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Arable Update

Herbage: Issue 79

Perennial ryegrass harvest timing – maximising yield and minimising losses

Key points

- Greatest seed yield was obtained when crops were cut at seed moisture contents (SMC) between 55% and 41%.
- When SMC fell below 41%, seed yield decreased by 25.2 kg/ha for every 1% drop in SMC.
- Reductions in seed yield were largely driven by harvest losses, which increased as SMC decreased.
- Harvest losses increased from 400 kg/ha at SMC levels above 50% to more than 1100 kg/ha at 29% SMC - equivalent to yield losses of up to 40%.
- Thousand seed weight increased as SMC decreased, reaching a plateau at approximately 33% SMC.
- Pre-cut irrigation did not significantly influence seed yield or harvest losses.

Background

A long and uneven flowering period makes harvest timing particularly difficult in perennial ryegrass. Cutting too early, when seed moisture is high, shortens the seed-filling period and produces smaller, lighter seed. Cutting too late, when seed moisture drops below 40%, risks heavy losses through seed shattering. Previous studies have identified cutting between 35% and 45% seed moisture content (SMC) as optimal.

This Herbage Update defines a more accurate harvest window for perennial ryegrass seed crops. The window is based on results from four small-plot trials carried out over three seasons in Canterbury to determine how seed yield, thousand seed weight (TSW) and harvest losses change as crops mature. Pre-cut irrigation was also tested to see whether adding irrigation could simulate 'dew' and reduce shattering and protect seed yield prior to harvest.

Methods

Trials were established in the Selwyn district of Canterbury between 2023 and 2025, using commercial cultivars including 'Base' (Trial 1), 'Array' (Trial 2) and 'Three60' (Trial 3 and 4). Each crop was managed using standard grower practices before initiation of treatments. Windrowing commenced once crops reached ≤ 55% SMC, and successive cuts were taken as moisture declined in steps down to 29%. To simulate dew, 6 mm of irrigation was applied before cutting in selected treatments. Harvest losses were determined by vacuuming seed from under the combine swath after harvest. Seed moisture content was tracked at least three times per week using the oven-drying method (see Herbage Update 76). Experiment 3 was excluded from the combined analysis due to an inconsistent trend in seed yield among replicates as seed moisture content (SMC) declined. Germination was tested by NZ Seedlab post-harvest on the machine-dressed samples.

Results

Across all experiments, SMC declined in a steady, linear fashion at ≈1.2–1.5% per day, regardless of rainfall patterns. This predictable decline provides a useful planning tool for harvest scheduling.

Maximum seed yield was consistently achieved when harvesting at 55–41% SMC. Across three seasons, yield averaged 2064 kg/ha within this range. Once crops dropped below 41% SMC, yield fell sharply, losing 25 kg/ha for every 1% decline in moisture (Figure 1). At 29% SMC, yields were typically 20–40% lower than the maximum recorded earlier in the harvest window.

TSW increased gradually as seed matured, reaching a plateau once crops dropped below ~33% SMC. This indicates physiological maturity, when seed filling ceases. While TSW was slightly heavier (Figure 2) at lower SMC levels, the potential yield advantage is offset by the large yield losses from shattering (Figure 3). Post-harvest germination tests showed no significant differences among cutting times, likely because seed quality assessments were conducted on machine-dressed samples.

Table 1. Mean seed yield across four Canterbury trials harvested at varying seed moisture contents (SMC) during the 2022–25 seasons.

% SMC	Trial 1 Yield (Kg/ha)	Trial 2 Yield (Kg/ha)	Trial 3 Yield (Kg/ha)	Trial 4 Yield (Kg/ha)
29	1570 d	1999 c	1751	1360 c
32	1794 cd	*	*	*
33	*	2214 bc	1733	1551 ab
35	2014 bc	*	*	*
37	*	2199 bc	1756	1496 b
38	2001 bc	*	*	*
41	2270 a	2193 bc	1761	1628 a
44	2220 ab	*	*	*
45	*	2207 bc	1924	1535 ab
47	2252 ab	*	*	*
49	*	2572 a	1673	1567 ab
53	*	2383 ab	1663	1601 a
P value SMC%	**< 0.001**	**0.035**	**0.226**	**<0.001**
LSD (p=0.05)	**228.4**	**310.9**	**NS**	**99.3**

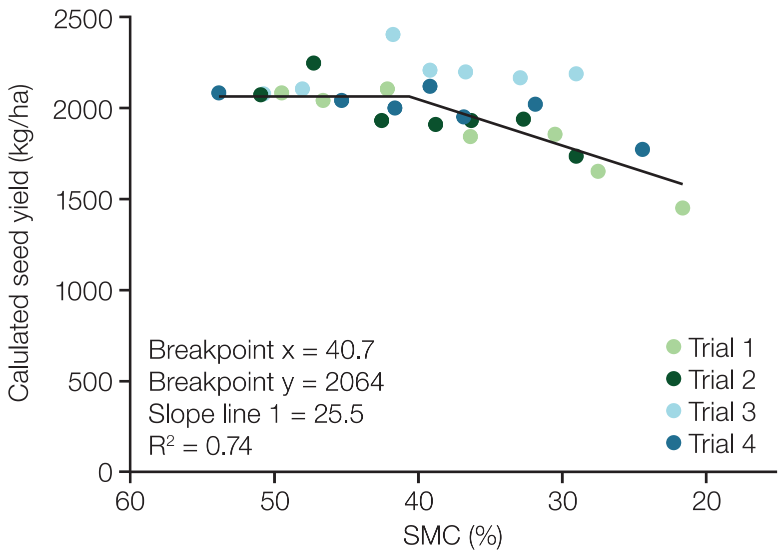

Figure 1. Calculated seed yield from four trials when cutting occurred at multiple levels of seed moisture content (SMC) grown during the 2022-25 seasons. Trial 3 (light blue circles) has been omitted from the regression analysis.

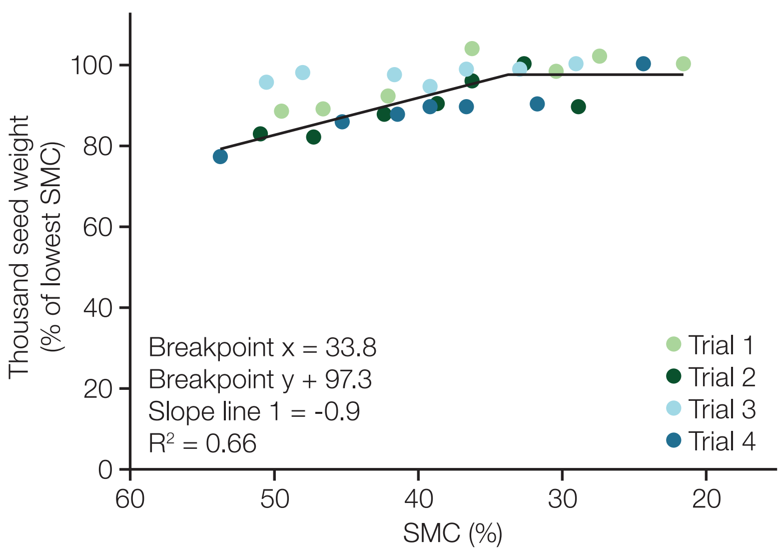

Figure 2. Calculated TSW from four trials when cutting occurred at multiple levels of seed moisture content (SMC) grown during the 2022-25 seasons. Trial 3 (light blue circles) has been omitted from the regression analysis.

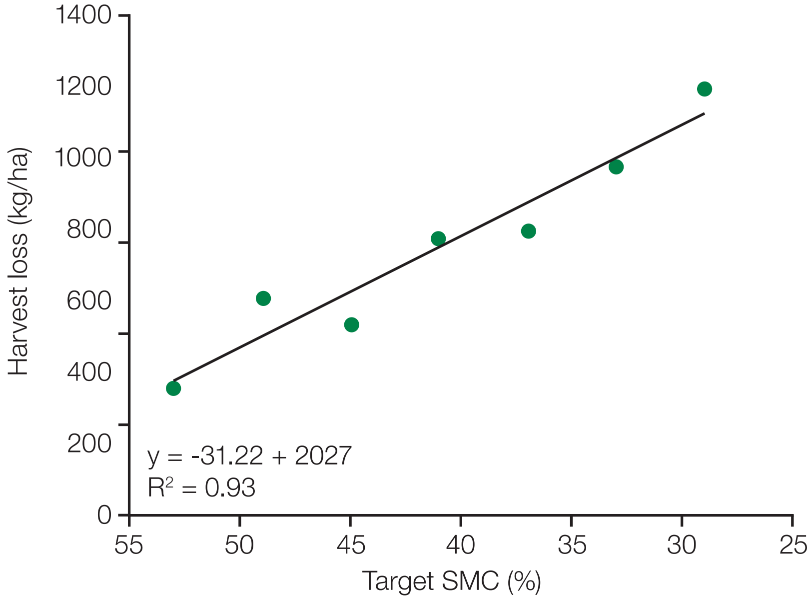

Figure 3. Total average harvest loss (kg/ha) compared with target SMC for three trials in the 2023-25 growing seasons. Trial means averaged across Trials 2, 3 and 4 as calculated harvest loss compared with the grand mean (No harvest loss measurements were recorded for trial 1).

Harvest losses were strongly linked to SMC. When crops were cut above 50% SMC, losses were generally under 400 kg/ha. By contrast, cutting at 29% SMC resulted in losses of more than 1100 kg/ha, equivalent to 40% of total yield. At a seed price of $3.50 kg, this represents a lost income of $4200/ha. These losses occurred both before and during harvest, as mature seed shattered from early-formed tillers.

Applying 6 mm irrigation before cutting had no impact on seed yield, harvest losses or germination. A slight reduction in TSW was observed, but this was not considered agronomically significant. These results suggest that irrigation does not mimic the protective effect of natural dew and does not reduce shattering losses.

Implications for growers

These findings show that SMC is a reliable and repeatable indicator of ryegrass maturity and should be used to guide cutting decisions. The results also extend the previously recommended harvest window. Greatest yields were achieved at SMC levels of 41% and above, with no penalty from cutting earlier at 50% SMC. By contrast, delaying cutting below 41% sharply increased shatter losses and reduced yield.

Cutting perennial ryegrass seed crops should be targeted for 41–50% SMC. Cutting within this window ensures the best balance between yield and seed size, while minimising economic losses from shattering. Monitoring seed moisture regularly, the linear decline of 1–1.5% per day provides a practical tool for harvest scheduling.

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