

# Implementing deferred grazing on New Zealand sheep, beef and dairy farms

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## Highlights

Deferred grazing is the practice of excluding livestock from a pasture between late spring and mid- to late summer to allow reseeding of desirable pasture species. It can be used as a pasture rejuvenation tool, and to control feed supply and pasture quality at farm scale. In this perspectives paper, we i) review the scientific literature on the impacts of deferred grazing on pasture and livestock performance; (ii) discuss key decision criteria involved in implementing deferred grazing for dairy, and beef and sheep farm systems; and (iii) present a decision tree for farmers to assist them in implementing deferred grazing.

**Keywords:** deferred grazing, *Lolium perenne* L., pasture improvement, pasture resilience, persistence

## Background

### What is the purpose of deferred grazing?

Deferred grazing is the practice of excluding livestock from a pasture, typically from late spring until mid- to late summer to enable seed production and seedling establishment of desirable pasture species (L'Huillier and Aislabie 1988; Dowling et al. 1996) as well as energy reserve replenishment and regrowth of existing plants (Tozer et al. 2020a; Tozer et al. 2025). These benefits for pasture composition and production can persist for several years and reduce the need for pasture renewal, depending on the system, timing, and duration of the deferred period (Nie et al. 1996).

Deferred grazing can also help to better match feed supply with feed demand and improve pasture quality at farm scale (Tozer et al. 2021a). As spring progresses, feed supply often exceeds livestock demand. Excluding livestock from some paddocks increases the grazing pressure on the remainder of the farm that is not deferred, if stock numbers remain unchanged. This can result in a better match of feed supply with livestock demand, with the grazed pasture having less senescence, increased net growth rate and increased herbage quality, leading to improved livestock production (Tozer et al. 2021a). In hill country, this may be one of the few options

available for farmers to maintain pasture quality. The implementation of deferred grazing is encouraged by its simplicity, flexibility, reduced costs, and benefits for pasture quality and quantity.

In this perspectives paper, we i) summarise the scientific literature on the impacts of deferred grazing on pasture and livestock performance, (ii) discuss key decision criteria involved in implementing deferred grazing for dairy, beef and sheep pastures, and (iii) present a decision tree for farmers to assist them in implementing deferred grazing.

### Impact of deferred grazing on pasture performance

By allowing reseeding, seedling establishment, and increased energy reserves of existing plants, deferred grazing can increase tiller populations of desirable grass species (Hume and Barker 1991; Tozer et al. 2020a; Griffiths et al. 2021). It was recently estimated that reseeding of perennial ryegrass (*Lolium perenne* L.) in Bay of Plenty hill country enabled the equivalent of successful germination of 60 kg of perennial ryegrass seed in the pasture, assuming that every broadcast seed produced one seedling (Tozer et al. 2023). The amount of seed produced was likely much greater. L'Huillier and Aislabie (1988) estimated that 280 kg ryegrass /ha was produced in their complete reseeding treatment.

Resting pastures from grazing also allows perennial ryegrass plants to maintain a larger leaf area, enhancing photosynthesis and promoting the accumulation of water soluble carbohydrate (WSC) reserves in the leaves and roots (Donaghy and Fulkerson 1997). With fewer defoliation events, the plant experiences lower energy demands for regrowth. This enables it to store more WSC as reserves, mostly in its crown but also in the roots, rather than utilising them for immediate recovery. This improves plant resilience and increases the amount of energy available for root growth and future leaf growth and tillering (Tozer et al. 2025).

Historically, there has been little emphasis on using deferred grazing as a pasture rejuvenation tool, but evidence from the literature and farmer experience suggests that it is a viable option with benefits for

pasture and livestock production. This is especially the case for hill country given that broadcast sowing has variable results (Lambert et al. 1985) and low returns, limited amounts of croppable land, steep slopes, and environmental legislation limit the extent of cultivation. In sheep and beef hill country pastures, increased tiller populations in response to deferring have been documented for up to 1.5 years after cessation of this practice (Tozer et al. 2021b).

Deferred grazing benefits for reseeding and increasing perennial ryegrass tiller populations were demonstrated in a grazed field study in Waikato dairy pastures (L'Huillier and Aislabie 1988), the authors recommended deferred grazing as part of a pasture renewal programme. This was tested more recently in a Waikato field study in which 7-year-old failing dairy pastures were deferred for approximately four months. There was an increase in herbage production for three years post-deferring, with an average of 1.5 t/ha produced each year. Benefits also occurred for tiller populations, but to a lesser extent than herbage production (Griffiths et al. 2021). This episodic rejuvenation of the existing pasture overcomes the declines in energy levels and plant persistence associated with intensive grazing (Fulkerson and Donaghy 2001), which is often encouraged by high stocking rates and climate extremes (Glassey 2011).

There has been less focus on the impact of deferred grazing on legume populations, although older research in both hill country and on dairy farms has demonstrated positive benefits (Suckling 1954; Harris et al. 1999). This has involved the dual approach of (1) applying grazing pressure when grass reproductive tillers are developing to reduce grass competition and seed production, and (2) excluding grazing livestock or applying lax, infrequent grazing, to enable white clover (*Trifolium repens*), red clover (*T. pratense*), lotus (*Lotus pedunculatus*) and subterranean clover (*T. subterraneum*) to flower and set seed (Brock 2006; Suckling 1966). Benefits to clover populations may also occur due to modifications of the microclimate. Increased survival of white clover populations in response to deferred grazing in dairy pastures was attributed to the reduced soil surface temperatures and increased soil moisture retention over summer under the deferred pasture biomass (McCallum et al. 1991; Harris et al. 1999).

The combined effect of reseeding, accumulation of energy reserves, increased tiller populations and increased root growth can increase pasture growth rates and ground cover after the deferred period. Examples are provided in Table 1. The extent of this increased growth, however, is highly variable and will depend on factors such as the pasture species, soils, topography, climate and grazing management.

**Impact of deferred grazing on livestock performance**  
FARMAX (Red Meat Version) modelling suggests that implementing deferred grazing will benefit pasture quality of the grazed (non-deferred) pasture, and livestock performance in beef and sheep hill country, given a spring surplus and availability of a suitable livestock class (e.g., store cattle, ewes) to graze the deferred feed (Tozer et al. 2021a). The quality of the deferred feed to be grazed in late summer or autumn will often be low, around 8-9 MJ ME per kg DM. Additionally, the utilisation of this pasture will often be as low as 50%, given the high amounts of dead material present in the sward and losses to trampling (Tozer et al. 2020a). However, it can be a useful source of feed, especially in years of drought, and to help maintain older store cattle bought at low prices at the end of summer. Grazing the deferred pasture allows light to reach the seedlings and tillers, encouraging the emergence of healthy, high-quality pasture beneficial for livestock production.

There are some livestock performance data which support this. In top-dressed and oversown hill country pastures, deferred grazing resulted in increased legume populations and ewe liveweight gain (Suckling 1954). However, the same response was not achieved when deferring pastures on soils with a very low soil nutrient status. This highlights the need for appropriate paddock selection. Where feasible, it is important to correct soil nutrient deficiencies and other fundamental issues such as drainage or controlling weed infestations, prior to using deferred grazing as a pasture rejuvenation tool.

A similar positive response for livestock performance occurred in a dairy farmlet trial that compared conventional management (with conservation of surplus pasture) with deferral of surplus pasture. On the deferred farmlet, there was an increase in pasture growth, milk protein content and milk solid income, and the cost structure was lower due to no mechanical feed conservation costs. This increased overall profitability of the deferred farmlet when compared to the conservation farmlet (McCallum et al. 1991).

### **Assessment of pastures and decision criteria for deferred grazing**

To realise the benefits of deferred grazing, critical decisions are required regarding paddock selection, timing of closing the gate (beginning the deferred period), timing of opening the gate (end of deferred period) and management of the pasture following the deferred period. It is also important to identify where deferred grazing is not appropriate. These critical decisions are discussed below and summarised in a decision tree (Table 2).

**Table 1** Impact of deferred grazing on key pasture performance indicators (KPI) after the deferred period. Data are from plot or split-paddock studies unless otherwise stated. Tiller densities are of perennial ryegrass unless otherwise stated. A key criterion is that grazing exclusion occurs from mid- to late spring (typically October/November) to mid- to late summer (typically January/February), to enable reseeding of the desirable species, followed by grazing to remove rank herbage before the autumn rains. This is essential to enable seedling emergence. A later opening time may not have the same impact due to the deferred pasture shading emerging seedlings/tillers/stolons and suppressing the growth of desirable pasture species (e.g., legumes, Korte and Quilter 1990).

KPI (after deferring)	Impact	Farm Type	Reference
Herbage production		Dairy: Taranaki and Waikato Summer wet beef and sheep: Waikato-BoP Summer dry beef and sheep: Waikato-BoP and Wairarapa	(L'Huillier and Aislabie 1988; Boom and Sheath 1990; McCallum et al. 1991; Waller et al. 1999; Hume and Barker 2005; Tozer et al. 2020b; Tozer et al. 2021b)
Perennial ryegrass tiller density		Dairy: Taranaki and Waikato Summer wet beef and sheep: Waikato-BoP (including prairie grass) * Summer dry beef and sheep: Waikato-BoP, Wairarapa and southern Australia	(L'Huillier and Aislabie 1988; Boom and Sheath 1990; McCallum et al. 1991; Waller et al. 1999; Hume and Barker 2005; Tozer et al. 2020b; Tozer et al. 2021b)
Clover content		Dairy: Waikato-BoP Summer dry beef and sheep: Manawatu and Hawkes Bay	(Suckling 1959, 1966; Watson et al. 1996; Harris et al. 1999)
Ground Cover		Summer wet beef and sheep: Waikato-BoP Summer dry beef and sheep: Waikato-BoP and southern Australia (perennial native Australian grasses)	(Nie and Mitchell 2006; Tozer et al. 2020b; Tozer et al. 2020a; Tozer et al. 2021b)

\*Prairie grass was not defoliated between October-December to enable reseeding.

## Management conditions

### *Pasture condition thresholds*

When a pasture has a low content of desirable species, such as perennial ryegrass, and lots of bare ground or is dominated by sub-tropical species, such as kikuyu (*Cenchrus clandestinus*) or yellow bristle grass (*Setaria pumila*), full pasture renewal may be the best option. On the other hand, when pastures have a high proportion of desirable species, rejuvenation benefits are less likely.

Kerr et al. (2015) recommended assessing current pasture performance, defining the potential gain, addressing underlying issues and renewing paddocks based on below average yield, quality and weed infestation. However, there are currently little data available for New Zealand pastures regarding lower and upper pasture condition thresholds for using deferred grazing, or on the best time of year to assess a pasture to decide if deferred grazing can be used as a rejuvenation tool.

For Upper North Island dairy pastures, assessing pastures in spring may be the best option when perennial ryegrass tiller populations peak. A grazed plot study in Waikato (2018–2022; Tozer et al. 2024a) demonstrated a steady decline in perennial ryegrass content and ground cover over four consecutive spring seasons, followed by a sharp drop in tiller populations, ryegrass content, and ground cover in the fifth year. In

contrast, no consistent trend was observed in autumn (Fig 1a-d; Tozer et al. 2024a). It is difficult to predict in autumn, when tiller populations are at their lowest, to what extent a pasture may recover.

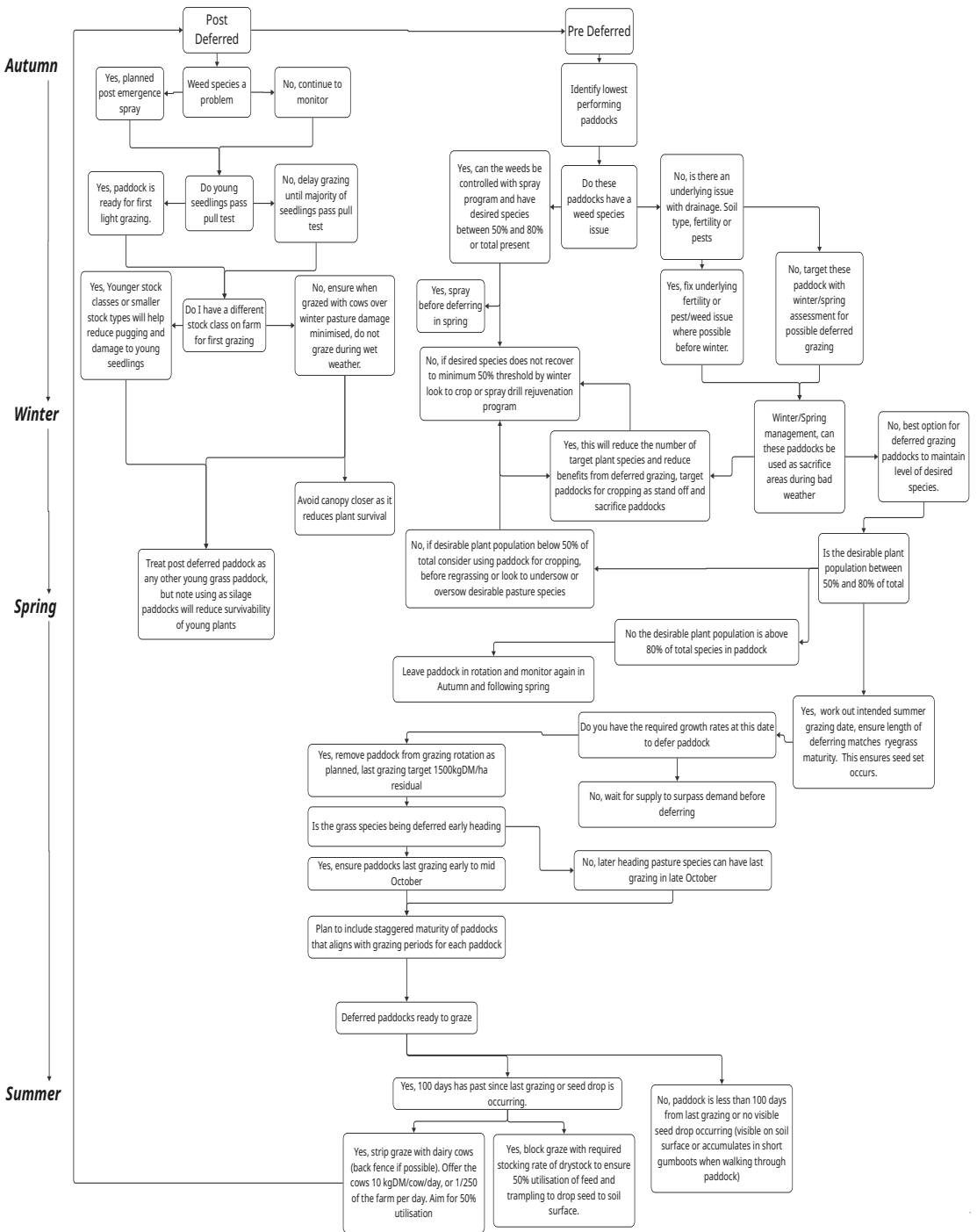
Based on the above study (Tozer et al. 2024a), a perennial ryegrass content of at least 50% of total DM or ground cover in spring in Waikato-BoP dairy pastures could be used as a trigger for considering deferred grazing as a rejuvenation tool. This is given the apparent collapse of perennial ryegrass populations in the final autumn of the study, which was possibly triggered by drought conditions in summer/autumn. Summer cropping, and pasture renewal, undersowing or oversowing could be implemented in autumn, if deferred grazing was not a viable option. The same dataset suggests that when the spring content of perennial ryegrass exceeds 80%, there may be no rejuvenation benefit. Therefore, the greatest benefit may occur when the perennial ryegrass content is between 50% and 80% of total dry matter, before the ryegrass content becomes too low. Once a pasture is severely depleted of desirable species, traditional renewal may be the best option.

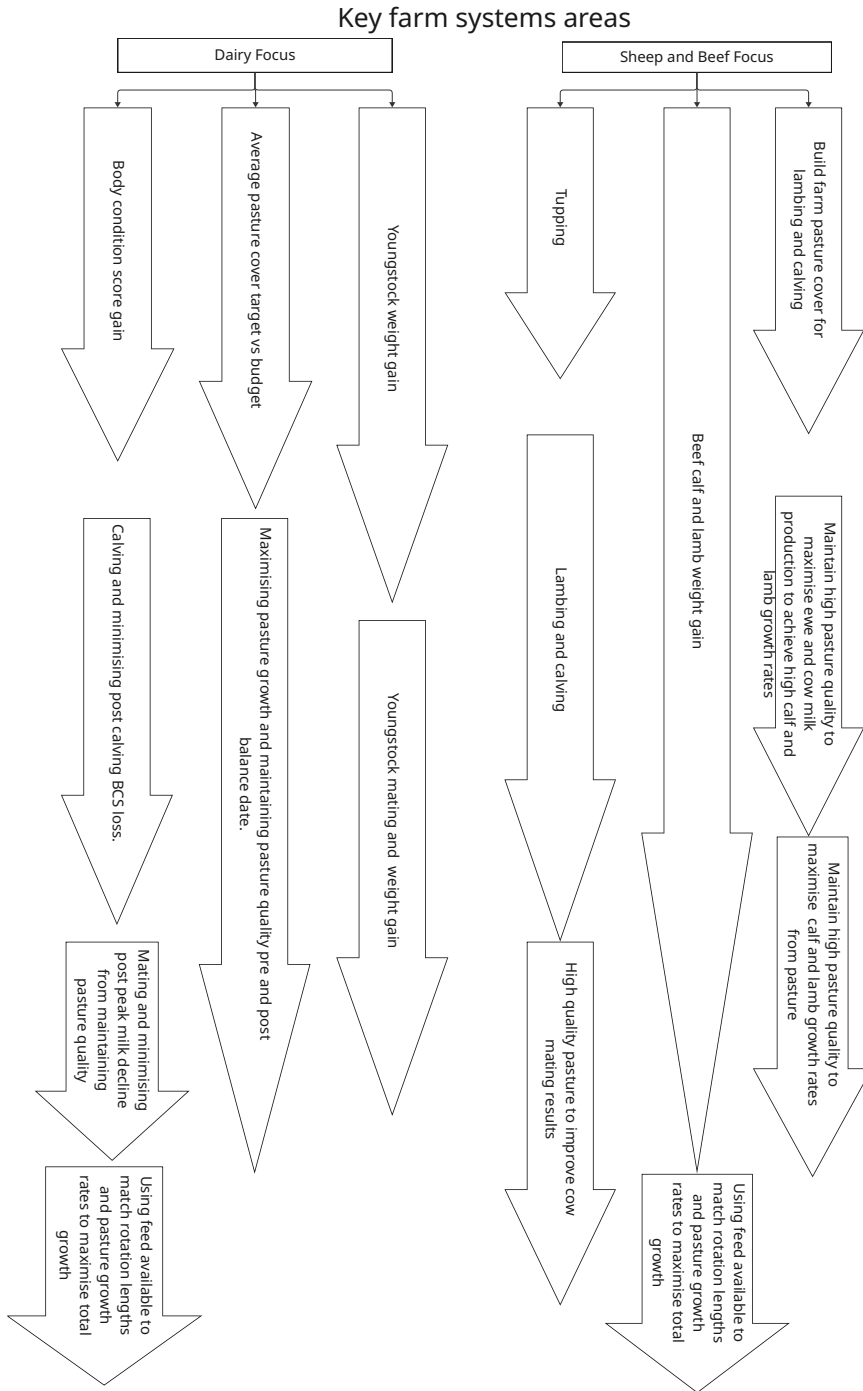
### *Closing date for pastures to be deferred*

This will depend on the reason for implementing deferred grazing. If the aim is to control pasture

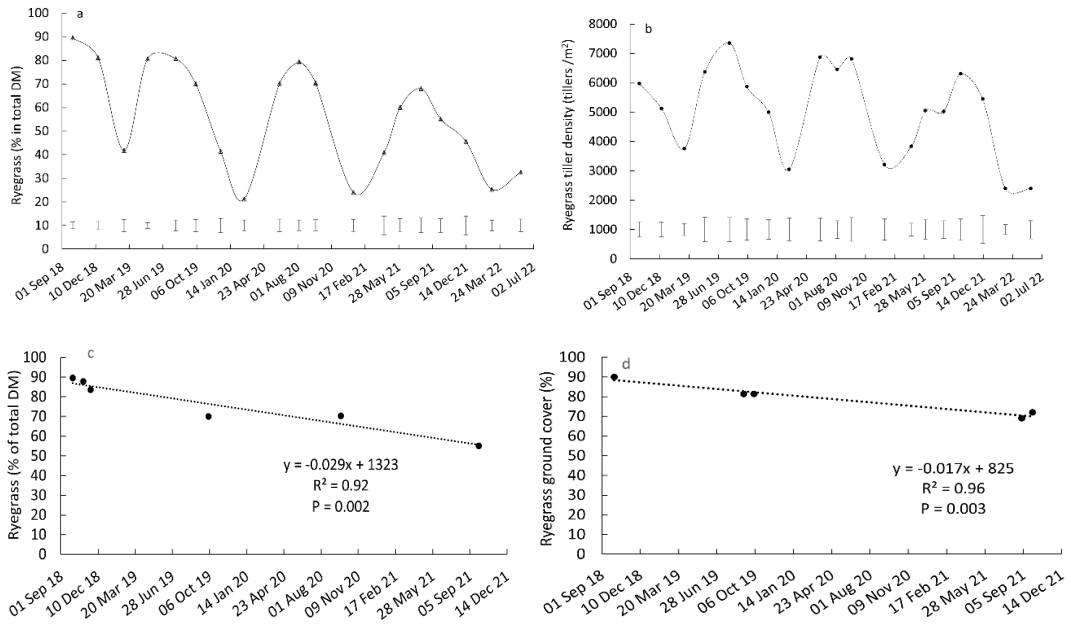
Season

### Deferred grazing Decision tree





**Figure 1** Deferred grazing decision tree. The deferred grazing decision tree is a summary of a tool currently under development. This tool integrates farmer experience with proven scientific principles to create a visual guide that helps farmers achieve desired outcomes through deferred grazing.



**Figure 1** Perennial ryegrass a) content in total DM (%); b) tiller density (tillers/m<sup>2</sup>); c) decline in ryegrass content in spring (Sept–Nov); and d) decline in ground cover in spring. These data are averaged over the 11 cultivars (Bronsyn, Samson, One50 and Rohan)-endophyte (AR37, NEA2/6, standard endophyte) combinations investigated in Tozer et al. (2024a).

quality at farm scale, paddocks can be removed from the grazing round once a feed surplus occurs in spring, as occurs when making silage on dairy farms. If the aim is to rejuvenate the pasture, the focus must be on excluding grazing to enable desirable species to flower and set seed. It is often possible to achieve both pasture rejuvenation and farm scale pasture quality benefits.

For perennial ryegrass, flowering can occur as early as late October and may extend into December, depending on the cultivar and location (Lee et al. 2012; Tozer et al. 2024b). Therefore, the last grazing could be as early as mid-October. Note that the timing of flowering and seed production depend on climatic conditions. It can vary by up to several weeks for the same cultivar depending on the year (Tozer et al. 2024b). The same principle of timing the closing date can be applied to temperate perennial legumes, such as white clover, red clover and lotus. Given differences between species, cultivars, and years, it is critical to observe the pasture and note when grass stem elongation or legume flowering begins. The key point to note is that grass stem elongation is often associated with the beginning of a spring surplus.

*Opening date for deferred pastures*

Deferred pastures can be grazed after seed fall of the desirable pasture grasses and perennial legumes such as white clover. A suggested rule of thumb for farmers is that ‘the pasture is ready for grazing when you walk through the paddock and the seed [of the desirable pasture species] falls into your Redbands {gumboots}’.

Timing will depend on the species and cultivar and can vary between paddocks, farms and years.

If the feed is required and the pasture is grazed before seed maturation of desirable species, rejuvenation benefits from fresh seed input will be compromised. However, other advantages can be realised if grazing occurs before seed maturation, such as provision of feed during a summer drought and control of pasture quality at the farm scale. Indeed, one of the benefits of deferred grazing is its flexibility, it can be stopped at any time through simply allowing stock access.

*Grazing the deferred pasture*

The pasture can be grazed using a range of different strategies: strip grazing for dairy pastures for short periods, while also allowing access to higher quality feed (L’Huillier and Aislabie 1988); or mob stocking for longer periods for more extensive sheep and beef pastures. It is important to consider the livestock class and impacts on livestock production. Grazing deferred pasture in certain systems might prevent livestock growth targets from being achieved; summer cropping and full renewal may be a better option in these systems. However, it can also provide a valuable feed buffer for maintaining livestock bought at lower prices in late summer, before the onset of autumn growth.

An example is on finishing farms, where flatter topography can allow machinery access and cropping or silage making, which are likely to provide higher quality forage to maintain sustained weight gain. A barrier to

deferred grazing on sheep farms can be the mismatch between the quantity and quality of the deferred pasture and the rising plane of nutrition needed for ewes pre-mating. Feed quality of the deferred pasture is likely to vary from season to season, depending on climatic conditions and the amount of clover in the pasture.

A key principle is to ensure that pasture covers are removed (through grazing or trampling) so that light can reach the base of the sward. This is necessary for seedling development and the growth of new grass tillers and clover stolons. Current guidelines suggest a target of at least 50% utilisation of standing herbage (Tozer et al. 2020a).

#### *Pasture management after the deferred period*

Pasture regrowth after the deferred period is boosted by new seedlings and new tillers. To test if the pasture is ready for grazing, grasp some new plants and pull firmly. If the plants are not pulled out from the ground and the seedlings remain firmly rooted, the pasture is ready for grazing with a light class of stock e.g. heifers (Tozer et al. 2020a). As regrowth can be rapid (Tozer et al. 2025), consideration needs to be given to ensuring that sufficient stock are available before the new seedlings are shaded out by regrowth from the older plants.

#### **Deferred grazing decision tree**

The *deferred grazing decision tree* is currently under development (Figure 1). This tool aims to integrate farmer experiences with proven scientific principles to create a visual guide that helps farmers achieve desired outcomes through deferred grazing. During the 2024–25 season, dairy, beef and sheep farm processes were monitored across multiple locations in the Bay of Plenty and Waikato regions. The aim was to solidify decision-making rules that ensure farmers observe both economic and physical benefits, thereby promoting the continued adoption of deferred grazing practices.

Central to the development of this tool is the recognition that farmer-to-farmer learning and shared experiences are essential for driving adoption and fostering on-farm change. By incorporating lessons learned from both dairy and dry stock farming practices, the tool seeks to expand the use of deferred grazing to more areas of the country, including land contours often considered unsuitable for pasture renewal.

#### **Conclusions**

Deferred grazing is a low-cost pasture management tool that may improve pasture persistence, livestock performance and pasture quality at farm-scale. By allowing pasture species to reseed and accumulate energy reserves, deferred grazing can increase tiller populations and the vigour of desirable species for up to three years following deferring. These benefits

will depend on appropriate paddock selection, timing of closure and reopening, and post-deferring pasture management. While deferred grazing can rejuvenate a pasture, it is not suitable for all pastures and systems, particularly those with high weed prevalence and a low content of desirable species, and where high-quality summer feed is required. The decision tree presented here can help farmers to achieve these benefits, improving pasture resilience and livestock productivity in beef, sheep and dairy farming systems.

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