

# How do I optimise seedling recruitment to avoid resowing?

- The issue:** Sown perennial pastures thin out over time, reducing productivity and providing an opportunity for weeds to increase. Resowing pastures is expensive and risky.
- The impact:** Reduced desirable grass content increases the opportunity for weed invasion that can add further stress to an already declining pasture. Eventually the sown pasture loses both productivity and persistence.
- The opportunity:** There are strategies that can be used every few years to encourage seedling recruitment in perennial ryegrass and cocksfoot, resulting in new plants without having to resow.

Seeding is part of the natural life cycle of perennial grasses, but allowing plants to mature and drop seed is not essential for their survival. However, encouraging optimal seeding is a strategy for some perennial grasses which tend to thin out due to hot and dry summers.<sup>1</sup>

There are a number of ways producers can encourage seedling recruitment in their pastures and here we look at how seedling recruitment can be managed.



Recruited perennial ryegrass seedling in amongst established plants.



## Which species actively recruit seedlings?

Perennial ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) are two perennial grasses which actively recruit seedlings.<sup>1,2</sup> Much less success has been experienced with phalaris (*Phalaris aquatica*) and tall fescue (*Lolium arundinacea* previously *Festuca arundinacea*).<sup>3,4</sup>

This fact sheet focuses on ryegrass and cocksfoot as there is solid research-based evidence surrounding seedling recruitment with these species. Information on other species, at this stage, is anecdotal.

Success with perennial ryegrass and cocksfoot appears to be associated with their ability to establish as a seedling. They are more 'aggressive' after germination, enabling them to compete successfully against other emerging weeds. Strategies tested by Agriculture Victoria (AgVic) and the South West Prime Lamb Group (SWPLG) near Hamilton, Victoria, in separate non-comparative projects, found seedling recruitment of perennial ryegrass to be highly effective (Table 1). The strategies demonstrate the wide variation in results, while showing each proved beneficial.

**Table 1: The average number of perennial ryegrass seedlings/m<sup>2</sup> in mid-July following normal practice (control) and a recruitment strategy**

	Average perennial ryegrass seedlings (plants/m <sup>2</sup> )	
	AgVic	SWPLG
Continuous grazing (control)	320	6
Seedling recruitment strategy	2,230	211

Note: The varied seedling numbers in each trial are likely to be related to differences in the percentage of perennial ryegrass in the pasture, pasture seed production, seasonal conditions and seedling maturity when counted.

The additional seedlings established in the SWPLG experiment led to an increase in perennial ryegrass composition in September of 52%, compared to 23% in the control.<sup>5</sup> This result is consistent with comparable seedling recruitment studies in New Zealand.<sup>6</sup>

Phalaris and tall fescue seedlings are less aggressive and tend to be smothered before they can establish. Where phalaris and tall fescue seedling recruitment has occurred, it has mainly been on disturbed roadsides, in tree plantations and along drainage lines during wet summers, and in the absence of weed competition (annual plants have died out). Research into conditions for successful phalaris seedling recruitment in established pastures found it occurred in the second half of February to early March, when there was 15 continuous days of moist soil and soil temperatures were approximately 20°C, which results in faster seedling growth.<sup>4</sup>



### Three things to remember about seedling recruitment

1. Achieving success is challenging and it is not something which should be attempted every year.
2. Maximising seed head emergence is the most crucial step for optimal establishment of new plants.
3. There is a cost due to the paddock being unavailable for grazing for an extended period.



Recruited perennial ryegrass seedlings in amongst established plants.

## Managing seedling recruitment

**The right paddock:** Choose paddocks with at least 10% perennial ryegrass or cocksfoot in winter or early spring.<sup>7</sup>

**Preparation:** Maintaining herbage mass at around 1,000kg DM/ha (height 3cm) during winter, ensures plants are not overgrazed and maximises the number of tillers (stems) which can be exposed to vernalisation conditions (a period of short days and low temperatures, followed by long days), which triggers tillers to become reproductive. If annual weeds dominate the pastures, clean-up strategies such as spray-grazing or winter cleaning may be needed to reduce competition.

In early spring, maintain herbage mass between 1,200 to 2,000kg DM/ha to encourage tillering of ryegrass and cocksfoot. This will lead to greater seed head production.

**Lock it up:** Spell the pasture from flowering (anthesis) until the seed has ripened and has been shed from the stem. Seed growers wanting to maximise seed production normally lock up at the start of stem elongation in mid-September. For livestock producers some of the earlier seed heads can be eaten. Follow-up resting enables the rest of the plants to develop seed heads. This keeps pasture digestibility higher for longer and extends the grazing time.

**Flowering:** The success of the technique is reliant on achieving ample seed production before the season finishes. In dry springs or where there is no moisture to support seed production in late or very late-maturing cultivars, this technique is unlikely to result in adequate recruitment.

Time of flowering is cultivar and season-dependent, but typically occurs around mid to late November with seed ripening usually finished by early January. To identify flowering, inspect the seed heads and look for the appearance of anthers (flowers) on the plant.



Flowering perennial ryegrass (left) and cocksfoot.

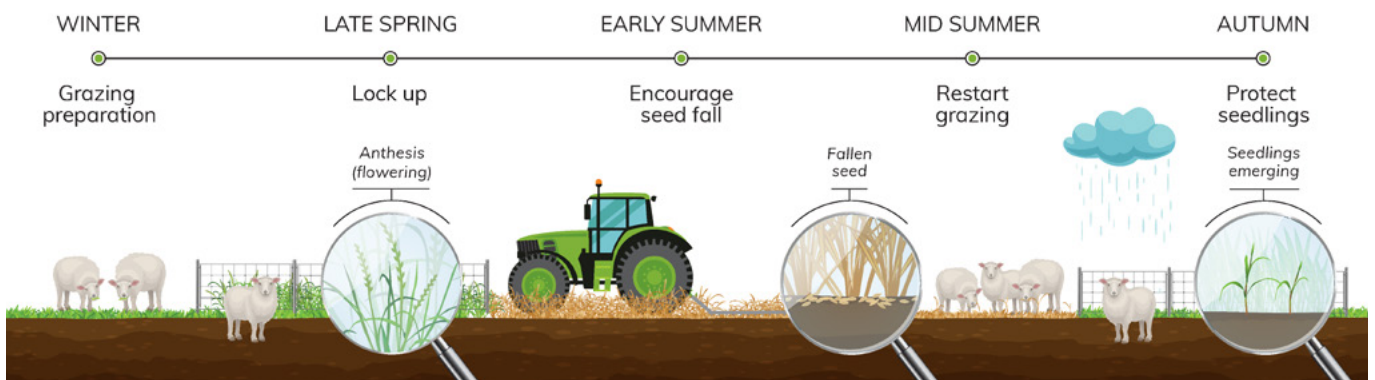
In perennial ryegrass, seed head emergence can signal flowering will occur in approximately 40 days.

Flowering time (anthesis) of different perennial ryegrass cultivars can vary by up to six weeks. In very early flowering varieties, such as 'Fitzroy', approximate flowering time is mid-November but very late flowering varieties, like 'Bealey', may not flower until Christmas.

A prolonged seeding period will improve the chances of recruitment. The length of heading is commonly longer or more staggered in older cultivars. Newer cultivars, which have been bred to maximise vegetative growth, tend to have more compressed heading periods. Referred to as 'low aftermath' heading, the plants run to head all at once, which shortens the seeding period.

Extended aftermath heading is thought to partly explain the persistence of older types of ryegrasses (such as 'Victorian') in long-term pastures. They set seed over a longer flowering period, meaning an increased chance some seeds may escape removal by grazing or hay cutting and remain to germinate the next autumn.

## Perennial grass seedling recruitment







Demonstration of rubbing seed head (left) and inspecting seed in hand.

**Maximising seed fall:** Natural seed fall from the reproductive tiller requires the seed heads to become brittle. This may not occur for several weeks after ripening. To assist this process, the seed head can be disturbed to enhance seed fall.

Methods to encourage seed fall include dragging tyres, chains or rollers across the paddock, or using a raised, tined implement. Moving large mobs of animals around a paddock has also proven to be successful, as the combination of disturbance and treading enhances the soil–seed contact. Hoof impact is a common technique used in aerial sowing of pastures to improve establishment.

**Restarting grazing:** Resting the pasture is important as stock preferentially graze ryegrass or cocksfoot seed heads, resulting in seed loss.<sup>17</sup> Few, if any, seeds ingested by animals remain viable, as seed is either damaged by chewing or does not survive the digestion process.

Stock should be excluded for about two months after lock-up or until the seed is ripened, which occurs approximately four weeks after flowering, and has shed from the seed head onto the ground (mid to late January).

Ripening is indicated by squeezing the seed between your fingers. It should be plump and firm.

**Getting good germination:** Following seed fall, the aim is to prepare for germination. This requires removing most of the dry material and may require large mobs, given the large build-up of dry material which may have occurred since lock-up in mid-spring and the limited time before the autumn break.

Graze down to about 1,000kg/ha before the autumn break. This is equivalent to about one to two handfuls of dry loose material in 0.1m<sup>2</sup> (31 by 31cm quadrat).



Checking if seed has ripened by squeezing the seed between your fingers.



One handful of loose litter scraped up within 31cm square quadrat will allow seed germination.

## A litter campaign

Strategies for removing excess litter include:

- **Choose your stock wisely** – prioritise mature dry stock over young, growing or pregnant livestock.
- **Go heavy** – combine herds or mobs or run sheep and cattle together to achieve high stocking rates.
- **Eat up** – supplementing stock with protein, such as lupins, can aid in the digestion of dry feed, allowing stock to eat more of it.
- **Keep it tight** – reduced paddock sizes (20ha) means higher stocking rates can be achieved to graze down pastures in a short amount of time.
- **Bring in the slasher** – pasture can be slashed if excess feed cannot be grazed and there is no fire risk.
- **Hydrate** – it is essential to have a supply of good quality water to meet the demand of livestock grazing on dry feed.

### Encouraging and protecting germinating seedlings:

Once the season breaks, spell the pasture until the germinating seed has anchored adequately. Germinating seed lying on the soil surface does not anchor as quickly or as well as seed sown underground. Therefore, an extended period may be required to enable adequate anchorage of the seedling compared to newly sown pasture.

The pinch and pull test is a useful indicator if plants are well anchored.

### Pinch and pull test

To determine if the seedlings are well anchored and will not pull out when grazed, gently pinch the seedling between your finger and thumb and twist while pulling upwards. Well-anchored seedlings will offer some resistance and will not pull out easily.



Gently pull seedlings to check anchorage.

## Other considerations

### Seedling recruitment in Italian ryegrass and hybrid ryegrasses

Hybrid and Italian ryegrass (*Lolium multiflorum*) types are short-lived but valued for their high production. Can seedling recruitment techniques be used to increase their longevity in these pastures?

Anecdotal information is that 20–30% of Italian ryegrass might be expected to survive if the plant was able to form viable seed and the seed re-establish. However, many flower late and have low-aftermath heading, meaning the chances of setting and shedding viable seed are less than perennial varieties. Shorter-season cultivars are more likely to achieve this than late-season cultivars.

### Endophyte in perennial ryegrass seed

Endophytes are microscopic fungi which live within perennial ryegrass plants and can transfer through seed. If perennial ryegrass has endophyte this will be transferred into the recruited seedlings.

Endophytes can enhance persistence, protecting the plant against insect and soil-borne diseases, but toxins produced by some cultivars, especially older varieties, can cause staggers, heat stress and death.



## A numbers game

New pastures of mixed species are typically sown with 8–12kg/ha of perennial ryegrass seed or 3–4kg/ha of cocksfoot seed. Estimated seed yields for thinning ryegrass or cocksfoot within mixed pasture could be 130kg/ha and 50kg/ha for cocksfoot. This equates to approximately 7,000 seeds/m<sup>2</sup> for ryegrass and 9,500 seeds/m<sup>2</sup> for cocksfoot.\*

## Where does all this seed go?

In a grazed pasture most is ingested by animals, which makes the seed unviable. If not removed by grazing, the main source of loss is ant predation. However, even achieving a 3% success rate with the high amounts of available seed equates to 200–300 seedlings/m<sup>2</sup>.

\* Results based on crop seed production of 1.3t/ha perennial ryegrass and 0.5t/ha cocksfoot. In a mixed poor perennial pasture, it is estimated that seed yields could be approximately 10%. One kilogram of perennial ryegrass seed equals 320 seeds/m<sup>2</sup> and one kilogram of cocksfoot is 760 seeds/m<sup>2</sup>.



Slashing seed heads to bring seed to ground after ripening.

## References and more information

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