HIDDEN DOLLARS IN GRAZING MANAGEMENT: GETTING THE MOST PROFIT FROM YOUR PASTURES

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Outline

- There is a wealth of solid scientific information which describes how perennial ryegrass grows. This information has been used to develop principles and practices for the grazing management of dairy pastures which have stood the test of time.
- Farmers can use this information to challenge any claims that the principles and practices don't work.
- Information from case study farms indicates that farmers are achieving optimal practice for the post-grazing residual and the timing of grazing during regrowth at less than 50% of grazing events.
- We use the science information to show that farmers could be foregoing $600/ha per year or more in operating profit as a result.
- 'Perfect' practice may not be achieved at all grazing events, but there is a lot of room for improvement.
- Barriers to improvement include a failure to recognise the financial impact of good grazing management decisions on a daily basis, time cost of collecting paddock pasture cover information, data-intensive decision tools, low confidence in decision tools, farm infrastructure including paddock number and size which compromises pasture allocation, and poor decision making with supplement feeding in order to optimise round length and post-grazing residuals.

Introduction

Pasture that is grazed directly by dairy cows is the bed-rock of the New Zealand dairy industry. Growing more grass and using it efficiently will increase operating profit on New Zealand dairy farms. Recent challenges to farm businesses with regard to the environment and the continued risk from milk price volatility bring a need to sharpen the focus on pasture growth and utilisation. However, there is continuing debate in the industry about how best to manage grazing of dairy pastures.

To help resolve this debate, it is useful to consider the underlying principles of pasture growth and the effects of grazing on growth and pasture yield. There is a wealth of solid research information for perennial ryegrass pastures, stretching back 60 years, which gives us a great foundation for doing so. Revisiting this information helps to put different arguments about what is 'best' grazing management in context. It also reveals how easily some operating profit can slip away if grazing management practices are not applied correctly. It is difficult for farmers to see this slippage happening, which means it is hard to identify and correct the cause(s). This paper describes the tried-and-true principles of pasture regrowth and uses data from case study farms to shine a spotlight on the 'hidden dollars' that can be recovered by sharpening grazing management practices.

Energy from sunlight: the primary food for plants

The starting point for understanding plant growth and pasture yield is light interception. Light energy is captured by leaves to drive photosynthesis which produces the carbon compounds (mainly soluble carbohydrates, cellulose, hemicellulose, and lignins) that form the metabolic machinery plus the structural backbone of the grass plant. In this sense, we can view light as the basic food stuff of plants. All organisms need food to supply energy; when food is in short supply, plants (and animals for that matter) respond in ways that increase their chances of getting more food. For grass plants, this is all about leaf production, particularly placing as much new leaf as possible into sunlight to capture more light energy.

Pasture yield was first related to light interception back in the 1950s (Brougham, 1956, 1957). This work showed that when the pasture canopy intercepts about 95% of the available light, then the mass of the pasture does not increase any further (called 'ceiling yield'). In the 1970s and 1980s, researchers in the UK took this a step further by working out how mass flows through plants and the canopy as pastures regrow from a post-grazing residual up to ceiling yield (Bircham and Hodgson 1983; Parsons et al. 1988). What this work uncovered is fundamental to the way we now manage pastures.

The pasture regrowth curve

The starting point for setting up an efficient grazing management system is the pasture regrowth curve. Pasture regrowth is a result of each grass tiller producing new leaves to replace leaves that were removed by grazing or cutting. Ryegrass is often termed a 'three leaf' plant because it generally sustains a maximum of three live leaves on a tiller at any point (Davies 1993). So, after grazing, once the third new leaf has been produced (which is called the 'three leaf' stage), the first leaf which was produced immediately after grazing will start to die. The sequence of new leaf production and the death of older leaves is fundamental to the overall regrowth process. When the mass of old leaves that is dying and disappearing from the bottom of the pasture is equal to the mass of the new leaf being produced at the top of the pasture, the total pasture mass will level off. This is called 'ceiling yield'. Pastures are still growing new leaves at this point, but the amount of new leaf being produced is cancelled out by the rate of leaf death: hence the <u>net</u> rate of pasture growth is zero. This will generally occur at, or after, three new leaves have been produced, unless the post-grazing residual was very high, in which case it might occur earlier.

Figure 1 shows three regrowth curves for perennial ryegrass pastures at Lincoln, Canterbury, which were mown to a residual height of 5, 8 and 11 clicks respectively on the rising plate meter (RPM). The

RPM was calibrated using equations that were generated each week in the P21 farmlets at Lincoln, which were adjacent to the mown plots. From these calibrations, the pasture mass left after mowing was calculated to be equivalent to 1150, 1500 and 1850 kg DM/ha. Before mowing, the pasture had been grazed as per 'normal' farm practice: about 10-12 grazings per year, to a post-grazing residual between 7 and 9 clicks. Therefore, the three starting residuals represent overgrazing (5 clicks – hereafter called the 'low' treatment), typical grazing (8 clicks – 'medium'), or under-grazing (11 clicks – 'high') compared with the past grazing practices. The pastures were allowed to regrow for 45 days. At least once per week during regrowth, the following measurements were collected:

- pasture mass, using the RPM which was calibrated using equations from weekly calibration cuts
- light interception using a hand-held ceptometer which measures the difference between the amount of light at the top of the pasture canopy and the amount of light reaching the base of the pasture
- leaf stage, by counting the number of new leaves that had emerged on tillers since defoliation.

Light interception (%)					
Low	18	48	77	90	97
Medium	57	82	95	99	100
High	77	89	97	99	100

Leaf stage:	0	1.0	2.0	3.0

Figure 1. A single example, from Canterbury, of the regrowth of perennial ryegrass pasture following mowing to 1150 (low, triangles), 1500 (medium, squares) or 1850 (high, circles) kg DM/ha as measured using a rising plate meter. Regrowth commenced on 28th March. Light interception and timing of the full emergence of the first, second and third new leaves after defoliation are shown below the x-axis.

In addition, part of the pasture was harvested to ground level on two occasions (after 18 and 38 days). A sub-sample of the herbage collected was dissected into grass leaf, white clover, and dead material, and each fraction was dried and weighted so that the percentage contribution of each to total pasture mass could be calculated.

This was not a fully replicated experiment. It just compared one area representing each treatment for one extended regrowth cycle in autumn, after mowing (not grazing). However, the results align very well with the principles from the earlier research described above, so it provides a 'real' illustration of the processes that are happening in the interval between one defoliation and the next.

The regrowth curves: leaf emergence

In Figure 1, the point at which the first, second and third new leaf had fully expanded is shown along the bottom (1.0, 2.0 and 3.0 leaf stage, respectively). The rate of leaf emergence was constant throughout the study: the leaf appearance interval was 15 days. There was no difference between the treatments in the rate of leaf emergence, which is consistent with what we know about ryegrass growth: unless grazing/cutting is extremely severe, the rate at which new leaves is produced is not affected, but the size (length, and weight) of new leaves can be reduced by severe defoliation. However, leaf emergence is strongly affected by temperature and soil moisture: it is faster at higher temperatures (for example, 18-20^{o}C compared to 8-10^{o}C) and when there is plenty of soil water available, compared with dry or drought-affected soils (Rawnsley et al. 2010). Hence leaf emergence will vary seasonally, and from year-to-year, depending on climate, but it is unlikely to be affected much by the range in post-grazing residuals seen on New Zealand dairy farms.

The regrowth curves: pasture mass in the 'medium' and 'high' treatments

Figure 1 shows that, after cutting, the pasture regrew quite quickly from the medium and high treatments and continued to accumulate before levelling off at between 3000 and 3500 kg DM/ha at the end of the regrowth period. At this point, virtually all of the light available was intercepted by the pasture canopy (as shown by the numbers for light interception along the bottom of Figure 1). The ceiling yield in this case was, therefore, about 3500 kg DM/ha. After the ceiling yield was reached, pasture mass started to decline slightly in the high treatment. This was because more length was left on the partially defoliated leaves after mowing and, since these were the first leaves to die once the third new leaf started to emerge, more mass was lost to death and decay. In the high treatment, dead matter comprised 30% of the total pasture after 18 days regrowth, whereas it was only 12% of total mass in the medium treatment (and 2% in the low treatment). By the end of the regrowth period, it appears that the rate of leaf death and decay was greater than the rate of new leaf production in the high treatment, so total pasture mass fell. The accumulation of more dead material would also have negatively affected the nutritive value of the pasture in the high treatment compared with the medium treatment, which would have a flow-on effect on animal production.

The regrowth curves: pasture mass in the 'low' treatment

Compared with the medium and high treatments, regrowth in the low treatment was relatively slow for the first 15 days, after which it picked up before showing signs of levelling off at the end of the regrowth period (Figure 1). The 'lag' in regrowth in this treatment corresponded with the time during which the first new leaf was emerging. Since all leaves were produced with a similar leaf appearance interval, this indicates that this first leaf was a lot smaller than the first new leaf produced in the medium and high treatments.

This is explained by the fact that, in the low treatment, most of the leaf that was present before mowing was removed, leaving very little leaf to capture the primary food source for the plant – light energy. This is confirmed by the numbers for light interception shown along the bottom of Figure 1; after the first seven days of regrowth, only 18% of total light was intercepted by the pasture in the low treatment, whereas in the medium and high treatments, 57-77% of light was being intercepted. Hence, in the low treatment, ryegrass plants had relatively little energy to 'spend' on growing their first new leaf, and therefore its size was restricted. However, once grown, the first leaf added more energy to the plant, so there was more to spend on the next leaf, so it was larger, and this pattern continued until plants had regained their full capacity to intercept light and capture energy – explaining the increase in growth rate through the mid-part of the regrowth period in this treatment.

Hidden dollars?

Continuing with the example shown in Figure 1, the total net amount of pasture grown at the point when ceiling yield was reached in the medium and high treatments (about 38 days into regrowth) was 1465 kg DM/ha for the low treatment, 1800 kg DM/ha for the medium treatment, and 1555 kg DM/ha for the high treatment. Hence, the medium treatment grew an additional 335 and 245 kg DM/ha compared to the low and high treatments respectively. Using the Dairy NZ Forage Value Index figure for the economic value (EV) of additional pasture grown in autumn in Canterbury ($0.30 per kg DM, www.dairynzfvi.co.nz), the value of the pasture growth that was foregone in the low ('over-grazed') and high ('under-grazed') treatments respectively would have been around $100 and $74/ha respectively. This is the potential economic effect of *missing the target range for the optimum residual state of the pasture* of between 7 and 9 clicks on the RPM. This will obviously compound if the target is missed frequently; if the target is missed for half of the 10-12 grazings normally applied to paddocks on irrigated dairy farms in Canterbury, those values could be multiplied by 5 or 6.

How realistic are these estimates? Using cutting management applied to perennial ryegrass pastures from September to April, Lee et al. (2008) measured about 1.2 t DM/ha less pasture yield from pastures managed to a consistent residual of 1100 kg DM/ha compared to a consistent residual of 1500 kg DM/ha. This equates to around $360/ha lost operating profit, based on an EV of $0.30 per kg DM. When cut to a consistent residual of 2300 kg DM/ha, there was minimal effect on pasture yield. Garcia and Holmes (2005), in a grazing experiment in the Manawatu, observed a statistically significant 20% reduction in pasture growth from residuals of less than 1300 kg DM/ha compared to residuals of greater than 1500 kg DM/ha. Mean total annual pasture yields in their study were around 12 t DM/ha: hence a 20% reduction in yield equates to around 2.4 t DM/ha in lost feed production, or potentially $600/ha lost operating profit. Similar to Lee et al. (2008), Garcia and Holmes (2005) did not observe any negative effect on pasture yield from higher pasture residuals of up to 2300 kg DM/ha. Hence, the cost of under-grazing that emerges from the analysis of the regrowth curves in Figure 1 is not supported by these more-comprehensive studies. But negative effects of high residuals on pasture quality would be expected, which could seriously restrict the efficiency of pasture utilisation and animal production.

In summary, over-grazing pasture (to 6 clicks on the RPM, or below) on a regular basis could reduce operating profit by $300-$600/ha. Ensuring that post-grazing residuals are managed consistently in the range 7 to 9 clicks on the RPM (approximately 1500 to 1750 kg DM/ha) will enable plants to capture as much of their basic food, sunlight energy, as possible, and convert this into feed for cows.

Regrowth interval: when is the best time to graze again?

Parsons et al. (1988) showed clearly that, to maximise the amount of pasture harvested over each annual cycle, the optimum time to graze a pasture in its regrowth cycle is the point when the maximum average growth rate of the pasture is reached during regrowth. So what is "maximum average growth rate", and how can farmers estimate it?

The average growth rate during regrowth is the difference in pasture mass at any point in time during the regrowth minus the mass left at the start of regrowth (the residual), divided by the number of days since grazing. When the *maximum average growth rate* is reached, this indicates that the optimum balance between the amount of new leaf being produced, and the amount of old leaf dying, has also been reached. Going beyond this point means that leaf death increases and the efficiency of further increases in pasture mass is declining. It is this declining efficiency which defines the maximum average growth rate as the optimal point to graze the pasture again. In other words. maximising the average growth rate in a paddock will maximise the amount of leaf grown.

Figure 2 shows the average growth curves for the low, medium and high treatments that were plotted in Figure 1. It uses exactly the same data as Figure 1; the key difference is that the vertical axis in Figure 2 is in kg DM/ha per day, whereas in Figure 1 it is kg DM/ha. The arrows in Figure 2 indicate when maximum average growth rate is reached for each treatment. Two conclusions can be drawn from this:

1) the maximum average growth rate is reached first in the high treatment (about 18 days after mowing), then in the medium treatment (about 28 days after mowing), and last in the low treatment (44 days). This implies that, if all of the farm was left with a high residual of 2000 kg DM/ha, the optimum round length would be 18 days, whereas for systems leaving about 1600 kg DM/ha and 1200 g DM/ha, optimum round length would be about 28 and 44 days.

2) the growth rate achieved at the maximum is highest for the medium treatment (about 55 kg DM/ha per day on the vertical axis), lowest for the low treatment (about 41 kg DM/ha/day, though this may still have been increasing after 45 days) and intermediate for the high treatment (about 51 kg DM/ha/day). The low treatment can never catch up with the medium treatment because the lag in regrowth after defoliation means that precious time was used to produce the first, relatively small, leaf which then kick-started the faster growth rates through the middle part of the regrowth period. Once the first leaf is fully expanded, it cannot increase any further in size. So the growth lost in the early phase of the regrowth period cannot be clawed back. This is fundamentally a problem caused by over-grazing (residual pasture is too low/short). There is an important interaction here between the grazing residual and the length of the regrowth period; both of which can be controlled by

grazing management decisions. Nor can the high treatment catch up, because the processes of leaf death and decay are taking over and driving net growth rate down.

Figure 2. Average growth rate during regrowth for pastures mown to about 1150 (Low, dotted line), 1500 (Medium, dashed line) or 1850 (High, solid line) kg DM/ha as measured using a rising plate meter. Arrows indicate the point when the maximum average growth rate was reached during regrowth.

The high and medium treatments could yield the same amount of pasture if grazed again after 19 days since the two curves in Figure 2 join up at about this time. However, extending the regrowth period by another 8 - 10 days will lead to further increases in growth in the medium treatment, but not the high treatment. For the high treatment, this is fundamentally a problem of leaving a residual that is too high, leading to a reduction in maximum average growth rate and locking-in fast rotations.

So how can farmers know when the maximum average growth rate has been reached? As the nature of all of the curves shown in Figure 2 arises from the sequence of new leaf production shown in Figure 1, we can use leaf stage as an indicator (Fulkerson and Donaghy 2001). Maximum average growth rate roughly coincides with the point when the third leaf is produced after grazing (Parsons and Chapman 2000) – so monitoring leaf stage gives us a simple and effective way to track what is happening (Figure 3).

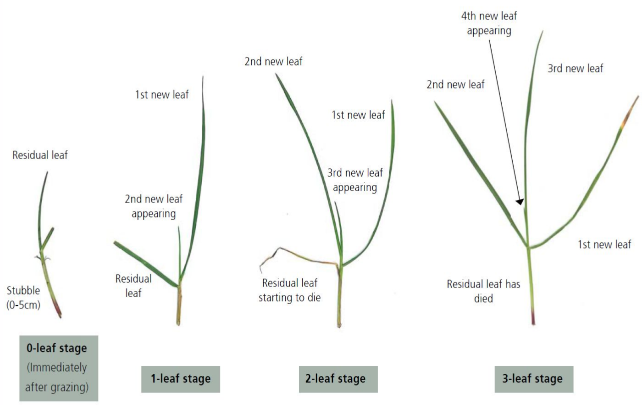

Figure 3. Leaf stages in perennial ryegrass. From Lee et al. (2011)

Hidden dollars?

When pasture regrows from a consistent residual of between 1500 and 1750 kg DM/ha, there is usually some curvature in the regrowth curve, reflecting an increase in mass of the successive leaves. The sigmoidal pattern is not as pronounced as for pastures defoliated to a lower residual (e.g. the regrowth curve for the low treatment in Figure 1), but it is still present. Using data from two years of a farmlet study, Chapman et al. (2012) calculated that the first, second and third leaves produced after defoliation contribute 25%, 35% and 40% respectively of the total available pasture mass at the next grazing. This implies that maximum average growth rate will occur when three leaves have been produced since the previous grazing.

While grazing at the two-leaf stage should not jeopardise pasture persistence, it will incur a small penalty in pasture harvest compared with grazing at the three-leaf stage, provided leaf death rates are not increased by other factors, such as heavy shading by a dense canopy of large leaves, or onset of moisture stress.

Table 1 shows the possible cost of erring toward a shorter round length (grazing at two leaves) compared to a longer round length (grazing at three leaves). It applies the 25:35:40 ratio seasonally (except for October-November, when reproductive growth is present and the difference in mass between successive leaves largely disappears (Chapman et al. 2012)), along with typical pasture growth rates and leaf appearance intervals for irrigated dairy pastures in Canterbury. It also uses the DairyNZ FVI seasonal economic values previously described. The analysis shows that, in February-March for example, if growth rates are 55 kg DM/ha per day, and the leaf appearance interval is 10 days, an additional 330 kg DM/ha could be harvested if pastures were grazed at the three-leaf stage compared with the two-leaf stage. With an EV of $0.25 per kg DM, the total value for the season of the additional DM grown on the longer rotation is estimated at $83. Across the full year, the analysis suggests around $260/ha additional profit could be achieved using a longer rotation, aligned with the three-leaf stage of regrowth.

Table 1. Estimated difference in economic value of pasture grown for a dairy farm in Canterbury where grazing occurs consistently at the two-leaf stage of regrowth compared to the three-leaf stage of regrowth. [1] From Chapman *et al*. (2012).

	Growth rate (kg DM/ha/d)	Leaf appearance interval	Contribution of 1st:2nd:3rd leaf to total DM (%) [1]	DM grown (kg/ha) when grazed at:			EV for season ($/per kg DM)	EV of the difference ($/ha)
				2-leaf	3-leaf	Difference		
Feb-Mar	55	10	25:35:40	2970	3300	330	0.25	$83
Apr-May	26	15	25:35:40	936	975	39	0.31	$12
Jun-Jul	0					0		$0
Aug-Sep	34	15	25:35:40	1224	1275	51	0.42	$21
Oct-Nov	95	7.5	30:35:35	7410	7552	142	0.29	$41
Dec-Jan	95	10	25:35:40	5130	5700	570	0.18	$103
Totals				***17670***	***18802***			***$260***

In summary, because of the nature of the regrowth processes in perennial ryegrass, faster rotations that result in grazing at closer to two leaves than three leaves could reduce operating profit by up to $260/ha per year. This is fundamentally a problem of missing the optimum time to graze – which can easily occur, given the difficulty of picking when pastures have reached the optimum. Leaf stage is a good indicator of the ‘readiness for grazing’ of a pasture, but there will be situations when grazing at the optimum point (assuming it can be picked reliably) is not possible, or is over-ridden by other system needs or targets.

Nonetheless, when combined with the previous analysis on the effects of missing the target for post-grazing residuals, achieving high precision and consistency in operational grazing decisions could return an additional $600/ha or more operating profit.

So, how well do farmers implement operational grazing decisions relative to post-grazing residual and leaf stage?

Implementing grazing management on farm

In 2012-13, DairyNZ and Massey University researchers followed grazing management decision-making and monitored pre- and post-grazing pasture state every two weeks on seven farms in the Manawatu region, and two farms in Canterbury. The study targeted farm businesses with varying levels of focus on managing pastures and grazing and, therefore, provides a good picture of how grazing is being implemented. Figure 4 summarises the results for the two key grazing control levers: post-grazing residuals, and the timing of grazing relative to the optimum as indicated by leaf stage. In the case of grazing residuals (Fig. 4A), Farms A, B, C and D achieved the optimum range of 7 - 9 clicks on the RPM for less than 50% of grazing events. Farms A and B tended to under-graze (50 - 60% of grazing events leaving > 9 clicks), while farms C and D tended to over-graze (35 - 40% of grazing events leaving < 7 clicks). Farms E, F and G hit the optimum post-grazing residual more frequently but, for farms E and F, it appears this was achieved by operating a fast rotation because grazing occurred at fewer than two leaves for 60 – 70% of grazing events (Figure 4B). Overall, the optimum timing of grazing was achieved less frequently than the optimum post-grazing residual: but, it appears that substantial gains could be made on all farms, along with substantial improvements in profitability.

A B

Figure 4. Percentage of paddocks on nine case study farms in Manawatu and Canterbury that were grazed to different residuals (graph A: open bars = < 7 clicks on rising plate meter, solid bars = 7-9 clicks, hatched bars = > 9 clicks), and grazed at different leaf stage (graph B: open bars = ≤ 2 leaf stage, solid bars = > 2 leaf and < 3 leaf, hatched bars = ≥ 3 leaf stage).

Barriers to implementing optimum management

There are multiple conflicting demands on operational management decision-making on dairy farms. There are also unpredictable and uncontrollable events, such as extremely wet weather causing waterlogging under pastures and restricting grazing time/efficiency, which can disrupt grazing plans. Hence, it is not surprising that grazing decisions are often sub-optimal, and it is unreasonable to expect targets will be hit on every occasion. Information on paddock-by-paddock pasture mass, including pre- and post-grazing mass, plus leaf stage monitoring, is necessary for making good decisions regarding round length, the area of pasture to allocate to the herd(s) each day, and the amount of supplement to feed to ensure post-grazing residuals are achieved. Collecting this information is time-consuming, and it is worthless unless it is used to make better decisions than would otherwise be the case.

Grazing decision support tools that are available for New Zealand dairy farmers are mostly data-hungry, and this can be a negative for farmers lacking the resources or skills to collect and process the information. Many farmers rely on visual assessments and intuitive decision-making. Several of the case study farms in Figure 4 fell into this category. Some of these farmers were happy with their current system, while others aspired to increasing their focus on grazing decisions but sought alternative decision tools to those currently available.

Having too many permanently-fenced paddocks will make it difficult to allocate the right amount of pasture each day and achieve the desired grazing residuals. Firstly, extra work is required to do a farm walk and enter all the paddock information into a feed wedge programme – which could be a major deterrent to doing a farm walk in the first place! Secondly, the amount of area required for a 24 hour grazing might often be, for example, more than in one paddock but less than in two. This will result in over- or under-grazing unless cows are moved as soon as the correct residual is achieved and leads to failure to manage supplement input and rotation length on these farms.

While there is no good research information on the effect of paddock number, it is likely that having any more than 30 permanent paddocks will cause problems, and the optimum may be about 20 paddocks which are sub-divided as required using electric fences. This is a situation where “less can be more”. However, most farms have unique features like uneven topography, existing track layout, or creeks and streams running through which limit how well the farm can be split up into different grazing areas, so it is impossible to be prescriptive about farm layout.

Bending the rules

On farm, the implementation of the grazing management principles outlined above can be compromised by the need to balance animal requirements and feed supply throughout the year. There are times when farmers may need to bend the rules to improve overall farm system outcomes and farm profitability. This probably explains some of the ‘unders-and-overs’ shown in Figure 4. Examples include:

Transfer of autumn and winter grown pasture to feed the milking herd in early spring

Average pasture mass at calving is a key determinant of annual milk solids production. Grazing management over late autumn and winter has a major bearing on average pasture mass at calving. The objective of grazing management during late autumn/winter is to transfer autumn and winter grown pasture into early spring to achieve target average pasture cover (APC) at calving and meet the feed requirements of the milking herd. Target APC at calving is achieved by lengthening the rotation in autumn and maintaining it through to the start of calving which could mean delaying grazing until after three new leaves have emerged, which inevitability leads to leaf death and low levels of net leaf production. However, bending the rules outlined above and transferring pasture from a period of relatively low herd demand (winter, dry cows) to a period of high feed demand (early spring, lactating cows) will better balance feed supply with herd requirements.

Late spring – managing pasture surpluses & quality

During late spring pasture growth rates may often exceed herd demand resulting in periods of temporary pasture surplus, and if not managed pastures will become stemmy resulting in low pasture quality and animal performance. The maintenance of pasture quality during late spring requires the monitoring and control of whole farm APC, which requires the timely identification and removal of surpluses. The removal of pasture surpluses may often reduce grazing intervals resulting in grazing pastures before the maximum average growth rate i.e. graze before three new leaves have appeared. On lower stocked farms, a short grazing interval may be used to control pasture growth rates and avoid excessive pasture surpluses during late spring. For example, during periods of peak growth pasture may be grazed at the two leaf stage as opposed to the three leaf stage. Again, bending the rules of pasture growth by grazing before three new leaves have appeared and controlling pasture surpluses will improve overall pasture quality and animal performance.

Managing pasture covers

High pre-grazing mass can cause poor pasture utilisation and animal performance. Recommended pre-graze masses for lactating cows are in the range 2600-3200 kg DM/ha (DairyNZ farm fact 1-2). Therefore, the principles of pasture growth must be balanced with pre-grazing mass targets. For example, during periods of rapid growth in spring allowing pastures to grow three new leaves may result in pre-grazing mass above the target range. In such situations, grazing closer to the two leaf stage should not affect subsequent production provided it is for short periods only.

Using the mower

The idea of mowing dairy pastures, especially mowing before grazing, has gained a lot of traction in recent years (e.g. Boyce and Kerr 2013). Mowing either before or after grazing can help uncover some of the hidden dollars, but it is important to be very clear about when the mower could be used effectively otherwise it can become a crutch for patching up problems with grazing rather than correcting the underlying issues. Knowing when to use the mower means knowing **why** to use it. Various reasons are proposed for this. One reason put forward is that pre-graze mowing increases cow intake, but there is no good scientific support for this. In any event, if it does increase intake, the implication is that cows will eat out their allocations faster than otherwise, and the rotation will need to speed up because the act of mowing does not lead to more pasture growth (in some cases it may lead to less, especially if mower settings are not 'just right').

There is a much stronger scientific basis for using mowing tactically (i.e., occasionally) to help achieve consistent pasture residuals and maximise feed quality, as the earlier part of this paper shows. A simple way to look at this is to go back to Figure 1 and envisage a paddock that has been left with an uneven residual after grazing. In this case, there are likely to be quite a few long patches at > 11 or 12 clicks on the RPM, which are akin to the 'High' treatment in the Figure. There could also be short patches (< 7 clicks) which are erring toward the 'Low' treatment. So, the paddock has a "3-speed" residual: some patches growing too fast, some growing too slow, and the rest about right. Pasture left in both the long and short patches is not going to achieve optimal growth rates or quality. When patchiness becomes pronounced, this is a signal that there may be a case for mowing, either before or after grazing, to bring all of the area back to the desired state for high regrowth and maximum quality of feed at the next grazing.

Before doing this, though, check that the problem is not due to, for example, excess supplements being offered, or a very high pre-graze mass which could indicate there is a pasture surplus and some area should be allocated for silage. In spring, if one or two paddocks are left a bit uneven, they could be ear-marked for silage in the next round, after which they will come back into the rotation in a uniform state. If silage-making is not on the agenda, then pre-graze mowing or topping after grazing may well be warranted. Mowing before grazing will mix any stems and/or dead leaf up with the good quality feed so cow diet quality could be reduced slightly, which would not be the case if the paddock is topped after grazing. On the other hand, topping after grazing is 'topping to waste' and a good raincoat is needed is to protect the tractor operator from the dung showers that will rain down as the mower goes to work on the dung pats!

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