



## **Managing Pastures - Readers' Note**

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## Limitations to pasture production

Pasture growth sets the potential for pasture utilisation, which has been shown many times to be related to profitability. This is because home-grown forage is still the cheapest source of feed. To increase pasture utilisation, you need to identify the aspects of your management that limit production.

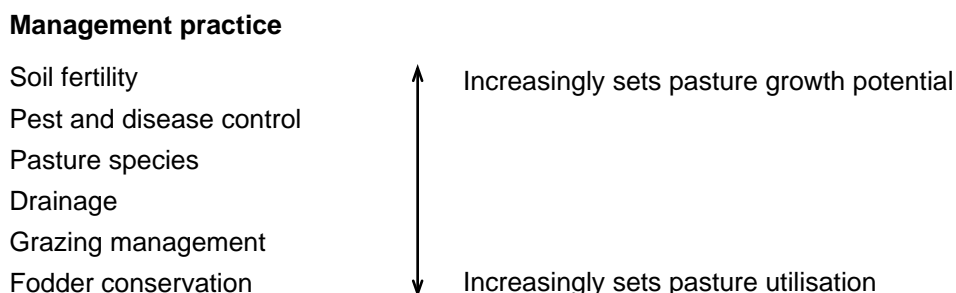
The various components of pasture management that can limit the potential of pasture growth and influence utilisation are shown in Figure 1.

For example, a comprehensive irrigation system is useless if growth is

restricted by poor fertility. Declining soil fertility, caused by removal of nutrients by a high yielding pasture, can suppress yield.

This manual concentrates on grazing management, and discusses other aspects of management, such as supplementation of stock and pests and diseases of pastures, which affect or are affected by grazing management. See the other DairyLink manuals on *Establishing Pastures* and *Conserving Fodder* for discussion of these topics.

**Figure 1. Pasture management practices that influence growth potential and utilisation of pasture.**



## Grazing management—ryegrass

The ryegrass plant is actually a series of independent tillers clumped together. In the vegetative state (Figure 2), each tiller regrows after grazing until about 3 live green leaves have expanded. This number of leaves is then maintained by the emergence of new leaves matching the death of the oldest leaves.

The growing point of the vegetative tiller is near the soil surface; therefore it is hard to kill a ryegrass plant by hard grazing. In contrast, in its reproductive state (Figure 3), the tiller’s growing point

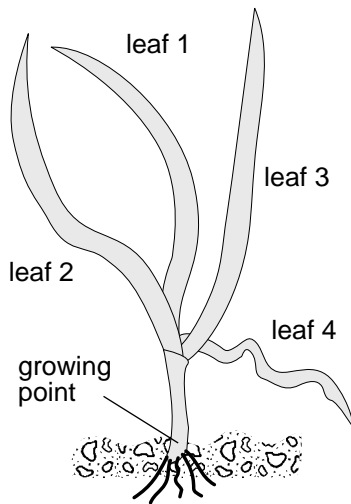
moves up the stem as the uppermost node. If the tiller is cut below this point, it will die.

The cue to begin reproductive growth is increasing daylength in spring, but a period of chilling is required before seed can set. This poses a problem for perennial ryegrass varieties (except the Kangaroo Valley types) on the NSW North Coast, as chilling is inadequate, and fewer than 10% of tillers produce a seed head. In contrast, 100% of annual ryegrass tillers set seed.

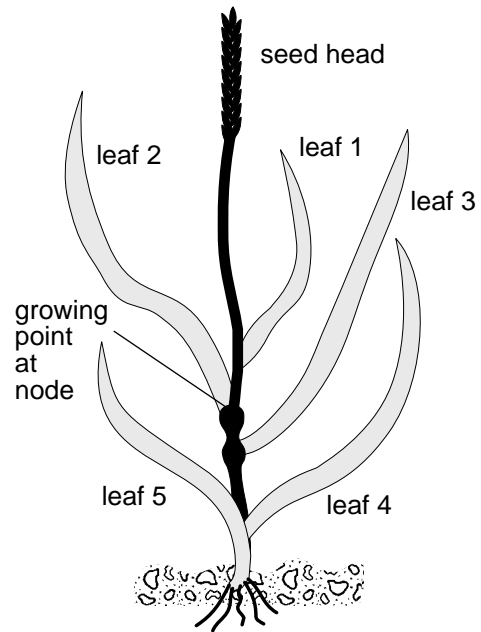
The poor seed set, and the fact that the few seeds that do set have little chance of surviving the harsh subtropical summer, means that swards need to be thickened up by oversowing. The continual decline in plant population from establishment is shown in Figure 4.

On the other hand, the lack of seed set

reduces the need to ‘top’ perennial ryegrass pastures in spring to keep them leafy, as is common in temperate regions. Topping by slashing or grazing annual ryegrass hard after stem elongation begins, however, is still useful to let light in to the pasture to encourage new vegetative tillers.

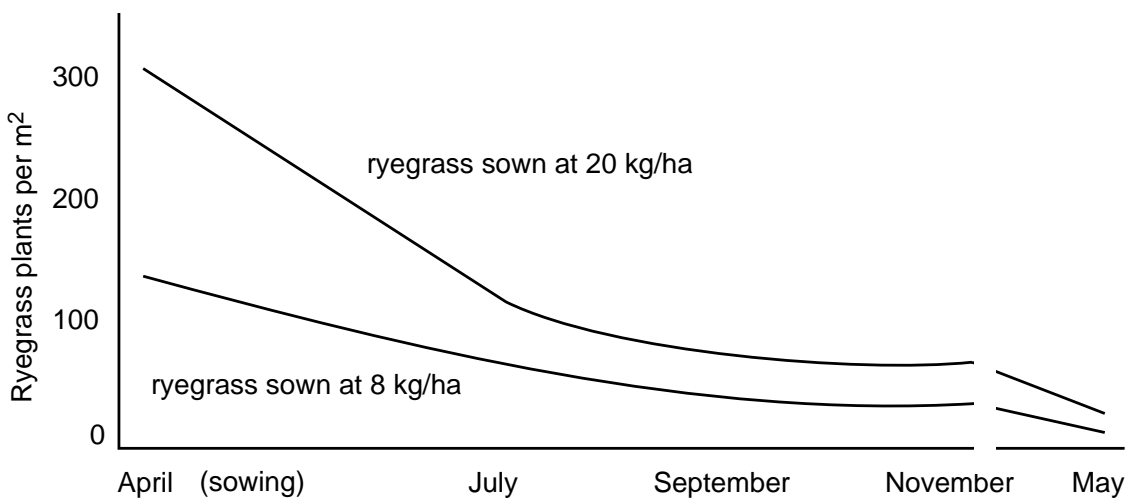


**Figure 2.** The vegetative ryegrass tiller.



**Figure 3.** The reproductive ryegrass tiller.

**Figure 4.** Ryegrass plant density declines from sowing in April–May to the autumn of the second year.



## Regrowth of the ryegrass plant

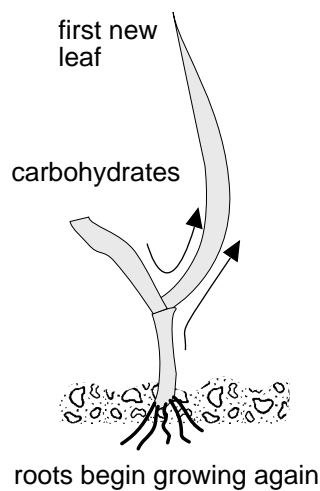
The drawings in Figure 5 show the regrowth of a tiller from grazing until 4 leaves have expanded.

In well grazed pasture, where most leaf is removed, the ryegrass tiller relies on carbohydrate reserves to initiate growth before the plant has sufficient leaf area to photosynthesise again and produce more carbohydrates. The changes in plant carbohydrate reserves during regrowth are shown in Figure 6.

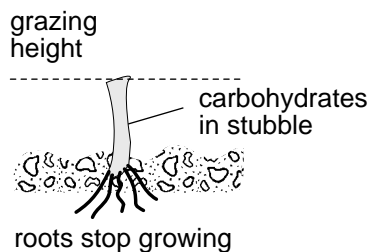
The time taken for 1 leaf to expand is known as the **leaf appearance interval**. This is determined primarily by temperature. For example, leaf appearance

interval of ryegrass is 20+ days in colder inland regions of NSW in winter, 12–14 days on the North Coast in winter, and as short as 6 days on the North Coast in spring.

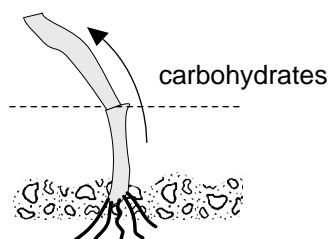
*Figure 5c. When the ryegrass tiller has regrown about  $\frac{3}{4}$  of a new leaf, it starts to replenish its carbohydrate reserves, which were used up to expand the new leaf. The plant is most vulnerable to grazing at this stage because of the low reserves. The roots begin to regrow.*



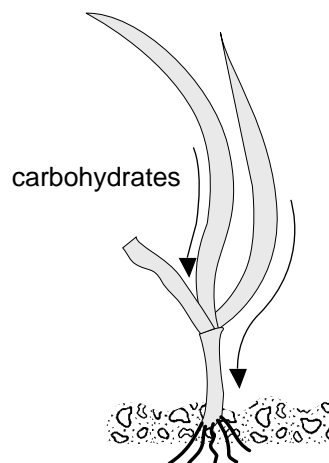
*Figure 5a. In well grazed pasture, most ryegrass leaves are removed and only the stubble remains. The roots stop growing after grazing.*



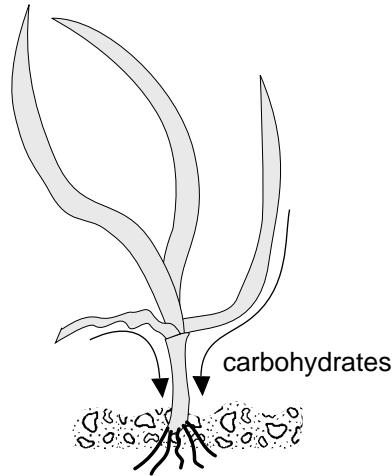
*Figure 5b. The remnant of the youngest leaf expanding before grazing must extend quickly in order to catch the sunlight to produce its own carbohydrates, otherwise the tiller will die. It relies at first on carbohydrate reserves in the stubble.*



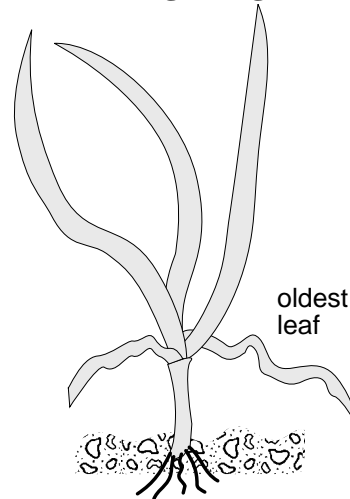
*Figure 5d. When the tiller has regrown 2 new leaves, the carbohydrate reserves are adequately replenished, and the plant can again cope with grazing. Thus, the time it takes the plant to regrow 2 leaves is the minimum interval between grazings.*



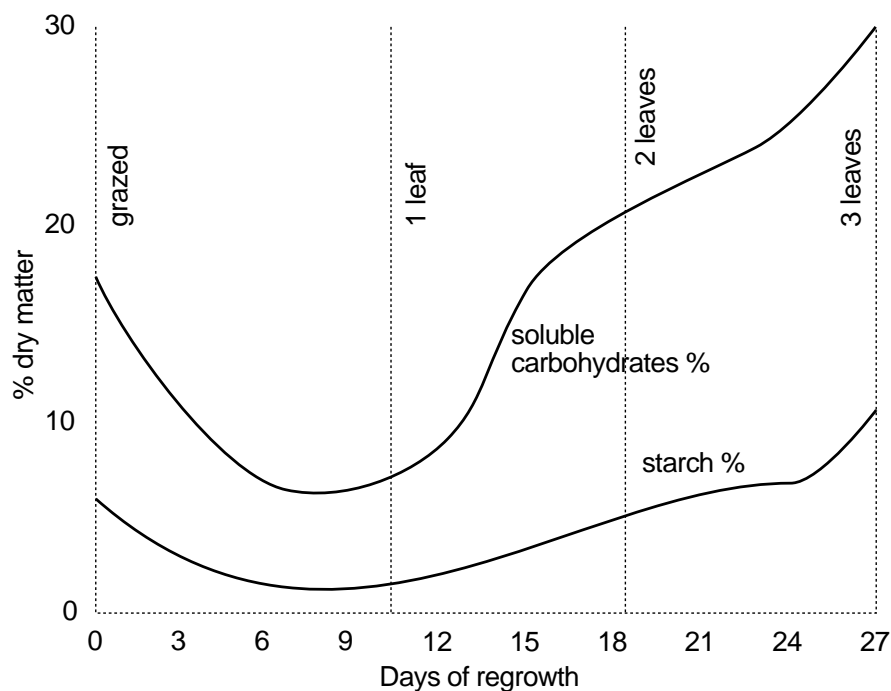
*Figure 5e. At 3 leaves per tiller, carbohydrate reserves have increased further. Net growth is probably at a maximum.*



*Figure 5f. After 3 leaves per tiller have expanded, the oldest leaf starts to die as a new leaf appears. A total of 3 green leaves is thus usually present at any time. As a consequence, pasture quality begins to decline beyond this stage and pasture is wasted. The 3-3½-leaf stage is generally the maximum grazing interval.*



*Figure 6. Soluble carbohydrates and starch in leaves decrease from grazing until regrowth of 1 leaf per tiller, and then increase to 3 leaves per tiller.*



## When to graze?

It is always best to use leaf appearance intervals to decide when to graze.

The best time for regrazing is from the **minimum grazing interval** (2 leaves) to the **maximum grazing interval** ( $3\frac{1}{2}$  leaves). This stage often coincides with the attainment of the 2400kgDM of regrowth per hectare recommended by Target 10<sup>(1)</sup>. This amount is generally the maximum that stock can graze without unacceptable wastage.

Table 2 shows that cutting ryegrass at the 3-leaf stage gives a higher total yield than cutting it at a set interval of 2 or 4 weeks throughout the year. It also results in more tillers per plant, more roots per plant, greater plant survival during summer, and less invasion by summer grasses and weeds.

Pasture height is a better indicator of when to graze than set time intervals, but it is influenced by soil fertility and air temperature, and hence is not solely related to the plant's development.

In late autumn, the oldest leaf begins to die when the newest leaf is only about half grown, at the  $2\frac{1}{2}$ -leaf stage, because new growth slows down. Therefore, exercise caution if you are going to delay grazing

**Table 2. Cutting ryegrass at the 3-leaf stage of regrowth gives a higher total yield than cutting it at regular intervals of 2 or 4 weeks.**

Harvesting interval	Yield kg DM/ha (% increase)*	
	Year 1	Year 2
2 weeks	9 260	3 084
4 weeks	10 927 (+18%)	4 384 (+41%)
3-leaf stage	12 223 (+32%)	4 904 (+59%)

\* The bigger % increases in year 2 are because of greater increases in summer grasses and weeds in the more frequently cut pastures.

to save pasture for winter: if you wait until the  $3\frac{1}{2}$ -leaf stage you will waste pasture and it will be unpalatable.

In late spring, as ryegrass turns reproductive, up to 6 live green leaves can be supported. This allows more bulk to be built up for hay or silage. However, this still promotes reproductive growth and a decline in pasture quality. If this bulk is subsequently grazed, there will be greater wastage as cows will trample it or simply not eat it.

If moisture stress becomes severe, new growth slows, leaf appearance interval increases, and death of older leaves begins before the 3-leaf stage. This is a survival mechanism designed to reduce the number of leaves exposed to evaporation. Therefore in this case grazing should begin earlier.

If shading of pasture limits growth (for example, plants lodge), also graze earlier. This could happen at the second or third grazing after establishment of short-term ryegrass, such as Concord, sown at high rates or fertilised with high rates of N.

If ryegrass becomes infected with leaf rust, you must graze more frequently or slash to remove badly infected leaves.

Grazing at the 3– $3\frac{1}{2}$ -leaf stage has been shown to improve persistence of ryegrass. The plant appears to build up carbohydrate reserves to allow it to cope better with summer stress<sup>(2)</sup>. Most nutrients in pasture are also at the optimum for stock at this stage (see 'Which nutrients in pasture limit milk production?', later).

## How hard to graze?

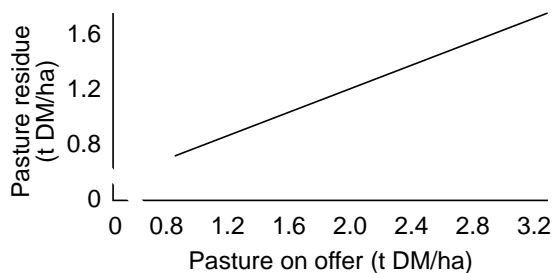
The harder you graze, the higher the utilisation at any one grazing. However, if pasture is grazed too hard (below 5cm stubble height), production per cow declines; and as more stubble is grazed, more of the plants' reserves are removed

and less leaf remains to photosynthesise, and so regrowth declines. On the other hand, although leaving a few leaves speeds regrowth, it does not outweigh the consequent reduced utilisation, as these older leaves are photosynthetically inefficient.

Achieving a desirable residue of 5cm often conflicts with achieving a high production per cow. Figure 7 shows that residues increase as pasture on offer increases in an attempt by the dairy farmer to increase intake. Management practices can reduce this conflict:

- Train cows. Giving cows daily breaks or strips of adequate amounts of pasture trains them to graze harder at a given level of DM. The effect can be dramatic. Cows should be trained from calves to graze behind wires, as cows transferred from a herd grazing laxly to a herd under controlled grazing can take up to 3 months to adjust and may lose several condition scores.
- Providing new pasture at each milking is a common way of improving intake and reducing selection of pasture by cows. Some producers have taken this a step further and give a new strip of pasture 4–6 times a day to entice further increases in pasture intake.
- Sometimes pasture is cut before grazing and left to wilt 12–24 hours. After 4–5 days of adaptation, cows

**Figure 7. As pasture on offer increases, pasture residues also increase. (Cows grazing ryegrass – white clover pastures at Wollongbar.)**



increase their intake, perhaps as a result of reduced water intake or the reduced energy required to graze. This practice is most common when the aim is to control bloat. The energy cost and time spent mowing should be considered.

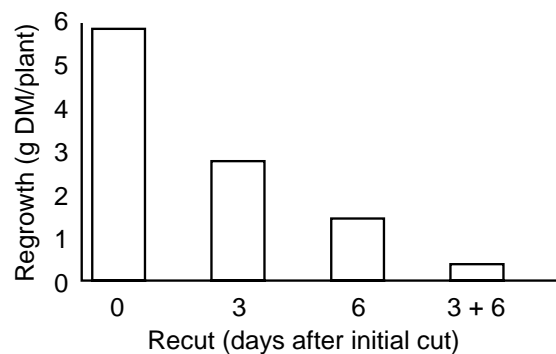
- With a leader–follower system you can get high production per cow as well as high rates of pasture utilisation: the leaders (milkers) take the lower fibre, higher protein tops, and the followers (dry stock) take the higher fibre, lower protein stubble.

Although following milkers with dry cows has proved valuable, following higher with lower producing cows has not been shown to increase total milk produced.

## How long to graze?

After grazing, carbohydrate reserves in the stubble are moved to the youngest expanding leaf remaining. If this expanding leaf is regrazed there will be little carbohydrate reserve left to initiate regrowth. Figure 8 shows a dramatic fall in DM yield after a full regrowth cycle and an increase in plant death when plants

**Figure 8. Glasshouse studies at Wollongbar showed a dramatic effect of reduction in regrowth by ryegrass plants recut at 3, 6, or 3 and 6 days after harvest<sup>(3)</sup>. More plants died too.**



were recut at 3, 6, or 3 and 6 days after initial harvest. Studies in Tasmania<sup>(4)</sup> showed a 40% decline in DM regrowth of pastures grazed continuously for 6 days compared with pastures grazed for 1 or 3 days.

The greater the pasture growth rate, the shorter should be the duration of grazing (and the grazing interval). Generally, if regrown shoots are long enough to be regrazed by cows—say 8cm—duration is too long. Use a back fence to keep the cows off the regrowth.

Similarly, if followers are used or the area is mulched or slashed, it must be done within 3 days of the start of the first grazing or it will do more harm than good.

## Managing ryegrass for persistence

Perennial ryegrass pastures are not very persistent on the east coast of NSW, but their rate of survival can be improved by appropriate management. The key to persistence is to maximise survival of ryegrass plants through the first summer, thus providing the least bare space for invasion by summer grasses (kikuyu, paspalum, couch and weeds).

Management must focus on this goal.

Fortunately, grazing management practices that maximise forage quality and utilisation by stock also maximise persistence of pasture (see above), although other factors also affect it, including fertiliser and grazing in spring and summer.

## Fertiliser requirements

Fertiliser requirements should be based on soil tests and the DM yields expected. For example, common soil test targets for highly productive dairy farms are

>100ppm phosphorus (Colwell test) (perhaps lower on sands and loams) and >0.4meq of potassium per 100g of soil. Consult your local agronomist for local information.

A major cause of deterioration of perennial ryegrass pastures is often soil nutrient drain. Ryegrass contains about 3% potassium and 0.35% phosphorus. To minimise soil nutrient drain:

- grazing management **must** ensure that most dung and urine is returned to pasture—no night paddocks; use short grazing breaks (no cattle camps, etc.); reduce time on the laneway, yards and dairy
- nutrients lost in milk, calves sold, laneways and yards, and leached from or bound to soil **must** be replaced
- replacement rates of 400–600kg/ha/year of a 2:1 mix of superphosphate and muriate of potash must be considered.

## Grazing in spring

Infrequent grazing in winter–spring allows the ryegrass plant to build up carbohydrate reserves to cope with the stress of summer. In trials at Casino<sup>(2)</sup>, plants grazed in spring at the 3-leaf stage of regrowth had nearly twice as much soluble carbohydrates in early summer as plants grazed at the 1-leaf stage of regrowth. The carbohydrate levels also declined less after grazing; this left 3 times more carbohydrate per plant in February. The more frequently grazed plants also had a smaller root mass, which allowed 6 times as many plants to be lost through sod-pulling.

Any practice that reduces carbohydrate concentrations in plants seems to reduce the plants' persistence. This includes grazing for too long and grazing too hard.

## Grazing in summer

Trial results and farmer experience indicate that perennial ryegrass must be grazed hard but infrequently (every 4–6 weeks) in summer. A follow-up mulching or slashing is vital if there are any summer grass weeds present, or the less palatable weeds will smother the ryegrass.

The worst practice is continuous grazing. This punishes the more palatable ryegrass and gives the weeds an even greater advantage.

## Rust in ryegrass and oats

Rust is a fungal disease commonly found on ryegrass and oats under humid conditions. The problem is greatest in late spring in the more subtropical dairy

regions of Australia. Lack of moisture and nutrients (particularly N) predisposes plants to it. A typical symptom is yellow blotches on the leaves. The growth of infected plants can be severely reduced. Utilisation by cattle is also affected because of reduced palatability.

There is no commercially viable chemical control of rust. Fortunately, plant breeders are continually breeding for rust resistance in grasses. Appropriate management specifies removal of the infected leaves by grazing or cutting and removal of the moisture or nutrient stress if possible. Apart from minimising plant stress, it may be necessary to graze infected pastures earlier than normal, as the denser the canopy, the more severe the effect of the rust will be.