross margin

Ross saves on paying for an agronomist, insect control and fertiliser costs.

Table 1. Kronje & Barton Downs sunflower gross margin 2008*

Variable cost	Actual ($/ha)
Pre-plant fallow weed control	34
Treated seed	43
Gross income	**840**
Gross margin	**763**

** Gross margin does not include fuel and labour costs.*

Sunflower gross margins compared extremely well to other dryland crops in the Central Highlands this season. Refer to Central Highlands Dryland Cropping Gross Margins Summary on page 28 (May 2008).

Economic benefit from growing sunflowers

Sunflowers extend the summer planting window for *Arcturus*, and they are a low cost crop to grow. Price sets the benefit.

Ross also believes one of the biggest improvements in their business has been investing in storage and the greater options this has provided *Arcturus* when marketing the crop. He also values his working relationship of 20 years with Pat McKey at Bettacrop;

I rely on people to help me market, I don't have time to sit in front of a computer.

Reliability and robustness of sunflowers

Ross believes that the plant can suffer a degree of stress early on, but still takes advantage of late rain and produce a good yield. He considers planting into good soil moisture critical as sunflowers set their future yield reasonably early in the plants' development.

I was starting to lose faith in sunnies after TSV; now I'm starting to believe in them again.

Crop intensity

Arcturus concentrates on summer opportunity cropping. To manage climate risk, *Arcturus* avoids winter crops and maximises their summer planting of sorghum and sunflowers.

Sunflower yield

Producing for the crush market, Ross's 2008 crop provided an excellent result with payment above 5% bonuses for its high oil content. The crop averaged 1.16 t/ha with an average oil content of 43.4%. Ross sold his crop in two contracts of $775t and $500t on-farm. The total crop grossed $796,160 from 1104t harvested. This realised an average on farm price of $721.15/t or gross income of $840.70/ha.

FARMER CASE STUDY, *DENSION DOWNS* EMERALD, CENTRAL QUEENSLAND

Take home messages:

- Given good soil moisture at planting, sunflowers are a robust opportunity crop for dryland summer production.
- Precision planting provides a critical edge for successful sunflower establishment, consistent plant health and yield.
- Grading and testing seed on-farm may be inconvenient, but is worthwhile to avoid stiff price discounts.

Farmer's name Hedley & Fiona Watt

Property size *Denison Downs*, 550ha

Location Emerald, Central Queensland

Enterprises

Rainfed cropping; wheat & sorghum

Aero Professional Services:

- Aerial crop spraying.
- Charter passenger service.

Average annual rainfall

637 mm; characterised by dominant summer rainfall in which 45% of annual rainfall is received during December to February.

Soil type

- Dark scrub loam; Self-mulching cracking clay.
- Soil depth ranges from 1/2m to 3m across the property
- Sloping country varying between 0.5 to 3% slope; all paddocks are contoured with drive-over banks.

Soil pH Neutral to alkaline

History of property

Denison Downs was bought 4 years ago in a run-down state with uncontrolled weeds and a significant seed bank.

The 2008 crop was Hedley's first sunflower crop planted since purchasing the property.

Crop details 526ha produced for the birdseed market

Why grow sunflowers?

With a full moisture profile at the end of February, I was faced with the choice of either growing a crop or leaving soil fallow through until a winter planting. To delay planting for wheat or chickpeas, I estimated the cost of fallow weed control would range between $20,000 to $25,000, and there was a high risk of missing out on planting rain. A delayed plant was more expensive than potential returns from planting a sunflower crop.

When evaluating climate risk, sunflowers' tap root structure provided a better option to other branch-rooted crops. Sunflowers do not rely as heavily on follow-up rain to ensure yield and even avoid outright crop failure. This crop received only 50mm in-crop rain at the end of May after flowering.

The other key advantage of sunflowers was that they were considered to quickly occupy the soil volume during establishment, to out-compete weeds.

Negative aspects of growing sunflowers

- There are no bulk storage facilities available in the Central Highlands for sunflowers. Lack of on-farm storage creates added management issues with storage, trucking and delivery. Freight costs add around $40/tonne to the gross margin for delivery to depot in Toowoomba.
- Very low areas of sunflowers have been grown in the Central Highlands for the last four years due to the emergence of TSV.
- Very few harvest contractors have specialised harvesting equipment such as sunflower trays, sullivan reels or head snatchers.


Hedley Watt

Paddock preparation

- Planted no-till into a full soil moisture profile, into sorghum and wheat stubble cover

Sowing system and establishment

- Used 31,000 seeds/ha on 0.45m rows, but reduced plant density by allowing a greater seed spacing of average 2.3 seeds/m.
- Recommended optimum planting window for Central Queensland runs from mid-February to early March. Planting took 3 days, finishing 2 March.
- Hedley has joined two John Deere MaxEmerge Disc Planters onto a single 12m bar. The planter has been extended to the widest possible length able to farm directly over contours.
- GPS used for aerial operations was transferred across to planting operation to assist with precision planting.
- Trialled doubling the planting rate on boundaries and treelines to account for cockatoo pest pressure. The crop suffered some early plant loss on the edges from rabbits and beetles so the grower and agronomist will repeat the increased rate for buffer areas next crop.

Like other dryland farmers in the Central Highlands, Hedley believes that precision planting is critical to successful sunflower growing.

Where the plant population is higher when I've been testing or calibrating the planter in the field, the difference in plant health and yield is obvious; an air seeder just wouldn't cut it.

Varieties

Advantage – polyunsaturated, purchased through Marshall Seed & Grain Services, Springsure.

Crop nutrition

- No pre-plant fertiliser was used.
- Intended to side dress granular fertiliser (urea) at pre-flowering stage with plane. It was considered that if there was enough rain to wash in the urea there would also be enough to increase yield potential and justify additional cost, however no in-crop rain was received and no fertiliser was applied.

Post planting, an air cart was purchased and added to the planter configuration to allow single pass plant and fertilising for future crops.

Weed control

Overall there were very few weeds in the crop, most likely due to no early in-crop rainfall.

A planned Verdict application for regrowth sorghum was not required due to lack of rain and poor germination of sorghum seedlings within the Verdict application window. Another problem weed present in significant patches was Parthenium, identified as a host plant for TSV. At early vegetative stage, perimeter spraying of parthenium with Roundup CT was undertaken.

Insect management

By planting later in the season, pest pressure from a number of key pests were avoided.

Crop agronomist Belinda Chase, Graham Spackman & Associates, reported that although whitefly, heliothis and Rutherglen bug were all found in the crop, they didn't reach numbers to warrant spraying.

Thrips, suspected carriers of TSV, were present in low numbers. Two full sprays of dimethoate were applied, at seedling and pre-flowering, to minimise risk of early infestation of TSV and plant loss. Belinda observes that plants appear to cope slightly better with the virus as they get bigger, although this season we were still losing sizeable plants.

TSV thresholds have been based more on the risk of infection or any existing infection as thrips are highly mobile so they continue to reinfest. Dimethoate tends to flare other pests such as whitefly due to its broad spectrum nature, so all of these things need to be taken into consideration when deciding whether or not to spray, not just numbers. There are no established thresholds for these pests because they are considered minor in areas where TSV is not a threat.

Disease management

Crop has been essentially disease-free. Low humidity and no rainfall from February have limited the potential for powdery mildew. Primary contributors of TSV are parthenium and insect carriers. Both have been actively managed resulting in a total of only 5 plants identified with TSV.

Harvest management

Harvesting contractors Complex Industries were employed at *Denison Downs* and used a Gleaner N7 to take off the crop. Hedley believes that harvesting is one of the key management issues for sunflower. He has found very little information available evaluating the benefits and risks of earlier harvesting (the risk of fire and costs of drying) or the associated problems with later harvesting of overly dry seed.

Management of sunflower residue

Sunflower stubble is managed by mowing the crop a little lower at harvest. Sunflower residue will add to the estimated 85% ground cover present from the two previous seasons' sorghum and wheat crops. Using a GPS allows the operation to inter-row cultivate which can be used to control any persistent regrowth sunflowers in the next crop if required.

Gross margin

Unexpected savings in fertiliser has been a major contributor in keeping direct growing costs below Central Highlands average gross margins.

Table 1. Denison Downs gross margin 2008*

Variable cost	Budgeted ($/ha)	Actual ($/ha)
Fertiliser	50	-
Treated seed	31	31
Chemical - Verdict	17	-
Chemical - Dimethoate	13	13
Chemical - Roundup CT	-	20
Harvest	40	30
Storage	-	12
Freight	-	24
Cleaning	-	5
Gross income		**418**
Gross margin		**$283**

** Labour and overhead costs are not included.*

Economic benefit from growing sunflowers

The gross margin for this year was very high in comparison to other summer rain-grown crops such as sorghum, feed corn and mungbeans.

Reliability and robustness of sunflowers

I don't think any other crop would have survived the harsh growing conditions this season – the sunnies were pretty resilient considering they only received a total of 50mm in-crop rain towards the end of the crop development. And despite the season, we still turned a profit. If we had waited to plant winter crops, we wouldn't have had a crop in at all and had no farm income for the year – in fact we would have only just planted now (December).

Crop intensity

Opportunity crops are planted at *Denison Downs* to take advantage of the region's variable rainfall.

Crop yield

The crop yielded a total of 310t from 526ha, and allowing for 11% admix cleaned from 200t, averaged a yield of 0.54t/ha. Hedley was producing for the birdseed market, with test weights averaging 38.5kg/hL and recording up to 42kg/hL.

The grain quality was good, however the crop finished a bit harder in areas of the ground that were dryer due to shallower soil depth.

Testing and cleaning equipment was purchased at harvest, and *Denison Downs* undertook their own testing and cleaning on-farm to grade out where grain was weighing outside the required Grain Trade Australia (formerly NACMA) standards. Hedley describes cleaning as time consuming but not so expensive, and worthwhile to avoid significant price discounts.

Being a first time grower, Hedley was hesitant to forward sell particularly as seasonal conditions deteriorated during the crop development. The harvested crop was stored in Dalby close to markets and sold to four different buyers at different times. Earlier on, 100t was sold at $850/t delivered, but as prices dropped the grower had more difficulty selling the crop. The final contract wasn't collected until end of November, 5 months after harvest. The inability of the birdseed market to take seed in bulk was also a frustration; one company contracted the bulk of the seed, but would only collect 60 tonnes at a time.

AOF better OILSEEDS

GRDC Grains Research & Development Corporation