8. Reading a pasture

Learning outcomes:
This chapter will help you to:

- Assess leaf stage after grazing.
- Assess pasture quantity.
- Assess pasture quality.
- Assess pasture composition.

To apply the grazing management principles outlined so far, it is necessary to read, or assess, a pasture for:

- Leaf regrowth after grazing.
- Quantity.
- Quality.
- Factors that might be reducing growth.
- Other aspects of pasture that might cause adjustment to grazing, such as pasture composition, canopy closure, the development of reproductive tillers, and fungal attack.

8.1 Assessing leaf regrowth

The following are the practical steps to determine ryegrass leaf stage, or number of leaves regrown after grazing:

8.1.1 Ensure you have a ryegrass tiller

- Ryegrass is easily confused with other grasses, especially winter grass.
- Ryegrass tillers often, but not always, have a **reddish/ purplish base**. Dead leaf may need to be peeled back to expose this.
- Each **new leaf appears on the opposite side** of the tiller to the previous leaf (see Figure 8-1).
- Leaves are generally **long and narrow**, and taper off to a **narrow tip**.
- Leaves have a **defined mid-rib** (see Figure 8-2). Younger leaves often emerge folded down this centre line, opening up as they mature.
- Leaves are **hairless**, with a ribbed upper surface and a **shiny, waxy back.**

Figure 8-1: A vegetative ryegrass tiller with daughter tiller

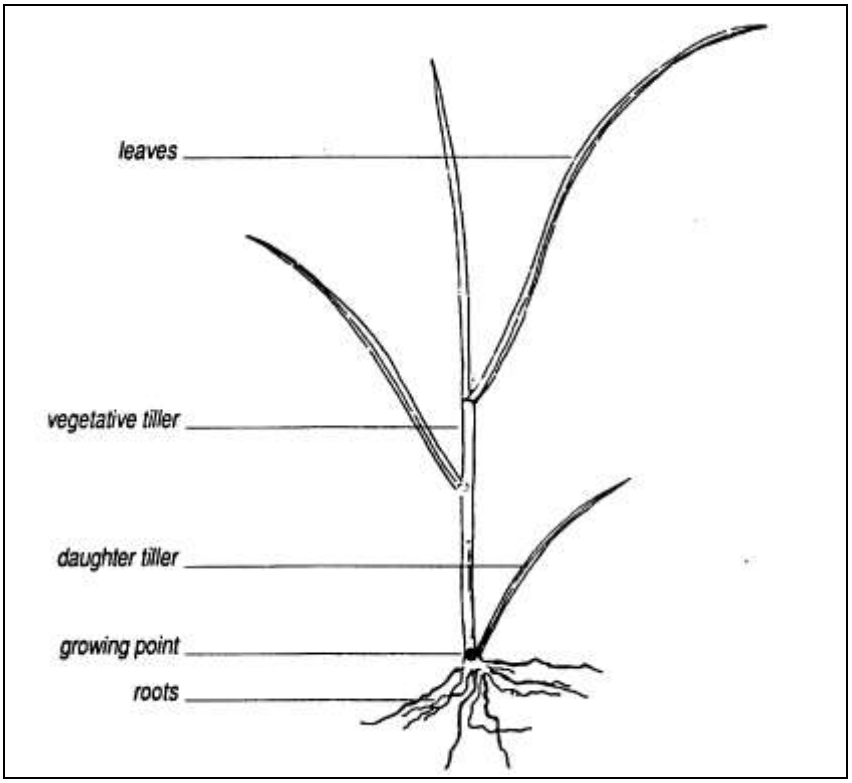
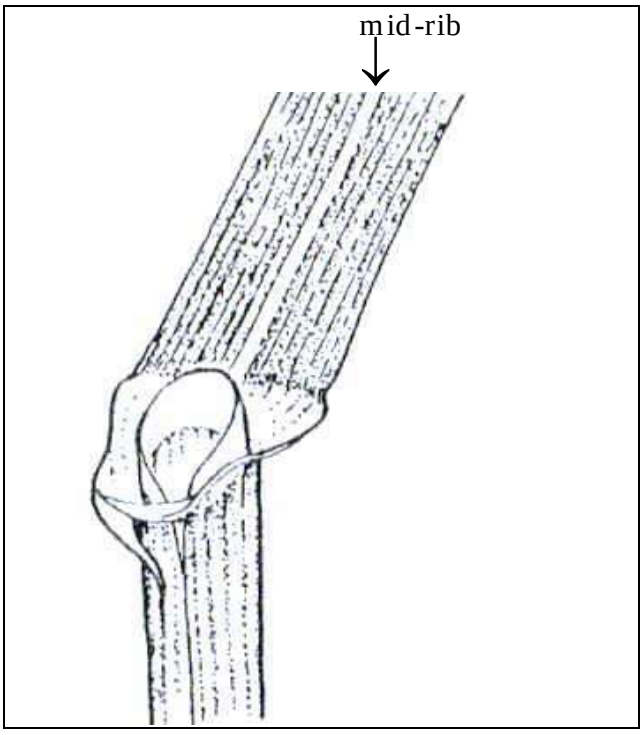


Figure 8-2: Detail of ryegrass leaf junction with tiller



(Source: Drawn by D.I. Morris, in *Knox, J. (1999). The glove-box guide to grass and legume identification in Tasmanian pastures. Tasmanian DPIWE ISBN 0-7246-4750-3).*

8.1.2 Don't let daughter tillers confuse you

- Daughter tillers start growing from growing points at ground level and can **emerge at either the base of the parent** (Figure 8-1) **or** at the junction **where the leaf and tiller are joined (**Figure 8-2**).**
- **Don't assess** leaf stage **with a daughter tiller**. Before a daughter tiller is mature, that is, has several leaves of its own, its leaves can appear at different rates than its parent's leaves. Also, a daughter tiller may have been too small to have been grazed at the previous grazing.
- **Don't count** young, emerging **daughter tillers as extra leaves** on the parent. An emerging daughter tiller can look like 2 leaves close together on the same side of the parent tiller.

8.1.3 Ensure the tiller is vegetative, not reproductive

- **Reproductive tillers**, elongating to set seed, can have **up to 6 live leaves** at the one time and may have more than 3 live leaves before the seed head is clearly visible
- Reproductive tillers, which can appear between July and February (depending on the ryegrass cultivar) **have nodes** along the tiller.
- Nodes stabilise the tiller as it elongates. At an early stage of tiller elongation, nodes will be at the bottom 2 cm or so of the tiller, and can easily be **felt by squeezing the tiller** between your thumb and forefinger. If you peel back the leaves and sheath surrounding the tiller, nodes can be seen as **hard white or yellowish lumps**. As the reproductive tiller elongates, it sets nodes along its length, and they are more obviously seen and felt.
- **Don't use reproductive tillers** to assess leaf stage.

8.1.4 Identify the remnant leaf

- The **remnant leaf** (sometimes called the flag leaf) is the most recently grazed one, shown by a **blunt, cut-off tip**.
- The remnant leaf **was the youngest growing leaf** when the tiller was last grazed, so it will have continued to grow a bit.
- The remnant size will depend on how old it was when last grazed.
- It is **usually small** (say 2 to 4 cm long), having continued growth for only a day or two. However, if the remnant was just emerging at grazing, its tip will be removed, but it will continue to grow to almost full size. Also, the remnant will be bigger (maybe 6 cm plus) on fertile soils.
- If the remnant leaf is **more than half as long as the first new leaf, it must be counted as at least) 0.5 to 1 leaf** on its own (depending on its size relative to leaf 1). If it is less than half as long as the first new leaf, it is not counted.

- If there are remnants present and you find a tiller with **no remnant**, it means that tiller was not grazed last time, maybe because it was near a dung or urine patch. **Don't use this tiller** in the leaf count.
- If **no tillers have a remnant** or if they are dead and shrivelled at the base, **more than 3 leaves have regrown**.
- You may find **more than one remnant** on a tiller, especially in spring, if the paddock was not grazed very hard last time. **Ignore the older remnants** because they have not grown at all since the last grazing. Only use the youngest (uppermost) remnant in your counting.

Figure 8-3: Remnant leaves visible in pasture

8.1.5 Begin counting leaves from the base of the tiller upward

- **First count the remnant, but only if big enough** (that is longer than half the length of the first full leaf).
- Then **count the next full leaves**.
- The top leaf, the youngest, may be only partly grown. **Judge the top leaf size in relation to the previous** leaf. It should grow about one – quarter or so larger than the previous leaf.
- If the youngest leaf sticks close to the previous leaf, it can be nearly half grown before you see it. **Check for this hidden leaf** by running the apparently youngest leaf between your forefinger and thumb, opening it up along its mid-rib.

8.1.6 Count at least 10 tillers across the paddock

- Choose **10 tillers at random** as you walk through the paddock, and get the average value.
- If the paddock was grazed well previously, **all tillers should be within half a leaf stage** or less of each other, when differences in the size of remnant leaves are taken into account.

8.1.7 Regularity of checks

- Check **more often in spring**, when growth is fastest, and less often during the winter, when growth is slower.
- **Checking each paddock** (or, on long rotations, each area of pasture) **prior to grazing is ideal**.

8.1.8 Calculating leaf appearance interval

Once you have determined the average number of leaves grown since grazing, you can use the number of days since grazing to calculate leaf appearance interval, as shown in Figure 8-4.

Figure 8-4: Calculating leaf appearance interval

Days since paddock was grazed (A)	**Average number of leaves grown since grazing** (B)	**Average leaf appearance interval since last grazing** (A÷B)
17	2.3	7.4

8.2 Assessing pasture quantity

To better decide how many feed to get out of a paddock, some assessment of the quantity in the paddock is necessary. All feeds have some water and some dry matter in them. **Feeds are best compared on the dry matter** they contain because:

- The **nutritional value** of a feed (the energy, protein, fibre, minerals and vitamins) is contained **in the dry part** of the feed.
- **Water can be supplied to cows more easily** and cheaply via drinking water.
- Cows can usually efficiently **remove any surplus** water from feed.
- **All feeds have varying water contents**, so using dry matter allows a proper comparison of feeds, and better communication.

Green leafy pasture contains about 85% water and 15% dry matter. If 100 kg of green pasture is completely dried out in an oven, about 15 kg of dry matter would remain. When we observe pasture to assess quantity, **we measure it directly as dry matter**.

8.2.1 Assessing quantity using pasture height and density

The quantity of pasture in a paddock is related to the pasture height and density:

- An average-density, **3 cm high** ryegrass pasture will have about **1,300 kilograms of dry matter per hectare** present.
- An average-density, **12 cm high** ryegrass pasture will have about **2,200 kilograms** of dry matter per hectare.
- Pasture between 3 cm and 12 cm high can be estimated by assuming **1 cm increase in height** (above the 3 cm) will be about **100 kilograms per hectare**.
- For pastures taller than 12 cm, there will be less than 100 kg in every additional centimetre, as pasture is less dense at the top.

Figure 8-5 shows:

- A range of green pasture **heights and kilograms of dry matter per hectare** of feed present.
- It assumes that the pasture is average density.

Later in the season, when pastures might be longer and less dense or even dry, a different set of figures would apply.

Figure 8-5: Approximate pasture quantity per hectare based on pasture height in an average density pasture

Pasture height (cm)	**Pasture quantity** (kg DM / ha)
3	1,300
6	1,600
9	1,900
12	2,200
15	2,400
20	2,800

You **can assess the height** of pasture using:

- Your **hand, your gumboot, or a ruler**, then assessing the density visually and adjusting for it. A less dense pasture will have less dry matter at a given height, and vice versa.
- A **clumpy pasture is harder to estimate** because of the widely varying heights.
- With practice in association with an experienced person or discussion group or by calibrating with the other methods, this **visual method can be quite accurate**.

Some people measure pasture quantity visually using the "cow day" as the unit of measure:

- A cow day is 15 kg DM.

- To convert cow days to kilograms of dry matter per hectare, multiply the assessed cow days per hectare by 15 and add 1,000.
- For example, 80 cow days equals 2,200 kg DM/ ha (80 x 15 + 1000).

8.2.2 Assessing quantity using a rising plate meter

A rising plate meter:

- Is a **plate** with a sliding **central probe** (see Figure 8-6).
- The plate is placed on the grass surface and the probe is allowed to fall down to the ground.
- The grooves on the probe rotate a counter, so measuring the pasture height.
- The plate compresses the pasture a little, which gives an indication of density as well as height.
- They cost about $400.

Figure 8-6: A discussion group measuring pasture with rising plate meters

To get the average plate centimetre reading of a paddock:

- Record the **start reading** on the counter (for example, 25,000).
- Take at least **50 measurements** across the paddock.
- Record the **final reading** on the counter (say, 25,670).
- Subtract the **start from the final reading** (25,670 - 25,000 = 670).
- **Divide** this difference **by** the number of **measurements** taken, in this case 50 (670 ÷ 50 = 13.4).

- **Divide** this number **by 2** to convert to centimetres because plate meters count in ½ cm increments (13.4 ÷ 2 = 6.7 cm).

Regular plate readings, without conversion, could used be to monitor changing pasture quantity on the farm. However, the reading can be converted to kilograms of dry matter per hectare by using **calibration equations.** The following, one of many equations, gives a reasonable figure in most situations:

- **Green growing pasture:**
  - That is, autumn, winter, spring (April to November) for non-irrigated pasture and year-round for irrigated pasture.
  - Kg DM/ ha = **250 × average meter reading (cm) + 500.**
- **Dry pasture**:
  - That is, summer (December to March) on non-irrigated pasture.
  - Kg DM/ ha = **320 × average meter reading (cm) + 500**

So for the example above, the 6.7 plate cm would convert to 2,175 kg DM/ ha (250 × 6.7 + 500) for a green growing pasture.

8.2.3 Assessing quantity using an electronic probe

An electronic probe (shown in Figure 8-7) can be used to measure pasture quantity:

- The readings are shown in kilograms of dry matter per hectare.
- They can store readings for many paddocks, so manual recording of each paddock is not necessary.
- The information can be downloaded to a computer for rapid analysis.
- Under most conditions, they are no more accurate than a rising plate meter or an experienced eye.
- They don't work well when the grass is wet.
- They cost about $800.

Figure 8-7: An electronic probe that measures pasture quantity

8.2.4 Assessing quantity using pasture cuts

Pasture quantity can be assessed by taking pasture cuts:

- To obtain an accurate figure that truly represents the quantity in the paddock, many cuts must be made, selecting them randomly across the paddock.
- The cuts are weighed, the water is dried out completely in an oven, then the cuts are weighed again.
- This is very time consuming.

A quicker but less accurate method can be useful for calibrating your eye or plate meter periodically:

- Choose a 50cm × 50cm square area ($0.25m^2$)that you consider represents the average of the paddock.
- Cut and collect the pasture down to ground level from the square.
- Weigh the pasture in grams and multiply by 0.15, because the average dry matter of pasture is only 15%. This gives you grams per $0.25m^2$.
- Then multiply by 40. This converts the grams per 0.25 m^2 to kilograms of dry matter per hectare.

8.2.5 Variations in pasture quantity assessments

Sometimes two experienced people might visually assess the same pasture differently for total quantity. The main reason is the misjudging of the quantity of pasture in the base:

- Pasture is very dense right at the bottom.
- The fact that there is usually as much as 1,300 kg DM below 3 cm shows this.
- The quantity in the base can vary and is not noticed easily by eye.
- However, we do not want the cows to eat the base; it is far too short to bite and is largely fibrous stubble.
- Usually, experienced assessors will agree very closely on the dry matter per hectare **available to the cows**.

8.3 Assessing pasture quality

Pasture quality is the balance of:

- Energy.
- Protein.
- Sugars and nitrates.
- Fibre.
- Minerals.

A sample of pasture can be taken and tested for dry matter content, protein, fibre and energy at a cost of about $45. Mineral testing costs about $90.

A feed test is not necessary to get some idea of quality because the following **indicators of pasture quality** can be seen in a paddock:

- **Species**. High quality pasture is full of ryegrass and clover, with minimal other species and weeds.
- **Colour. Green** colour indicates higher quality **growing** leaves; **yellow** indicates **decay, death**, fungal attack or mineral deficiency, and therefore lower quality.
- **Leaf stage**. Less than 2 leaves and more than 3 leaves are both poorer quality.
- **Height**. Very short and very long pasture are both poorer quality.
- **Stems, flowers or seed heads** indicate lower quality.
- **Stubble height**. The more ungrazed stubble, the lower the quality.

Assessing pasture silage or hay quality

Silage or hay quality depends on:

- How well it was both conserved and stored. It can only be less than the pasture it was made from.
- The proportion of stem compared to leaf. More stem means poorer quality.
- The maturity of the stem. As its changes from a young stem to flowering to seed set, the quality falls.

8.4 Assessing pasture growth factors (fertility, soil moisture, and grazing)

With experience, you can know how a pasture has been managed in the past by simply observing its current state. The pasture you see is simply a result of management. You get the pasture you deserve!

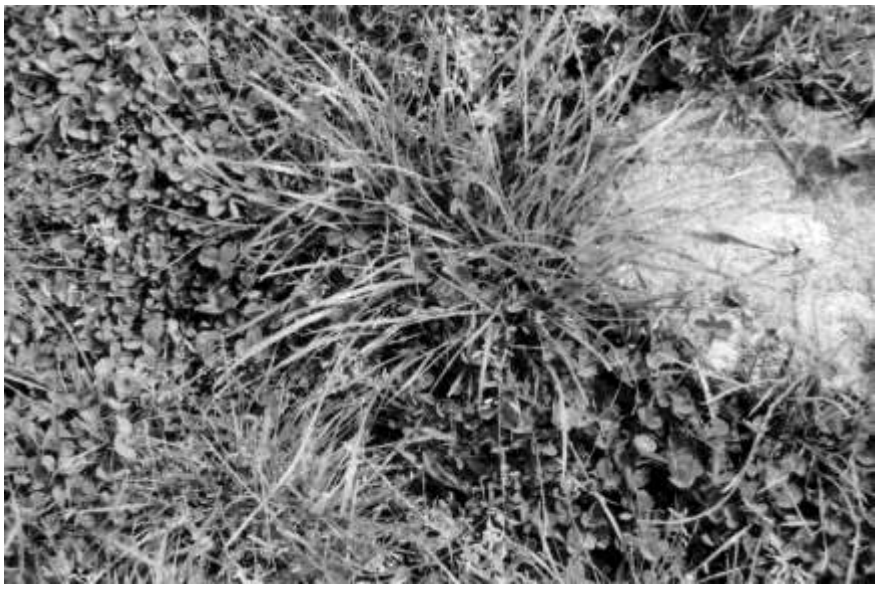
The following are some poor management practices and their probable pasture symptoms:

- **Undergrazing** (not grazing down to 4 to 5 cm):

- Too much stubble, dead material.
- Fog grass can indicate undergrazing, particularly if undergrazed in spring because the pasture was conserved as hay.
- Bent grass.

- **Overgrazing** (continually grazing at less than the 2-leaf stage or grazing harder than 4 cm):
  - Low ryegrass plant density.
  - Small leaves.
  - Weed invasion.
- **Too much soil moisture** or poor drainage:
  - Paspalum, water couch, umbrella sedge (nutgrass), rushes, probably in that increasing order of severity of waterlogging.
- **Too little soil moisture:**
  - Paspalum, prairie grass, cocksfoot.
- **Low soil fertility**:
  - Small leaves generally, with large leaves in **old manure** patches, may show a need for **phosphorus** (see Figure 8-8).

Figure 8-8: A manure patch showing larger leaves in the patch



  - Small leaves generally, with large leaves in **old urine** patches, may show a need for **potassium**. Urine patches are usually much larger than manure patches (see Figure 8-9).

Figure 8-9: Urine patch showing larger leaves in the patch

- Yellow leaves, show a need for nitrogen.
- Bent grass, flat weeds such as catsear, plantain and white daisy, sweet scented vernal, and meadow foxtail, indicate a lack of fertility generally, often potassium.

8.5 Assessing pasture composition

To graze to suit the major species, you need to judge pasture composition, to decide if it is largely ryegrass and clover, or dominated by some other species.

To assess composition:

- You need to know the different pasture species.
- You could observe carefully what is present and make a judgment.
- Or, a more accurate method is to:
  - Throw a biro into the pasture, say twenty times.
  - Record which species the biro tip actually touches.
  - Calculate the proportions of different species, based on the proportion of each species touched by the biro tip.
  - Be careful you don't lose the biro.

8.6 Assessing pasture canopy closure

It is best to graze earlier than 3-leaf stage if canopy closure has occurred. Canopy closure means the pasture has become thick and high enough to be shading the lower leaves. This can be seen by:

- Parting the pasture with your hands and observing whether the leaf that grew first after the previous grazing is yellowing.

8.7 Summary

To help with grazing and feeding the cows you need to assess:

- The **leaf stage** prior to grazing.
- Pasture **quantity**.
- Pasture **quality**.
- Pasture **composition**.

9. Grazing practice

Learning outcomes:

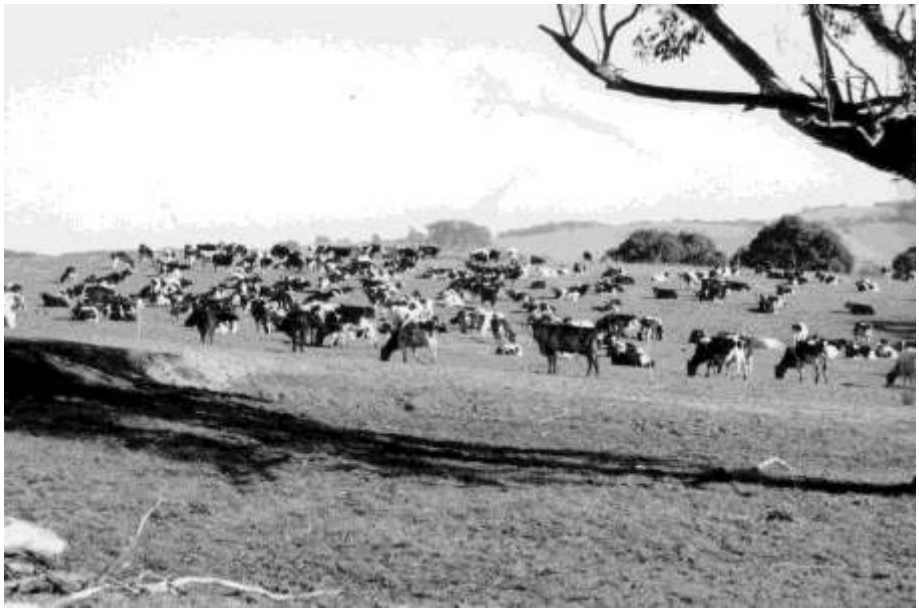
This chapter will help you to:

- Decide on a suitable rotation length to achieve the target pre-graze point.
- Choose the best paddock to graze and where to put the strip fence.
- Graze to a target post-graze point.
- Work out how much pasture the cows are getting.

To put good grazing management theory into practice, you need to:

- Decide on the grazing **rotation length** to achieve the target pre-graze point.
- Calculate the **24-hour allocation** from the total grazing area.
- Choose the next **best paddock** to graze.
- Determine the **number of feeds** the cows can get from that paddock, usually adjusting the 24-hour allocation a bit to suit that paddock.
- **Place the strip fence** to avoid backgrazing and to ensure water for the cows.
- **Graze to the target post-graze** point, by providing the appropriate quantity of supplement, or by reducing the total grazing area.
- Calculate **how much pasture the cows are getting.**

Figure 9-1: Cows grazing their allocated area



9.1 Decide on the rotation length

In Chapter 7, we recommended the leaf-stage method to set the target pre-graze point. To achieve this target a particular number of days grazing rotation, or paddock spell time, is needed. In practice:

- The rotation length needs to be **monitored and changed gradually, almost continually**, as the seasonal conditions change, because:
  - This will keep the pasture at its optimum, more of the time.
  - The cows' diet changes will then be gradual.
  - If you make large and abrupt changes, they may be an over-reaction.
- **Check paddocks prior to grazing them, to see if there are more or less than 3 leaves**:
  - If it is 3, probably stay on the same rotation.
  - If is less than 3, consider lengthening (slowing) the rotation.
  - If it is more than 3, consider shortening (speeding up) the rotation.
- The rotation length decision needs to **consider what might happen to leaf appearance in the next few weeks**, so that you are always offering cows pasture that is at the desired leaf stage. Considering the future can be done by:
  - Having an idea of typical leaf appearance rates for the next period of time.
  - Considering changes in growing conditions, particularly temperature, that will most likely occur in the next period.

You could use Figure 9-2 to record and average the leaf stage of 10 tillers and then calculate the past leaf appearance interval and set your new rotation length.

Figure 9-2: Leaf appearance interval and rotation

Tiller:	1	2	3	4	5	6	7	8	9	10
Leaf stage (leaves since grazing)										

A	(Avg the 10 tillers above)	Average leaf stage in paddock		leaves	
B		Days since paddock grazed		days	(ie. current rotation length)
C=B/ A		∴ Past average leaf appearance interval		days	
D		Your target pre-graze leaf stage		leaves	
E=CxD		Grazing rot'n length needed to get your leaf stage target		days	
F		Anticipated LAI for next leaf		days	
G=DxF		New target rotation length		days	

In the middle of winter, 1 leaf may take 30 days to appear, so you might think a 90-day rotation is necessary in winter, that is, 3 leaves will need 90 days. But **3 leaves rarely need more than 45 to 50 days to regrow** because only one of them requires 30 days, while growing in the depth of winter, and the other two will appear quicker, growing either before or after the very coldest period.

Figure 9-3 is a seasonal guide to rotation length and shows some issues to keep in mind as you are adjusting rotation length.

Figure 9-3: A guide to forecasting the rotation length change

Current growing conditions	Typical days to get 3 leaves	What might happen soon?	So, how might rotation length change?
Early spring (August) Generally cool, but variable.	35	Get warmer. Leaf appearance quicker.	Shorter
Late spring (November) Warm Reproductive tillers dominating.	18	Get hotter. Leaf appearance about the same. But paspalum will be starting.	A bit shorter, especially on paspalum pastures.
Late summer (March) Still hot, but mornings getting cooler.	25 (irrigation) 40 (dryland)	Get cooler. Leaf appearance slower. Paspalum may stop suddenly.	Longer
Late autumn (May) Cool.	40	Get colder. Leaf appearance slower.	Longer

Shortening the grazing rotation length means the cows are offered more area per day. As far as feeding cows with pasture is concerned, shortening the rotation seems easy, because shorter leaf appearance interval is usually associated with higher growth rates, and therefore the cows are offered more pasture feed.

Lengthening the grazing rotation length is usually being done because growth rate is slowing, the cows are offered smaller areas per day, and they are therefore being fed less pasture.

When lengthening the rotation, you could:

- Simply suffer the lower cow feed intake and milk production for the longer-term benefit of the better pasture growth, once the longer rotation is established.
- Maintain the cows' total feed intake by supplying more supplement while the lengthening process is occurring. Although the supplementary feed increases costs, this is probably the better alternative:

- Cow milk production will be maintained at a higher level both during the rotation lengthening process and when the longer rotation is established.
- The pasture is not grazed below the target post-graze point, thus maintaining long term pasture production and persistence.

9.2 Calculate the 24-hour allocation

If you want to rest a paddock between grazings for 20 days (that is, have a 20-day rotation length), you must allocate the cows only one twentieth of the **total grazing area** each day. So, once the rotation length has been decided, the area to be grazed for 24 hours can be determined by:

Total grazing area	divided by	Rotation length

For example, to calculate a 24-hour allocation on a 56-ha grazing area, with a 20-day rotation:

- Total area available for grazing: 56 ha
- Rotation length desired: 20 days
- Calculation 56 ÷ 20 = 2.8
- Therefore the cows should get: 2.8 ha for 24 hrs.

Care is needed to use the correct total area. The **total area available for grazing is not always the same**. It can vary due to:

- **Fodder conservation.** In spring, a part of the grazing area may be withheld from grazing (say 19 hectares) for a while to make hay or silage. You would then have only 37 hectare available. With the same rotation length as the previous calculation (20 days), the 24-hour allocation would then be only 1.8 hectares (37 ha ÷ 20). After the 19 hectares has been harvested, it will come back into the total grazing area. A method to decide on the area to conserve will be discussed later.
- **Pasture renovation**, which can cause an area to be unavailable for grazing for maybe two months.

9.3 Choose the next best paddock to graze

Once the 24-hour allocation is calculated, you need to choose the paddock to graze. There are many factors that affect **which paddock should be grazed next**:

- The **most important factor is leaf stage**. Try to graze the paddock that is closest to the target leaves regrown (2 to 3) since the previous grazing.

- On irrigation farms, sometimes the paddock with the target leaf stage is **wet from irrigation**. Cows do not like grazing wet or damp pasture, and there is a risk of poor utilisation and pugging the ground, causing long-term pasture damage. It is best to postpone grazing this paddock until dry, usually only one or two days later.
- On all farms, **all paddocks could be very soft** due to wet weather.
  - It is very important to remove cows from very wet soils to avoid poor utilisation of pasture at that grazing; short-term reduction of regrowth; long-term reduction in regrowth due to bare areas and weed invasion; soil structural damage, causing poor water infiltration and holding and reduced plant root movement; and cow production, health and welfare problems.
  - It is best to hold to the next best leaf stage and the correct number of feeds per paddock. Allow only about three hours of grazing, then take the cows out to a stand-off area. About 80% of the feed will be eaten, the rotation length will be maintained, and the longer grass will tend to keep the cows' feet from sinking into the wet soil. Trying to avoid pugging damage by allocating a larger area to spread the cows out does not reduce damage; it simply makes it less concentrated and less visible.
- Any paddock chosen for **hay or silage** will not be grazed for a period.
- You may want to **direct drill new pasture** into a paddock. Grazing that paddock before it is ready (that is, before the 2- to 3-leaf stage) will probably remove more stubble, and set back the existing plants. Both will ensure the new seedlings will have a better chance to compete.
- Some of the farm in summer may be **paspalum dominant** and some ryegrass dominant. Ideally, use two different rotation lengths, one for the ryegrass portion of the farm and a shorter rotation for the paspalum portion. This means in summer the next best paddock to graze will more often be a paspalum one.
- Sometimes in very hot weather you might choose a paddock that has better **shade, or water supply**.
- If you have **fodder crops** (turnips, oats, millet, etc.) ready for grazing, they need to be fitted into the rotation.

For whatever reason you have to miss a paddock, the overriding principle is the next best paddock is the one at your target leaf stage.

9.4 Calculate the feeds per paddock

After calculating the 24-hour allocation and choosing the particular paddock for the day, the **next step** is to **calculate the number of feeds** you will get from that paddock. Most dairy farmers give the cows a new area to graze after each milking, so there are two feeds per day. Thus, the area you have calculated for the 24 allocation is divided by two and the resulting 12 hour area is divided into the paddock size to get the number of feeds from the paddock. Figure 9-4 shows an example.

Obviously, knowing your paddock sizes is critical for this calculation.

Figure 9-4: Calculating the number of feeds in various size paddocks

Total grazing area for next rotation (ha)	Rotation length required (days)	Average 24-hour allocation (ha)	Area for each feed (assuming two feeds per day) (ha)	Paddock size (ha)	No. of feeds in paddock
A	**B**	**C = A ÷ B**	**D = C ÷ 2**	**E**	**F = E ÷ D**
56	25	2.2	1.1	2	1.8
				3	2.7
				4	3.6
				5	4.5

It is often **difficult to provide <u>exactly</u> the calculated 24-hour allocation;** and it is even better if you don't, for the following reasons:

- Paddocks **vary in size**, and it is unlikely that they will fit one, two, three, or more, 24-hour allocations neatly. Figure 9-4 shows that the number of feeds in the different example paddocks is 1.8, 2.7, 3.6, or 4.5, that is, never a neat whole number. You could cope with this by moving the cows more often into another paddock, say at midday. Or you could give the cows part of one paddock and part of another (easier if paddocks are connected by a gateway). However, the two paddocks ready to graze are not always connected; and most farmers prefer to give the cows a new area only twice per 24 hours, that is after each milking.

- Paddocks have varying growth rates (mostly due to pasture composition, soil moisture and fertility differences) and therefore have **varying quantities of feed** in them when ready to graze. For example, if you have a paddock with more pasture per hectare than average and you have calculated the number of feeds as 1.5, it would be best to adjust up to 2 feeds per paddock for that paddock.
- Paddocks vary in **quality of pasture.** For example, if you have a paddock that has more lower-quality species (such as paspalum or sweet vernal), higher levels of stubble left from previous grazings, or more clumps, and you have calculated the number of feeds as 1.5, it would be best to adjust down to 1 feed per paddock for this paddock. This will maintain the cows' intake of quality pasture. However, the poor quality pasture in that paddock remains a problem.
- It might be convenient to factor in the **next change in rotation length** early. If you anticipate a shortening of rotation length soon and you come to a paddock where it is convenient to allocate a bit more than the current 24-hour allocation, then do so. Vice versa, if you anticipate a lengthening of rotation length soon and you come to a paddock where it is convenient to allocate a bit less than the current 24-hour allocation, then do so.
- **Night and day** feeds. Normally, cows eat more during the daytime, so need more feed allocated. On hot days, the reverse could be the case. Therefore, be inclined to adjust to less feeds per paddock if only for a day-time feed, and vice versa for a night-time feed.

So, when the number of feeds in a paddock is not quite a round number, you adjust up or down, considering the factors above. Figure 9-5 shows this adjusting, with the calculated number of feeds in brackets and the adjusted number of feeds in bold.

Figure 9-5: Adjusting the number of feeds in different paddocks

Grazing area (ha) (A)	Rotation length (days) (B)	24 hr allocation (ha) (C=A÷B)	Area for each feed, assuming 2 feeds per day (D=C÷2)	No. of feeds in paddock (E=paddock size÷D) (calculated) – **adjusted**			
				2-ha paddock	3-ha paddock	4-ha paddock	5-ha paddock
56	25	2.2	1.1	(1.8)– **2**	(2.7) – **3**	(3.6) – **4**	(4.5) – **4**
56	30	1.9	1.0	(2) – **2**	(3) – **3**	(4) – **4**	(5) – **5**
56	37	1.5	0.8	(2.5)– **3**	(3.8) – **4**	(5) – **5**	(6.3) – **6**

To ensure that the rotation length that you desire actually occurs, you must **adjust equal number of paddocks up, as down**.

When adjusting feeds per paddock, the **most important and advantageous factor to consider is pasture quantity** in that paddock. If you do this, you get the following three major benefits:

- The cows will maintain a more **constant offer and intake of pasture each day**, so they will require the same intake of supplement. This avoids the need for constant supplement adjustment and, more importantly, ensures more efficient rumen function and feed use.
- **All paddocks** on the farm are more likely to be **grazed down to the same, and target, post-graze point**, with all the associated long-term pasture benefits.
- You can adjust supplement quantity and watch for the effect on post-graze point and milk production, knowing that it is mostly only the supplement causing these two to change and not the varying of pasture quantity on offer. You are then **more likely to find the most profitable level of supplement use**.

So, when you come to a paddock that has:

- **Above average quantity** (and/ or quality) per hectare in it, **get slightly more feeds** out of it than you would calculate on average.
- **Below average quantity** (and/ or quality) per hectare in it, **get slightly less feeds** out of it than you would calculate on average.

Figure 9-6 shows some information, and the 16 paddocks, of an example farm. The paddocks vary in size from 2 to 5 hectares, and the feeds per paddock have been decided. The desired rotation length is 25 days. If two feeds are needed per day (for simplicity in this example equal areas are given after each milking), 50 feeds are needed. Some of the paddocks are adjusted up, some down, but if you add up all the feeds, you will see they total 50.

Figure 9-6: A sample farm with feeds per paddock calculated and adjusted

Grazing area:	56	hectares
Rotation length:	25	days
24-hr allocation rate:	2.2	hectares/ day
Area offered per feed (two feeds per day):	1.1	hectares/ feed
Number of feeds required for rotation:	50	feeds

Calc feeds/ pdk:	**2 ha:**	**Paddock A** 2 ÷ 1.1 = 1.8	**Paddock B** 2÷ 1.1 = 1.8	**Paddock C** 2÷ 1.1 = 1.8	**Paddock D** 2÷ 1.1 = 1.8
Quantity-qlty/ ha:		Above average	Average	Below average	Below average
Adjusted feeds/ pdk:		**2**	**2**	**1**	**2**
Calc feeds/ pdk:	**3 ha:**	**Paddock E** 3÷ 1.1 = 2.7	**Paddock F** 3÷ 1.1 = 2.7	**Paddock G** 3÷ 1.1 = 2.7	**Paddock H** 3÷ 1.1 = 2.7
Quantity-qlty/ ha:		Above average	Average	Below average	Below average
Adjusted feeds/ pdk:		**3**	**3**	**2**	**2**
Calc feeds/ pdk:	**4 ha:**	**Paddock I** 4÷ 1.1 = 3.6	**Paddock J** 4÷ 1.1 = 3.6	**Paddock K** 4÷ 1.1 = 3.6	**Paddock L** 4÷ 1.1 = 3.6
Quantity-qlty/ ha:		Above average	Average	Below average	Above average
Adjusted feeds/ pdk:		**4**	**4**	**3**	**4**
Calc feeds/ pdk:	**5 ha:**	**Paddock M** 5÷ 1.1 = 4.5	**Paddock N** 5÷ 1.1 = 4.5	**Paddock O** 5÷ 1.1 = 4.5	**Paddock P** 5÷ 1.1 = 4.5
Quantity-qlty/ ha		Above average	Average	Below average	Above average
Adjusted feeds/ pdk:		**5**	**4**	**4**	**5**

Figure 9-7 shows the same example farm, but this time allowing for the two-thirds day and one-third night allocation. The method uses three feeds per day, two being fed during the day time and one at night. Thus, the area offered per feed is reduced to 0.73 hectares. Three times the required rotation length of 25 days means 75 feeds are needed. The above-average paddocks are adjusted up, the below down, but if you add up all the feeds, you will see they total 75.

Figure 9-7: A sample farm, with feeds per paddock calculated, adjusted and allowing for different day and night feeds

Grazing area:	56	hectares
Rotation length:	25	days
24 hr allocation rate:	2.2	hectares/ day
Area offered per feed (3 feeds per day):	0.73	hectares/ feed
Day time feed (2 feeds):	1.46	hectares
Night time feed (1 feed):	0.73	hectares
Number of feeds required for rotation:	75	feeds

		Paddock A	**Paddock B**	**Paddock C**	**Paddock D**
Calc feeds/ pdk:		2 ÷ 0.73 = 2.7	2÷ 0.73 = 2.7	2÷ 0.73 = 2.7	2÷ 0.73 = 2.7
Quantity-qlty/ ha:	**2 ha:**	Above average	Average	Below average	Below average
Adjusted feeds/ pdk:		**3**	**3**	**2**	**2**
		Paddock E	**Paddock F**	**Paddock G**	**Paddock H**
Calc feeds/ pdk:	**3 ha:**	3÷ 0.73 = 4.1	3÷ 0.73 = 4.1	3÷ 0.73 = 4.1	3÷ 0.73 = 4.1
Quantity-qlty/ ha:		Above average	Average	Below average	Below average
Adjusted feeds/ pdk:		**4**	**4**	**4**	**4**
		Paddock I	**Paddock J**	**Paddock K**	**Paddock L**
Calc feeds/ pdk:	**4 ha:**	4÷ 0.73 = 5.5	4÷ 0.73 = 5.5	4÷ 0.73 = 5.5	4÷ 0.73 = 5.5
Quantity-qlty/ ha:		Above average	Average	Below average	Above average
Adjusted feeds/ pdk:		**6**	**5**	**5**	**6**
		Paddock M	**Paddock N**	**Paddock O**	**Paddock P**
Calc feeds/ pdk:	**5 ha:**	5÷ 0.73 = 6.8	5÷ 0.73 = 6.8	5÷ 0.73 = 6.8	5÷ 0.73 = 6.8
Quantity-qlty/ ha		Above average	Average	Below average	Above average
Adjusted feeds/ pdk:		**7**	**7**	**6**	**7**

Although adjusting the 24-hour allocation is advisable for a particular paddock, in the long term you should feed only the amount of pasture that is growing on average. If you continually feed off less or more than growth, you will not be achieving the ideal pre- and post-graze targets.

- If you are on the correct rotation and the cows are not grazing down to the target post-graze point in most paddocks, the only three alternatives (if you want to maintain growth rates and minimise waste) are to feed less supplement, to reduce the total area of the farm being grazed (by cutting silage), or to graze more cows.

- If you are on the correct rotation and the cows are grazing harder than the target post-graze point in most paddocks, firstly consider whether past management of soil moisture, soil fertility, or pasture composition could have grown more. In any case, until past management errors can be corrected, the only three alternatives (if you want to maintain growth rates and minimise waste) are to feed more supplements, to increase the total area of the farm being grazed (perhaps by bringing in paddocks that have been cut for silage), or to graze fewer cows.
- **If you are on the correct rotation, stay on it.** If pasture surpluses or deficits occur, use varying levels of fodder conservation or supplement feeding to manage them.

9.5 Place the strip fence

When you know how many feeds you want from a paddock and how often you would like to shift the cows, you then decide where to place the temporary electric fence, if needed.

Figure 9-8: A strip fence in position

You will need a minimum of four electric fence reels and post sets.

Place strip fences to ensure:

- That the cows **cannot backgraze** areas. To cope with big paddocks, consider a temporary side lane.

- That cows have **access to drinking water**. This can be difficult in large paddocks if the water trough is not near the gate. If the trough is near the gate in a paddock that needs say 6 feeds, to avoid backgrazing, you could consider fanning two strip fences across the paddock, pivoting at the gate or trough.
- That the extra feed need for the **daytime compared to night time** is allowed for.

If small paddocks are next to each other simply join the two with a gate and think of them as one.

9.6 Graze to the target post-graze point

The target post-graze point is about 4 to 5 cm height, with one-quarter to one-third of the area covered with clumps not higher than 8 to 10 cm, no more, no less. The **post-graze target can be achieved** no matter how many cows are allocated to whatever area, by providing the **appropriate quantity of supplement**, whether it be forage or concentrate:

- If the post-graze point is **below 4 to 5 cm, provide more supplement,** so the cows leave more pasture. Substitution is then working for you, increasing your profitability.
- If the post-graze point is **above 4 to 5 cm, provide less supplement**, so the cows leave more pasture. Don't let substitution work against you, reducing your profitability.
- If the post-graze point is **still above 4 to 5 cm, when no supplements** are being fed, reduce the total area being grazed by **conserving some silage**. Your number of feeds per paddock in the paddocks still available for grazing will increase, so the cows will graze harder.

When the fertility (and soil moisture) is the same over the whole paddock, the paddock grows more evenly, rather than good growth only in the urine and manure patches, with nothing much in between. The cows then graze the paddock more evenly and this makes the post-graze point easier to assess.

Sometimes you will not achieve your post-graze target, and graze too hard:

- If you happen to **graze too hard,** there is nothing you can do except **wait for it to grow back**, probably at a slower rate than you might like. Grazing too hard is not such a problem, if (and this is an important "if") the pasture was at 2 or 3 leaves at the pre-graze point; because it will still grow back well.

Sometimes you will not achieve your post-graze target, and graze too lightly:

- If you happen to **graze too lightly** and you are not prepared to return the cows to the paddock immediately to clean it up, you can **"top" the paddock** down to the required point with a mower. The word "topping" is not really appropriate. It should be "bottoming", because the mower height should be set to cut very low, at 4 to 5 cm. The mower blades should be kept sharp to ensure a clean cut. If the effort, time, fuel, and machinery wear and tear is going to be expended, it is a waste to top any higher than say 5 cm. **Topping** needs to be done **soon after grazing** to avoid removing any of the emerging "stored-sugar grown" first leaf.
- Stock that do not require a high level of feeding (and this is probably only dry cows that are already in adequate body condition) can be used to get the paddock down to the required post-graze point after the milkers. This is cheaper than topping, but you need enough animals are needed to do the job quickly to avoid backgrazing.

Some farmers **top before** the cows graze the paddock. Topping before grazing:

- May get the cows to **eat more of the feed** available because it is wilted and because it is easier for them to harvest; they stand still, downing huge mouthfuls!
- May get the cows to eat more, but they cannot select, so you may be forcing them to **eat poorer quality feed**.
- Might result in **windrows of uneaten grass all over the paddock**, if the cows are not familiar with grazing like this or you misjudge the amount of feed on offer. If you are mowing a lot of clumps and stubble, you will be offering a lot of poor quality, so it cannot all be eaten.
- May **reduce the over-hard grazing between the clumps**, because if already mown to 5 cm, the cows are less likely to touch those areas.
- Requires **more planning** to do. If it rains on topped pasture, it may become very unpalatable.
- Avoids the fresh **manure splattering** on you or your tractor when you top after grazing, although in wet weather, the manure from the previous grazing may still be moist.

9.7 How much pasture are the cows getting?

Having given the cows a certain number of feeds in a paddock, you can now calculate how much **pasture the cows are likely to get**. Figure 9-9 does this for each month of the year, for an example farm.

In column D, you need to know how much pasture feed is on offer per hectare. For example if your pre-graze point is 2,200 kilograms of dry matter per hectare and your post-graze point is 1,300, the pasture on offer is 900 kilograms of dry matter per hectare.

Figure 9-9: An example of pasture offered to cows in different months

	A	B	C (A÷B)	D	E (C × D)	F	G (E ÷ F)
	Total grazing area (ha)	Rotation length (days)	24-hour allocation (ha)	Pasture on offer per ha (kg DM/ ha)	24-hour pasture offered (kg DM)	Number of milkers	Pasture offered per cow each day (kg DM)
January	56	19	2.9	850	2,465	200	12.3
February	56	20	2.8	800	2,240	200	11.2
March	56	24	2.3	800	1,840	200	9.2
April	56	28	2.0	800	1,600	200	8.0
May	56	35	1.6	800	1,280	200	6.4
June	56	45	1.2	800	960	150	6.4
July	56	50	1.1	750	825	100	8.3
August	56	45	1.2	850	1,020	150	6.8
September	56	22	2.5	1,000	2,500	200	12.5
October	45	18	2.5	1,100	2,750	200	13.8
November	56	21	2.7	900	2,430	200	12.2
December	56	20	2.8	900	2,520	200	12.6

Figure 9-10: How much pasture are these cows getting from their allocation?

9.8 Summary

Once you have set your target pre-graze point, post-graze point and shift time, the following steps will achieve them:

- Decide on the **rotation length**.
- Calculate the **24-hour allocation**.
- Choose the **next best paddock** to graze.
- Calculate the **number of feeds** per paddock.
- Place the **strip fence**.
- Graze to the **target post-graze** point.

And you can then work out how much pasture the cows are likely to get.