

DIRECT HEADING CANOLA FACT SHEET



SOUTHERN REGION

EARLY PLANNING KEY TO DIRECT HEADING

Many grain growers fear that direct heading canola is risky and that high shattering losses are inevitable. But with improved management and timing of harvest operations, it is increasingly being considered as a cost-effective option.

KEY POINTS

- Direct heading canola is an alternative to windrowing and may reduce costs. Both techniques may be used on the same property.
- Direct heading allows for maximum yields if canola is harvested on time and the header is set-up correctly to avoid shattering.
- It is a good option for heavy crops that are lodged and unable to be windrowed.
- For low-yielding crops, where small windrows can be unstable in wind, direct heading is often the best option.
- Yield losses due to shattering while direct heading are likely to be lower than yield losses associated with windrowing a crop too early, such as a week or more before 40 to 60 per cent of seeds on the main stem have changed colour.
- Canola should be direct headed at between 6-8 per cent moisture level.
- Pod sealers can reduce shattering. Growers must be conscious of costs versus what they may offer. Research into their effectiveness has given mixed results.
- Rigid table auger and draper fronts are suitable. Specialist header fronts are also available.
- For growers who are direct heading canola, it is best they have their own machine to harvest exactly when the crop is ready.



PHOTO: GRAEME CALLAGHAN, DELTA AGRIBUSINESS

Direct heading canola can be an acceptable alternative to windrowing but it must be planned early to ensure the harvest window fits into the overall cropping program.

Windrowing canola is still the most common harvesting practice for many growers and has many advantages. Growers who have an even crop and their own header or timely access to contractors, direct heading is an acceptable alternative.

Recent trial work has shown poorly-timed windrowing can cause yield losses and lower profitability. Where crops are windrowed too early there is incomplete grain development. Yield loss can be up to 100 kilograms per hectare per day or \$50 per hectare per day under favourable spring growing conditions.

It can be difficult to windrow large areas at the right time to avoid these losses. This is one reason why direct heading is becoming more common. It is also being used to manage labour and machinery capacity constraints and can be a potential cost-saving over windrowing.

Direct heading does not produce seed with higher oil content. This has been proven in research comparing direct heading with an on-time or later windrowing. Oil accumulation is progressive during the entire development stage of the seed. Oil increases have ceased by the time plants reach the maturity required for windrowing or direct heading.



Windrows with a good stubble base to anchor the windrow can help keep them in place (left) but if there are windy conditions after windrowing a low-yielding crop (right), then it can result in loss of the windrow. This is why direct heading is the most suitable option for crops under 1-1.5t/ha.

As the seed develops, its weight increases until it reaches about 35 to 40 per cent seed moisture content at physiological maturity. This is when the seed changes colour from green to brown then red and finally black. If the crop is windrowed when there is too much green seed then grain will not have reached its maximum size, resulting in lost yield and oil.

Growers need to consider the harvest approach that is best suited to their operation. Direct heading is proven to perform similarly to windrowing, providing the crop is not windrowed before 40 to 60 per cent of seeds have changed colour from green to red, brown or black. However, delayed direct heading or poor harvester set up could negate any benefits over windrowing due to excessive shattering losses.

Economics

Canola harvest operations are a major enterprise cost and so any improvements can have a significant effect on the final economic outcome. For this reason, there is an increased focus on cost savings and operation efficiencies with direct heading over windrowing. The cost effectiveness depends on the rate of harvesting windrows to direct-headed crops, which can vary.

A fully calculated comparison between direct heading and windrowing is examined in the *Canola Technology Update Module* by New South Wales Department of Primary Industries (see Useful Resources section).

This comparison shows total harvesting costs of \$95/ha for a windrowed crop

compared with \$58/ha for a direct-headed crop. This is a difference of \$37/ha, most of which is windrowing costs at \$30/ha.

The cost-saving assumes the same sized header and windrower swathe but does not account for some key variables, such as suitable harvesting hours. If a grower has a larger header front than the available windrower, the savings figure could change. Growers should make their own calculations for their individual situation and predicted seasonal conditions.

The decision whether to direct head or windrow canola should primarily be more about the logistics and the pros and cons of each practice rather than economics.

Pros and cons

The decision on which technique to use should be made on a paddock-by-paddock basis. A number of pros and cons are related to the unique characteristics of individual paddocks.

The advantages and disadvantages of direct heading canola include:

Advantages of direct heading

- **Cost-savings.** There are potential cost-savings by direct heading due to fewer harvest operations.
- **Reduce outlay.** Capital outlay can be reduced for an owner/operator who wants only one machine or for growers with small canola areas targeting a one-pass harvest.
- **Reduce timing pressure.** Direct heading reduces the pressure on growers to windrow at the right time. Windrowing earlier than the industry-

recommended seed colour change can result in yield and oil penalties which top \$300/ha, particularly in seasons or regions where availability of windrowers are an issue.

- **Overcome variable maturity.** Since direct heading requires most of the paddock to reach full maturity, for crops with variable maturity, direct heading can maximise the whole paddock's yield. If the same crop was windrowed, green patches would be cut too early. While there is a risk that delaying direct heading could expose the riper parts of the paddock to shattering, the green parts may end up delivering higher yields (if they are not still green due to late germination). This advantage is seasonally dependent and growers need to assess each approach.
- **Harvest low-yielding crops.** In low-yielding crops (less than 1t/ha) or short crops, direct heading is the most suitable option. If there is limited stubble to anchor the windrow then it can be susceptible to movement by wind. Light windrows can be harder to feed into the harvester front. Windrowing these crops may not be affordable or cost-effective. While direct heading is suitable for crops up to 1.5t/ha, heavier crops should not be ruled out but the larger bulk can make it more difficult.
- **Overcome lodging.** Direct heading is often the best option in high yielding bulky crops that are lodged and unable to be windrowed. Windrowing lodged crops can result in lumpy windrows that may not dry down effectively and can be harder to feed into the harvester.

- **Maximise yield.** In favourable spring finishes, later maturing crop areas may reach maximum yield and oil potentially reducing the risk of green seed in harvested grain.
- **Climate gains.** Crops to be direct headed may dry out more quickly after rain allowing harvest to commence earlier. Leaving the crop standing can also reduce a lowering of the test weight in extended wet periods.
- **Cleaner samples.** Cleaner samples are produced because the greener stalk and stem material is harder to over-thrash, which can overload sieves, increasing admixture in grain samples.
- **Meet insect standards.** There is potential for fewer Rutherglen bugs and aphids in harvested grain, and hence issues with insect receival standards.

Disadvantages of direct heading

- **Shatter exposure.** There is greater exposure to pre-harvest shatter due to high winds, hail or natural crop maturation, although windrowed crops are also subject to the same risks.
- **Harvest delay issues.** The chance of seed loss due to shattering increases if harvest is significantly delayed. Uneven crops and variable maturity can delay harvest and cause issues with grain

moisture levels. They can also result in shattering if ripe areas are left while waiting for other parts of the crop to mature. As a result, direct heading is not suited to paddocks with significant variations in soil type and/or topography – factors that affect plant-available water and plant maturity.

- **Delayed maturity.** Crops left to be direct headed may hang on longer than predicted, delaying harvest and possibly interfering with the harvest of other early crops, such as barley.
- **Slower harvester speeds.** Direct heading may take longer than crops which are windrowed then harvested because of slower harvester speeds or reduced daily operating hours. Direct heading may need to be suspended in extreme weather conditions, such as heat, low humidity and wind.
- **Risk of breakdown.** If harvest has to be postponed due to machinery breakdown, poor weather or the need to harvest other higher value paddocks or crops first, any canola left standing for direct heading will have a higher shattering risk than windrowed crops.
- **Green weed risk.** Without desiccation, green weeds could contaminate harvest samples or result in potential storage issues due to higher moisture content.

Timing

There is no yield or oil penalty if crops are direct headed or windrowed at the correct time. However if windrowing takes place outside industry-recommended seed colour change guidelines then there will be yield and oil losses. The size of the penalty will depend on the season and timing.

Windrowing brings forward the canola harvest date whereas direct heading allows the crop to mature naturally. Some growers prefer this option because they can finish canola harvest and reduce the risk of weather damage to cereals. Seasonal conditions are the largest factor influencing the difference in time interval between the two methods.

The general rule of thumb is that crops will be ready to direct head about 10-14 days after the optimum windrowing time. However the exact timing varies according to location, environment and season finishes. A hot dry season can result in a shorter interval while mild and wetter seasons lengthen the interval. In the Victorian Mallee, it has been 8-12 days while in some South Australian seasons, it has been as long as 18-21 days.

If canola is slow to mature due to the season, delaying windrowing to 60-70 per cent seed colour change on the main stem is recommended. Under these conditions, a greater proportion of the seeds in the

Tips for assessing yield loss

Accurately measuring losses can be difficult because seeds can be hard to see. Growers can use a 10x10cm square of weld mesh or similar to assess actual losses. This is open to interpretation based on where the square is placed but provides an approximate guide (see Table 1).

For example, a grower with a 1000 seed weight of 3.3g finds 30 seeds in the 10x10cm square, which is equal to losses of 100kg/ha.

Table 1. Estimating harvest losses (kg/ha) based on seed size using a 10x10cm square (100cm²)

Number of seeds per kg	Equiv 1000 seed weight (g)	Number of seeds in square													
		10	15	20	25	30	35	40	45	50	60	70	80	90	100
		Harvest loss (kg/ha)													
250,000	4.0	40	60	80	100	120	140	160	180	200	240	280	320	360	400
275,000	3.6	36	55	73	91	109	127	145	164	182	218	255	291	327	364
300,000	3.3	33	50	67	83	100	117	133	150	167	200	233	267	300	333
325,000	3.1	31	46	62	77	92	108	123	138	154	185	215	246	277	308
350,000	2.9	29	43	57	71	86	100	114	129	143	171	200	229	257	286

*Source: Canola Technology Update – Module 7: Harvest Management, Kathi Hertel, NSW DPI

middle and upper canopy will continue to accumulate oil and yield, maximising overall crop performance.

A common misconception with direct heading is the appearance of the crop at an acceptable harvest time. Canola will often average 8 per cent moisture while part of the plant or the crop area is still green. If growers wait until all canola stalks start to turn white – as they would for harvesting windrowed canola – then exposure to yield and seed loss could be higher. Pod colour is a poor indicator of plant maturity; examining the crop for seed colour change is recommended.

Shattering

Shattering is a natural process in current canola varieties and can commence before a crop is ready to direct harvest. While there are varietal differences, weather conditions are believed to play a major role in the amount of shattering in plants as they progress to maturity.

Many grain growers fear that increased shattering is the trade-off in direct heading over windrowing. If there is shattering in a canola crop, growers need to quantify the loss as a percentage of yield by considering:

- In 1kg of canola there can be 250,000 to 350,000 seeds so it takes a lot of seed to constitute a significant weight of grain. An average pod may only hold 1/10th of a gram of seed.
- So a crop with 10 pods/m² shattered is only equal to 10kg/ha of seed loss.

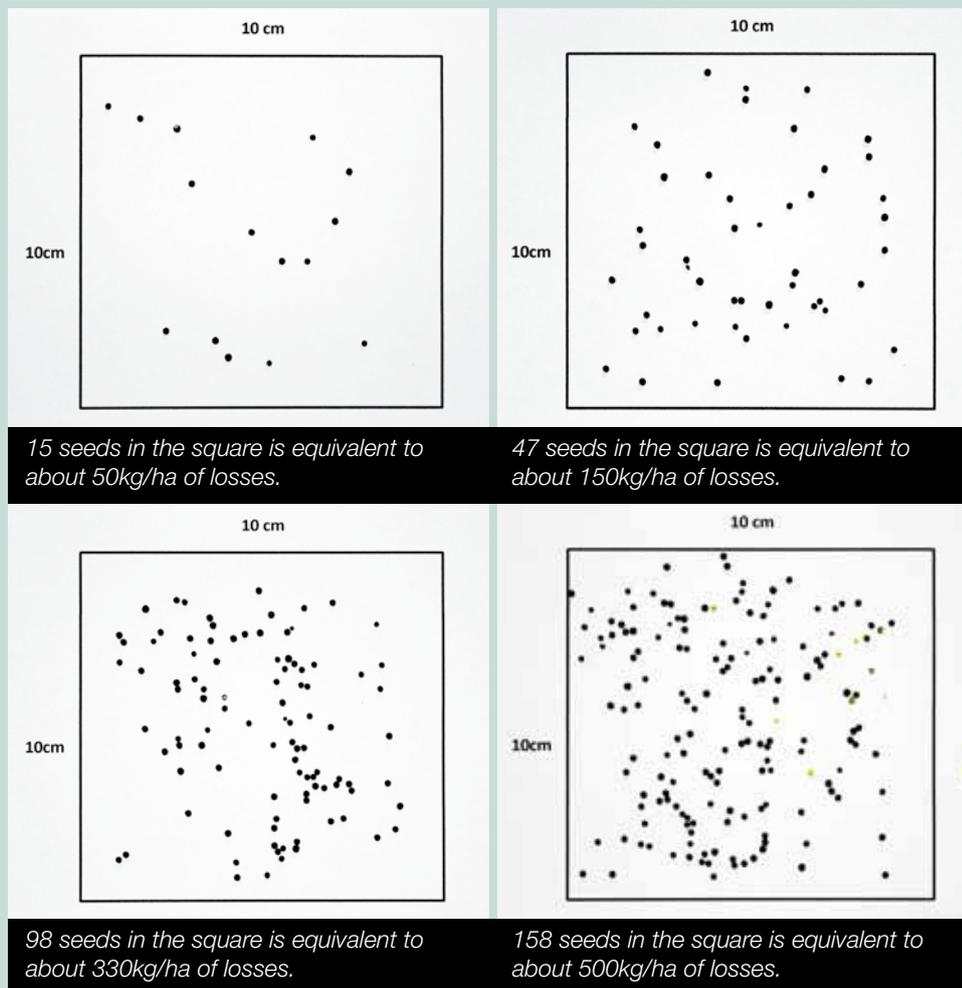
Often the losses that are experienced look large when they are seen as split pods or black seeds on the ground which is why growers need to quantify the loss. For every tonne/ha of crop, there is more than 1000 pods/m². To experience a 10pc yield loss then more than 100 pods/m² would need to shatter.

Harvesting canola using either windrowing or direct heading requires correct harvester set-up to gain the full benefits.

Minimise the risk

The potential yield losses from windrowing canola too early can be greater than losses due to shattering while direct heading.

Growers can use a 10x10cm square of weld mesh to assess actual losses, depending on the weight of the seed.



PHOTOS: MAURIE STREET, GOA

However, the correct approach to direct heading must be taken.

There are a number of options to minimise risks including:

- Reel speeds can have the greatest influence on shattering. Reel speed should be matched very closely to ground speed and adjusted to only lightly engage the crop when harvesting. Run the reel as high and as far back as possible over the grain table. Failure to get this right means the reel will act as a huge thrasher where grain will be lost forward of the header front.
- Harvester speed is more critical when direct heading canola than other crops. Excessive speed, especially when the crop is dry, can cause

significant shattering at the knife and divider. Harvest speeds may need to be gradually reduced as the day approaches late morning to midday – pods dry out and become more fragile. Harvest should stop when conditions are too hot and dry.

- Cool and overcast days and nights are the most suitable times to direct head canola. However in the case of very uneven crops, seed with higher moisture contents are difficult to thresh.
- Ensure the cutter bar is sharp.
- Remove row dividers. Dividing the rows shatters pods and can be where plants are pulled apart.
- Use a header front with an extendable table/knife which may be more suitable for direct heading.

Pod sealers

Pod sealers can prevent pods from drying out and may reduce the potential for shattering. However if pod shattering is not reduced then the cost impacts on a grower's profit.

If a pod sealer is being considered, most products' labels recommend early application. Pod sealers are not suitable as a last minute option if windrowing times are missed, direct heading has been unexpectedly delayed or if applied immediately before strong, hot and dry winds.

Maximum water coverage ensures maximum effectiveness of pod sealers. Sealers need to be applied using a ground sprayer at more than 100 litres per hectare for some products, which also makes application expensive. While aerial application is possible, the need for higher water rates adds to the cost and makes it uneconomical in many cases.

Some Australian trials into the effectiveness of pod sealers have found them to be inconsistent. Some pod sealers cost as much or more than windrowing so their value may be limited.

Equipment

Rigid table auger and draper fronts are both suited to direct heading canola. Extendable table fronts work well but are less common.

Tips for smooth direct heading include:

- ▶ With all fronts, a tyne reel is the preferred option for direct heading canola. Run the reel as slow as possible to reduce shattering and pod drop.
- ▶ A cross auger helps the flow of material along the draper belts.
- ▶ Increase the angle of the draper to aid feeding.
- ▶ Adjust retractable fingers to stop tangling of material around the table auger.
- ▶ Use crop lifters in lodged crops.

Canola is not hard to thrash. Rotor or drum speed should be about half to two-thirds of wheat speed (450 to 650 revolutions per minute) and the concave should be set as wide as possible so stalks are not mashed up and overload the sieves.

Fan speed should be about two-thirds capacity (550 to 700 rpm), the top chaffer/



PHOTO: PAUL BREUST, FARMLINK RESEARCH LIMITED

Canola can be quite green when harvested but is not hard to thrash. Rotor or drum speed should be about half to two-thirds of wheat speed, set at 450 to 650 revolutions per minute, and the concave should be set as wide as possible so stalks are not mashed up and overload the sieves.

Desiccation and direct heading

Crop desiccation is sometimes carried out as an alternative to windrowing to prepare an uneven crop for direct heading. Desiccants are usually applied by air and can help in heavy weed infestations and when maturity is not uniform. Desiccation has a similar effect to windrowing by ceasing crop development so it dries evenly. It affects all green vegetative growth, including weeds.

Reglone® is the only option currently registered for desiccation of canola.

Off-label application of any other products is illegal and could result in residues in grain samples. Bulk grain with residues detected could be rejected by buyers. If residues have contaminated larger parcels of grain, liability for the full amount could fall to individual growers.

There are applications pending with the Australian Pesticides and Veterinary Medicines Authority for glyphosate formulations for pre-harvest use but registration for the 2013-14 harvest is unlikely. These applications have been developed to manage weed escapes in canola crops, not for uneven crop maturity. Treatment of green patches will be slow to dry down, which can be expected with any glyphosate application on large mature plants, and may not meet growers' needs in managing variable crop maturity.

Desiccation is usually not required when terminal drought with high temperatures and hot winds help drying down.

sieve between 6-8mm and bottom sieve between 3-6mm depending on sample quality.

As with harvesting of any crop, some loss – in this case through shattering and pod loss – is unavoidable. However, growers must be proactive in getting off the harvester

and looking behind it to accurately set loss monitors. The source of the loss must be accurately identified – is it pre-harvest, at the reel or knife or a loss behind the header through poor separation? Once the cause of the loss is found, then the most appropriate action can be taken.

FREQUENTLY ASKED QUESTIONS

When examining seed on the main stem, does a fleck of green on the seed coat mean that it has changed colour?

No, a seed is not considered to have changed colour until the seed coat has changed from green to a darker colour, such as red, brown or black.

Is direct heading an option for growers with crops with distinct differences in maturity?

Not ideally. Direct heading can still be used but early harvesting will mean the risk of harvesting green material while later harvesting means mature parts of the crop have to wait a long time for the header. Unless different areas can be harvested separately, windrowing may be the better option.

In what timeframe should direct heading be finished?

The sooner direct heading is finished the better but losses from delays in harvesting are very weather dependant. Hail (which a grower can insure against) and hot windy weather are the worst scenarios. Anecdotally, growers have reported delays in harvest of weeks with little negative impact but growers should strive to get it off as quickly as possible.

Can direct heading and windrowing be incorporated into a cropping program?

Yes. For growers cropping larger areas, designing a canola harvest program with a mixture of both windrowed and direct head crops may be a good approach. This is because costs can be saved where possible, risks are minimised in situations or paddocks where they are greatest while capturing benefits of improved labour, machinery and time management. While direct heading is a viable option that may offer some savings, the decision of whether to windrow or direct head should be based on other benefits or risks associated with each option, not only economics.

At what point in the season can a decision be made on whether to direct harvest or windrow?

The key to direct heading is to plan ahead. Consider rotation options at the start of the season to ensure the optimum time to direct harvest canola does not clash with other crops and that machinery is prepared for the possibility for direct heading.

USEFUL RESOURCES

Canola Technology Update – Module 7: Harvest Management

Kathi Hertel, NSW DPI
<http://bit.ly/165Su61>

Canola harvest: Is direct heading a serious option?

2012 Update paper – Southern Farming Systems
www.grdc.com.au (search direct heading canola)

Windrow timing and direct heading in canola – effects on yield and oil

Grain Orana Alliance, 2012 Northern Region Updates
www.grdc.com.au/
GRDCUpdatePaper-Street2012

Harvesting canola in 2013 – to windrow or direct head?

Grain Orana Alliance, 2013 Northern Region Updates
www.grainorana.com.au/documents?download=22

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