

HARVEST LOSSES FACT SHEET

Time to halve canola harvest losses

One way to harvest more canola and bank more profit is by taking the time to set up the harvester according to crop conditions to minimise the amount of grain falling to the ground.

KEY POINTS

- Canola losses are estimated at \$191 million nationally
- An estimated \$98 million of canola is lost out the back of harvesters in Western Australia alone
- Grain losses from the rear of harvesters can be reduced by using home-made or commercial drop trays that help to accurately measure grain losses
- Experts suggest setting up the harvester according to the settings written in the harvester manual and then measuring the losses using a drop tray
- After measuring actual losses, change one setting at a time with the aim of reducing canola losses before measuring actual losses again
- During 2018, 10 WA growers measured canola losses with drop trays from the Bushel Plus Multi Calibration System and ScherGain Solution System
- Some of the growers reported picking up more than \$50,000 of extra canola by using the drop trays to refine their harvester settings



Introduction

The small size of canola creates two challenges during harvest:

- large volumes of canola can be lost falling to the ground because of incorrect harvester set-up; and
- canola losses on the ground are difficult to see and measure.

An estimated \$191 million of canola is lost out the back of harvesters nationally every year. This is based on average losses of 150 kilograms per hectare or \$75/ha across the approximately 2.5 million hectares of canola grown across Australia every year. This loss estimate is based on measurements made by 10 WA canola growers during the 2018 harvest, but the figure is consistent with what has been found in western Canada where canola harvest losses have been measured extensively.

Acceptable losses

The American Society of Agricultural and Biological Engineers (ASABE) states the acceptable level of cereal losses at harvest is one per cent of grain yield. In other words, losses from a cereal crop yielding two tonnes per hectare should not exceed 20kg/ha (\$5.20/ha).

However, for canola, many growers say it is difficult to reduce losses to less than three per cent. For example, three per cent of a 1.5t/ha canola crop is 45kg/ha, or \$22.50/ha. Yet new research shows scores of growers could be unknowingly losing more than \$75/ha of canola at harvest because they do not invest time in measuring actual grain losses using a drop tray. Nonetheless, canola is a high-value crop, warranting efforts to refine harvester settings to reduce lost grain and profit.



The Bushel Plus Multi Calibration System showing the covered tray.

PHOTO: PETER NEWMAN

System and ScherGain Solution System.

Both drop trays proved effective, however the Bushel Plus Multi Calibration System was preferred by the collaborating growers because it included a covered drop tray. This reduced the chance of capturing grain before the tray was dropped. The Bushel Plus Multi Calibration System drop tray completed many drops per battery charge and the battery-powered separator was excellent. It could also measure grain losses on harvesters fitted with chaff decks (where residue is diverted to the wheel tracks of the harvester). The separator made the job quick and easy.

To calibrate a grain loss monitor, check what it says when the tray is dropped. After actual losses have been measured from the rear of the harvester, recalibrate the monitor so it displays actual losses in kg/ha.

Measure losses every day

Aim to measure actual canola losses once or twice a day during harvest. Although this sounds a lot, losses can change from morning to afternoon, with big changes observed between the start and end of harvest. In 2018, some growers checked losses every couple of hours in changing conditions.

Involve the harvester driver

Involve the harvester driver when checking actual losses because he or she will become motivated to drive to reduce losses, not to increase the tonnage of grain harvested each hour. The ideal harvester set-up produces low losses at high efficiency (t/h). With this in mind, harvester drivers can pride themselves on hitting this 'sweet spot'.

Harvester set-up key

All harvester brands are capable of producing low losses. It is harvester set-up and harvester settings that matter. The aim is not to produce the lowest losses per hectare, but the lowest cost of harvesting per tonne of grain.

Harvesting contractor Rod Gribble makes this point on his website (www.harvestcalc.com). He says a harvester can cost \$500 to \$650/hour to run, so slowing down may reduce losses, but it



Harvest loss kits were assembled and sent to WA growers to measure their canola losses.

PHOTO: PETER NEWMAN

growers measure their canola losses.

The Bushel Plus Multi Calibration System comprises a covered drop tray that fits under any make of harvester using magnets. Harvest losses are calculated as soon as a remote control is engaged to release the drop tray from the harvester. The drop tray collects a sample of chaff, straw and grain losses from the rear of the harvester as the machine travels over the tray lying in the stubble. A battery-powered separator and weigh scale is also included.

The ScherGain Solution System comprises a drop tray, two remotes, a battery, grain gauge and a loss chart. It attaches under any make of harvester using magnets. After the straw chopper is raised, the operator selects a speed considered to be efficient. Hitting the remote control drops the tray to collect straw, chaff and grain.

To reduce canola losses, change one setting at a time and measure actual losses again after each adjustment. Harvester settings that influence canola lost during harvesting include the rotor speed, the gap between the rotor and the concave (separator), the cleaning fan speed, the openings of the upper sieve and the openings of the lower sieve.

Halving canola losses

In 2018, 10 WA grain growers participated in demonstrations to halve the amount of canola lost from the rear of their harvesters. The participating growers were sent drop trays to measure their canola losses. They were encouraged to adjust their harvester settings and share their findings and dollars saved, using the Twitter handle @harvestloss. The drop trays used were those included in the Bushel Plus Multi Calibration

Actual grain losses

While most new harvesters have grain loss sensors, these cannot be relied on without first checking their accuracy. This involves harvesting a small section of crop and measuring how much grain is lost from the rear of the harvester. Looking on the ground for lost grain is a waste of time, particularly for canola, because it is difficult to see and collect. Drop trays, or drop pans as they are also known, are the most accurate way to measure canola losses. Thrown grain loss collection trays, such as those supplied by HarvestCalc, are a low-cost alternative, but these may be unsafe if not used carefully.

Checking for losses

Drop trays can be made or bought. An Australian drop tray is available from Ag Gear, however, two Canadian-made drop trays supplied with both the Bushel Plus Multi Calibration System and the ScherGain Solution System were used during the WA 2018 harvest to help



PHOTO: PETER NEWMAN

The Bushel Plus Multi Calibration System drop tray in a canola windrow with the fan-driven separator.



PHOTO: NICOLE BAXTER

Involve the harvester driver when checking losses.



PHOTO: PETER NEWMAN

Adjusting the front to ensure even and smooth movement of the crop into the feeder house.

could also increase the harvesting cost. The ideal is to find the optimum point at which harvest efficiency is high and losses are low. This can be done using a drop tray and changing one setting – such as rotor speed, the gap between the rotor and the concave (separator), the cleaning fan speed, the openings of the upper sieve and the openings of the lower sieve – on the harvester at a time.

Harvester fronts

During 2018, many WA growers involved in the harvester loss project used a draper front to harvest canola and were only able to work at 9 to 11t/h. This kept losses to a minimum, but the work was very slow. A tin front and a well set up machine allow faster harvesting and low losses. Effective movement of the crop into the feeder house is the key to managing crop flow and reducing potential grain loss problems inside the machine. If material enters a harvester unevenly and too slowly because the

“IF YOU DON’T USE A DROP TRAY TO MEASURE YOUR ACTUAL CANOLA LOSSES, REFINING THE SETTINGS ON YOUR HARVESTER IS JUST A GUESS.”

– PETER NEWMAN, PLANFARM CONSULTANT

wrong front has been chosen or poorly set up, it may be difficult to reduce losses and improve harvesting efficiency.

Residue spreading

Many harvesters only spread residue half the width of the front. This needs to be accounted for when measuring losses. Accordingly, the harvester must be set up for the job at hand. For example, if harvesting in chop and spread mode, measure losses in this mode. The makers of the ScherGain Solution System state the grower should change the harvester to windrow mode to measure grain losses, but this may increase losses due to changes in airflow through the machine.

Crop conditions

Generally, the highest canola losses occur when the crop is very dry. This seems the opposite of what is expected because canola is easier to thresh when dry. However, dry standing or swathed (windrowed) canola can result in high losses from the rear of the harvester because of sieve and rotor losses.

Sieve and rotor losses

Sieve losses may occur when canola threshes very easily, causing a lot of material to powder up in the rotor which then overloads the sieve. Rotor losses

may result from powdered material in the rotor carrying canola seed through the rotor. However, green and wet conditions can also cause losses because canola kernels can stick to straw or canola pods and be carried out of the machine. These specific losses are almost impossible to measure. Take time to study the owner’s manual (if available) because the recommended settings are often listed for each crop. Most operator manuals also contain a troubleshooting guide.

One way to hone in on the source of the losses is to disengage the straw chopper and perform a ‘power stop’, also known as a ‘kill-stop’, ‘power shutdown’ or ‘power stall’. Generally, the procedure involves driving the harvester for at least 100 metres at normal speed to fill the machine with crop and then stopping the engine. However, it is important to follow the instructions outlined in the operator’s manual to avoid damaging the harvester’s engine. If performed correctly, the harvester can be stopped and the covers can be opened to see where material has piled up.

During 2018, some of the growers who used the commercially available harvester trays to measure rotor and sieve losses separately did so using two drop trays. They often found both rotor and sieve losses, which is surprising because many would assume rotor losses would be minimal when harvesting canola.

Tested grain loss

Some of the canola growers in the northern agricultural region of WA who evaluated one of the commercially available calibration systems during 2018 picked up an extra \$50,000 or more by measuring their harvest



PHOTO: EVAN COLLIS



PHOTO: NICOLE BAXTER

Direct heading canola can cause high losses. Careful harvester set-up is critical to prevent lost profit and volunteers in the next crop.

losses with a drop tray and changing some of the settings in the cabin. These growers were unaware they were losing grain and profit until they accurately measured their actual canola losses using a drop tray.

John Scotney, Badgingarra, WA, used a Bushel Plus Multi Calibration System drop tray to measure canola losses from his Case 8120 harvester when picking up swaths yielding about 2.5t/ha. His first measurement showed losses of 180kg/ha. With help from Bushel Plus Multi Calibration System founder Marcel Kringe, John modified his harvester settings and reduced his losses to 80kg/ha, saving about \$66,000 over 1200ha.

Measuring losses with a ScherGain Solution System drop tray saved Darren Yewers, Morawa, WA, \$58,000 over 500ha of canola, just by adjusting the fan. For the first test, Darren's John Deere S680 was calibrated in windrow mode with the cleaning fan speed set at 800 revolutions per minute, the top sieve at 13mm and the bottom sieve at 4mm. The result showed 286kg/ha of canola was lost, which equated to \$157/ha or \$78,000. For the second test, the cleaning fan speed was set at 620rpm, which led to canola losses of 91kg/ha, but admixture was too high. For the third test, the cleaning fan was set at 750rpm, which resulted in canola losses of 72kg/ha, equating to \$40/ha or \$20,000 over the 500ha paddock.

Peter Barnetson, Eradu, WA, runs two John Deere harvesters, one with a premium PowerCast chopper and another with a standard chopper. He used a ScherGain Solution System drop tray to calibrate his John Deere S670

harvester with the PowerCast chopper. He discovered it was losing about 60kg/ha of canola. The John Deere S670 fitted with a standard chopper lost 200kg/ha, but it was only spreading residue one-third of the width of the harvester front. On first impression this machine appeared to be losing a lot more canola, but when residue spread was accounted for there was only a minor difference from the other machine. Losses were measured when the cleaning fan speed was at 800rpm, the rotor speed at 680rpm and the rotor to top sieve was adjusted to 12mm, the bottom sieve to 3mm, the cleaning fan to 680rpm and the rotor to 480rpm.

Jack Burton, Yuna, WA, used a ScherGain Solution System drop tray to measure 200kg/ha of canola losses when he tested his John Deere S660. However, at the time, the machine was only spreading residue about one-third of the width of the harvester front, so actual losses were estimated at 70kg/ha. The harvester settings when tested were 14mm for the top sieve, 3mm for the bottom sieve, a cleaning fan speed of 800rpm, a rotor speed of 400rpm and a 32mm gap between the rotor and the concave.

Liam and Fiona Mann, Eradu, WA, measured losses in a direct harvested Bonito canola crop using their Claas Lexion 760 harvester. During the first test, while the machine was harvesting 11t/hour, losses were measured at less than 20kg/ha. For the second test, while the machine was harvesting at 20t/h in a patch of 3t/ha canola, the losses were measured at 60kg/ha. In this case, the faster harvest

speed with higher losses was the most economical way to harvest the crop.

Craig and Kim Thompson, Balla, WA, measured losses while harvesting 43Y23 canola with their two Case 7230 harvesters. The harvesters were operating at 5km/h at 12t/h at 80 per cent engine load, while making narrow windrows for harvest weed seed control. With one harvester losing 51kg/ha and the other 54kg/ha, neither machine needed to be adjusted.

Brad and Raylene Burns, Balla, WA, used the ScherGain Solution System drop tray to measure canola losses from the rotor of their John Deere S680, fitted with a 640D front and chaff decks. Car floor mats were placed on permanent tramlines to estimate sieve losses from the chaff decks. With the machine only harvesting at 11t/h at 50 per cent of engine capacity, the draper front was identified as the limiting factor to harvest efficiency. Canola loss was measured at 50kg/ha, with 30kg/ha from the sieves and 20kg/ha at the rotor. The manufacturer of the Bushel Plus Multi Calibration System has small drop trays to measure losses under chaff decks.

Mark Appleyard, Chapman Valley, WA, measured losses from a Claas 770 demonstration machine during 2016, while harvesting a 2.6t/ha GT42 canola crop. When working at 18.7t/h, losses were measured at 128kg/ha (\$70). At 15t/h, losses were 87kg/ha (\$48). At 11.7t/h losses were 65kg/ha (\$36). This demonstrates that slowing down reduces losses, but total harvest cost should be considered to determine which harvest speed is the economic optimum.

CALCULATING CANOLA LOSSES IN WINDROW MODE

A harvest loss calculator (<https://grdc.com.au/resources-and-publications/apps/harvest-loss-calculator>) is available to ease the task of measuring actual grain losses at harvest using a drop tray mounted underneath the harvester. It can also be used with trays that are thrown or placed.

Calculating canola losses in windrow mode involves setting the harvester to windrowing mode and catching everything. This will measure all losses, but keep in mind that switching to windrow mode can change airflow through the harvester and can often increase losses.

When using this method, use grams to record canola losses in the drop tray and then multiply the result by the 'multiplication factor' in the right-hand column of Table 1 to estimate grain loss in kg/ha.

STEP 1: Record the width of the drop tray. This is the smaller measurement of the two.

STEP 2: Record the harvest cut width. Either use one provided in Table 1 or enter a measurement at the bottom of the harvest loss calculator spreadsheet found at <https://grdc.com.au/resources-and-publications/apps/harvest-loss-calculator>. About 200 millimetres has been removed from the advertised front width to allow for wiggle. The autosteer display should indicate the actual harvester cut width.

STEP 3: Record the multiplication factor. Because this method involves catching all material, estimate the area of crop covered by the drop tray. This estimation is then used to determine the multiplication factor.

STEP 4: Calculate actual canola losses. Use the drop tray to catch everything. Sieve the grain from the chaff. Weigh the grain and record the caught grain in grams.

STEP 5: Multiply the caught grain (grams) by the multiplication factor to determine harvest loss in kg/ha.

WORKED EXAMPLE:

STEP 1: The drop tray width is 0.295m.

STEP 2: The harvester cut width is 10m.

STEP 3: When the cut width is entered into the spreadsheet, the calculator produces a multiplication factor of 3.39.

STEP 4: 20g of canola was caught in the drop tray.

STEP 5: $20g \times 3.39 = 67.8kg/ha$ of canola lost.

PHOTO: PETER NEWMAN



Canola windrows made with a Case harvester.

CALCULATING CANOLA LOSS IN CHOP AND SPREAD MODE

Measuring canola losses in normal harvest mode (chop and spread) is ideal because harvest losses may be increased by converting to windrow mode.

Many straw choppers do not spread residue evenly across the full width of the harvester front, but instead concentrate it towards the centre of the cut. If this is the case and the losses tray is dropped in the centre of the cut, losses will be over-estimated. Some harvesters spread more residue on the sides, so dropping trays in a range of locations is ideal to check actual losses.

To account for uneven residue spreading, look behind the harvester and estimate the percentage of the front width that is covered in residue. Then, multiply the answer by the measured canola loss. For example, if the harvester is spreading residue across only 50 per cent of the width of the front, multiply the grain loss result by 0.5.

Also, it may be wise to test the losses with drop trays at different positions across the width of the harvester front, or drop the tray one side of the harvester front. To avoid destroying the tray, place it outside the line of the wheels.

STEP 1: Determine the area of the drop tray. This is done by measuring the drop tray width and length, and multiplying the answer of both.

STEP 2: Enter result in the harvest loss calculator spreadsheet (<https://grdc.com.au/resources-and-publications/apps/harvest-loss-calculator>) and the multiplication factor will be provided.

STEP 3: Use the drop tray to catch lost grain with the harvester set in normal chop and spread mode.

NOTE: Some harvesters lose more grain from one side than the other. For example, single-rotor Case and John Deere harvesters are known to lose more grain on the right-hand side. Trial the positioning of the drop tray in the centre, then left and then right, and calculate the losses. This will help to determine the best location for the drop tray for subsequent measurements.

STEP 4: Sieve the grain from the chaff and weigh the grain. Write down the result. Multiply the grain lost (grams) by the multiplication factor to determine harvest loss in kg/ha.

WORKED EXAMPLE:

STEP 1: The drop tray is 0.295m wide x 1.69m long, which equates to a drop tray area of 0.499m².

STEP 2: The multiplication factor (determined by adding the drop area to the harvest loss calculator) is 20.06.

STEP 3: The amount of grain caught in drop tray (grams) is 20.

STEP 4: The harvest loss is 401kg/ha.

TABLE 1 How to determine the multiplication factor with harvester in windrow mode.

Cut width (ft)	Advertised front width (m)	Cut width (m)	Drop tray width (m)	Crop area per drop tray (m ²)	Multiplication factor
30	9.1	8.9	0.295	2.63	3.81
36	11.25	11	0.295	3.25	3.08
41	12.62	12.4	0.295	3.66	2.73
42	12.92	12.7	0.295	3.75	2.67
45	13.68	13.5	0.295	3.98	2.51
50	15.21	15	0.295	4.43	2.26
60	18.41	18.2	0.295	5.37	1.86
Your cut width		10	0.295	2.95	3.39

SOURCE: PETER NEWMAN, PLANFARM



PHOTO: PETER NEWMAN

A Claas Lexion harvesting canola in chop and spread mode.

FREQUENTLY ASKED QUESTIONS

Is minimising harvest losses the ultimate aim?

Yes, however losses must be considered in combination with harvest cost. A harvester and chaser bin can cost more than \$500/hour to run. Slowing down to minimise losses will increase the cost of harvest. Harvest cost equals machine cost plus harvest losses. It is important to consider both.

Do I have to slow down harvest to minimise losses?

Slowing down at harvest is an effective way of minimising losses, but it is not the only way to achieve this goal. Harvester set-up and settings are crucial to maximise harvester efficiency while minimising losses.

Did this project consider front losses?

No, this project was only focused on canola losses from the rear of the harvester.

Was one make of harvester better than any of the others?

All harvesters are capable of achieving minimal losses with the right set-up and settings.

USEFUL RESOURCES

Harvest loss calculator, <https://grdc.com.au/resources-and-publications/apps/harvest-loss-calculator>

Bushel Plus Multi Calibration System, +1 204 4020666, info@bushelplus.ca, www.bushelplus.com, @BushelPlus

ScherGain Solution System, order@schergain.ca, <https://www.schergain.ca/>, @ScherGain

Ag Gear Harvest Calibration/Loss Tray, 0438 531 891, aggearparts@gmail.com, www.aggear.com.au, @AgGear

Rod Gribble, HarvestCalc, 0427 614 549, mail@rcgribble.com.au, www.harvestcalc.com, @GribbleRC

GroundCover™ article, <https://groundcover.grdc.com.au/story/6036213/harvest-losses-costing-industry-millions/>

Two GRDC videos describe the process of harvest loss measurement. **Part 1:** <https://www.youtube.com/watch?v=WMm44AhDYQQ>; **Part 2:** <https://www.youtube.com/watch?v=iiN-dFFHaBs>

FURTHER INFORMATION

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Growers from WA involved in the GRDC canola harvest losses project are using the @harvestloss Twitter feed to share their results.

PHOTO: NICOLE BAXTER



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