Grazing management: areas for improvement on dairy farms

Michael O'Donovan and Michael Egan
Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Summary

- The optimal stocking rate for your farm should be aligned with the average annual grass grown of your farm over a number of years.
- Every farm should have a target figure for grass growth and number of grazings achieved to support the farm stocking rate.
- Farms using PastureBase Ireland to routinely measure and record grass growth have grown on average 13.2t DM/ha over the past five years — with a difference of 7.1 t DM/ha between the top 10% and bottom 10%.
- Autumn closing management and targeting the correct closing cover are vital to ensure adequate spring grass availability.
- Each one day delay in closing (from September 25th) results in 16 kg DM/ha reduced herbage mass in spring.

'If you don't measure it, you cannot improve it' — *Peter Drucker, 1954*

Introduction

The proportion of dairy farmers in Ireland that are routinely measuring and recording grass growth is approximately 10%. To improve farm performance, key performance indicators (KPI's) need to be measured. Measurement serves two purposes:

- It provides clarity regarding current performance.
- It can provide motivation to improve performance.

Grassland measurement is a hugely important KPI for dairy farm management. The grassland performance dictates the farm stocking rate, concentrate supplementation strategy and fertiliser application program for the farm. Ireland has a great opportunity to continue its grass-based focus by implementing better grassland management. Teagasc data indicates that the increased concentrate feeding during 2018 due to poor pasture growth rates resulted in €650/ha lower farm profit for dairy farmers. This highlights our dependence on grazed grass, and the escalation in costs of production when grass availability is inadequate.

Every farm situation is unique: soil types, local climatic conditions, stocking rates, grazing days and farmer management capabilities are highly variable. Nevertheless, grass production is currently limiting productivity on most Irish farms, with huge scope for improvement. Many Irish farms have increased herd size while at the same time increasing their grass DM production capacity. However, other farms have increased herd size without increasing grass DM production, and instead increased the level of concentrate fed to the herd to compensate for higher herd feed demand. Teagasc Moorepark research indicates that every 10% increase in purchased feed reduces net profit by €97/ha, highlighting the importance of matching any increase in stocking rate to an increase in grass growth. Since the abolition of milk quotas in 2015, greater cow numbers, increased stocking rates and more compact calving have collectively caused an increase in spring feed demand on dairy farms. Increasing grass utilisation can lead to increased farm profits, with each extra tonne DM utilised/ha worth an additional €173 net profit/ha. This paper outlines key areas where Irish dairy farmers can improve annual pasture utilisation through regular

grassland measurement, increased focus in both spring and autumn grazing management and increasing grazing herd performance.

Current Grass DM Production in Ireland

The optimum stocking rate for an individual farm is that which gives sustainable profitability, and is dependent on the individual farm's grass growth and utilisation capability. A subset of the farmers in PastureBase Ireland (PBI) recorded grass growth data annually over a five year period (2014–2018). Mean grass production was 13,200 kg DM/ha. The individual year differences in DM production between farms are large (Figure 1), and the variation within farm can be just as large. In 2018, there was a large reduction in grass output across the farms, with a difference of 3,050 kg DM/ha from the average of the previous four years. The year with the greatest difference between the top 10% and bottom 10% of farms was 2015 (8,502 kg DM/ha difference). These DM production differences demonstrate most farmers have potential to increase grass DM production.

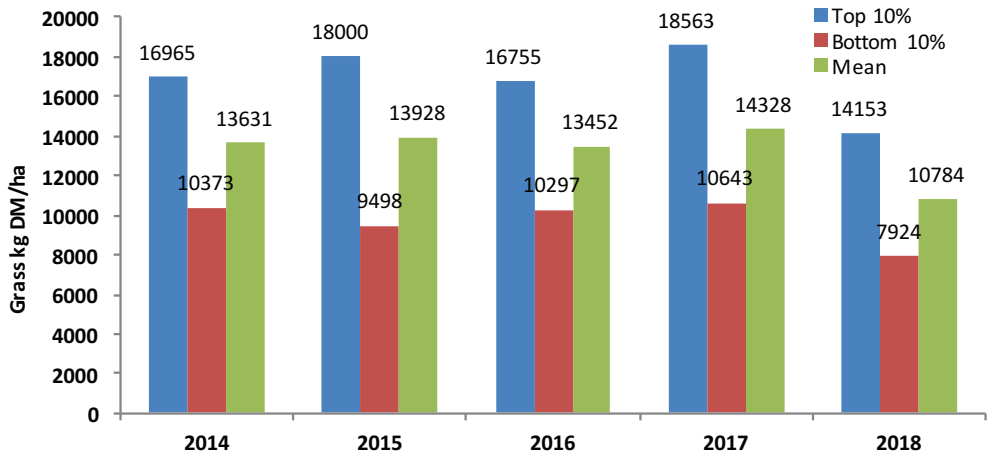

Figure 1. *Summary of dairy farm grass DM production from 2014–2018 on farms participating in PBI and completing >30 measurements per year. Results are presented for the average of all farms, the top 10% and the bottom 10%*

The number of grazings/cuts per paddock provides a good indication of herbage production and grass utilisation. Every additional grazing is equal to an extra 1,386 kg DM/ha herbage grown. On average, the number of grazings/cuts for PBI farms over the five years was 8.2 per paddock. The mean difference between the top and bottom farms was on average 2.1 grazings/cuts, with a range of between 1.6 and 3.2 over the five years. It is clear that some farms are not generating enough grass growth to support the grazing animals. This deficit in grass production results in increased milk production costs (i.e., more imported feed). On the other hand, if a farm is currently producing surplus grass/silage, an opportunity exists to increase farm stocking rate to utilise the surplus grass growth. **The capacity to grow grass on the farm should be determined, and stocking rate matched accordingly.** A farm growing an annual average of 14 t DM/ha across the whole farm is capable of supporting a stocking rate of 2.5 cows/ha with a concentrate supplementation level of 500 kg DM/cow (Table 1). All farms have different actual and potential grass production. If a farmer wants to increase stock numbers, grass output needs to increase first. The below table summarizes the optimum stocking rates for farms that produce different quantities of grass (from 10 to 16 t DM/ha) and feed different amounts of concentrate (from zero to 0.75 t DM per cow). For example, if a farm can grow 10 t DM/ha on average (similar to national average figures, NFS) and the farmer feeds 500 kg concentrate DM/cow, then the optimum stocking rate is 1.8 LU/ha. If, on the other hand, the farm is capable of growing 16 t DM/ha and the farmer also feeds 500 kg concentrate DM/cow, then the optimum stocking rate is 3.0 LU/ha.

Table 1 highlights the appropriate stocking rate for a particular farm based on its grass growth capacity, but it does require that the farmer has accurate knowledge of the grass growth capability on the farm. Identification of the appropriate farm stocking rate is further complicated by farm fragmentation, leading many farmers to increase stocking rate on the milking platform. Farmers with very high milking platform stocking rates are building systems that are dependent on imported feed, particularly in the second half of the year. Based on data available from PBI, only farmers in the top 10% for annual grass growth can support a stocking rate of 3 cows/ha.

Table 1. Stocking rate that optimises profit on farms growing different amounts of pasture and feeding different amounts of concentrate/cow (Roche and Horan, 2013)

Concentrate, t DM/cow	Grass grown, t DM/ha			
	10	12	14	16
0.00	1.5	2.0	2.3	2.6
0.25	1.7	2.1	2.4	2.8
0.50	1.8	2.2	2.5	3.0
0.75	1.9	2.3	2.7	3.1

Spring grazing management

Excellent spring grazing management is crucial to reduce costs and increase output. Ireland have experienced two very different spring seasons in the past two years (2018 and 2019), but we are now very much aware of that we must have a silage reserve available (400 kg DM/cow, or two bales per cow) for feeding in spring. Three factors dictate the success of spring grazing: spring fertiliser management, turnout cover and grazing management. The optimum level of N used for early grass will depend on turnout date and grass demand (stocking rate). For most intensive dairy farms in Ireland, the optimum level of N to apply for early spring grass is 30 kg N/ha (23 units/acre) in mid-January to early-February (depending on geographical location) and 56 kg N/ha (46 units/acre) in March, a combination of both chemical fertiliser and slurry available on farm (Table 2), with an average of 88 kg N/ha (70 units/acre) by April 1st. Slurry should be applied using trailing shoe or dribble bar, to ensure the most efficient use of N uptake. Ground with the lowest P and K fertility levels should be targeted with slurry.

In 2016, data from PBI indicated that the majority of farms were applying early spring N fertiliser, with 33 kg/ha (27 units/acre) applied by mid-February, but there was a large variation in quantity (range: 0 to 65 kg/ha; 0 to 52 units/acre). By April 1st, PBI farms had on average 110 kg N/ha (88 units/acre) applied, but again, with a large variation between farms (range: 64 to 167 kg N/ha; 51 to 134 units/acre). Obviously, this variation can have a large impact on grass DM production in the spring period. Farms that had applied at least 88 kg N/ha (70 units/acre) by April 1st grew 24% more DM (275 kg DM/ha) by April 10th compared with farms that had applied less N. Some useful guidelines to aid decision making regarding spring N application are outlined in Table 2.

Table 2. Nitrogen fertilizer application plan for the spring period			
Month	Product	Rate	Area
[1]January/ February	Slurry	2,500 gal/acre	1/3 of grazing platform (covers <600 kg DM/ha)
January/February	Urea	23 units/acre (29 kg N/ha)	Remaining 2/3 of grazing platform
March	Urea	46 units/acre (58 kg N/ha)	Entire grazing platform
February/March	Slurry	2,000 gals/acre	1/3 of grazing platform (paddocks grazed first)
Average by 1st April		**70 units/acre[2] (88 kg N/ha)**	

[1]*Slurry and chemical fertiliser should only be applied once the open period commences;*
[2]*Combination of Urea and slurry available on farm*

Early spring growth is influenced by the genetic capacity within the sward to respond to the N application. Newly reseeded swards with high perennial ryegrass content have a greater response to N than older swards with more diverse grass species. Soil factors, largely driven by soil texture and weather, will also influence N response. Colder soils are obviously slower to respond; as a rule of thumb, soil temperatures should be 5°C and rising for the first N application. Soil drainage also plays a big role, as land that is more prone to extended periods of waterlogging is less likely to respond to early N. Strategic decisions are required for the spring N application schedule, and may mean that N applications are delayed for some areas of the farm that are less likely to respond, resulting in a split application. It is still important to apply early N fertiliser on fields where a higher response is more likely.

Despite poor growth conditions in spring 2018, data from a trial in Moorepark indicated that there was a response of 9 kg grass DM per kg N applied from the first round of N (late-January), and a response of 11 kg per kg N from the second round of N (mid-March). These responses, albeit achieved under good sward and soil type conditions, are well above the financial break-even rates of 5 kg grass DM per kg N. Based on the responses achieved, 1,200 kg DM/ha was grown by April 10th compared to delaying N application until early April. The same experiment was carried out in spring of 2019. The first harvest (16th March) had a response of 14 kg grass DM per kg N applied in the first round (late-January), a 40% increase on the response obtained in 2018.

Grazing management in the first two months after turnout determines spring grass growth and cumulative growth for the remainder of the year. Data from PBI (n=65 farms) from 2015 and 2016 indicates that, on average, 22% (range 0 to 52%) of the grazing platform was grazed in February, well below the target minimum of 30% grazed by March 1st. The same dataset indicated that for every 1% of the grazing area grazed in February, an additional 14 kg DM/ha was grown by April 10th. This equates to an additional 125 kg DM/ha grown on those farms by April 10th. A target of 1,450 kg DM/ha must be grown from January 1st to April 10th to meet the majority of the cow requirements from grazed grass. The first rotation end date also has a large impact on spring DM production. Data from PBI indicates that mean spring grass production from January 1st to April 10th was 1,239 kg DM/ha on farms that completed the first grazing rotation on or before April 10th and 994 kg DM/ha on farms that completed the first grazing rotation after April 10th. This 20% difference highlights that some farms are finishing the first rotation too late.

An experiment was established at Teagasc Moorepark to examine the effect of opening farm cover (OFC; high or low) on animal performance in early lactation. Both treatments had the same stocking rate (2.95 LU/ha) and calving pattern. Table 3 summarizes the results for animal performance during the first and second rotation (February 6th to May 1st 2018 and 2019).

Table 3: The effect of high and low opening farm covers on grazing and animal performance in early lactation (February 6 to May 1) in 2018 and 2019

	High OFC	Low OFC	Diff
Opening farm cover (kg DM/ha)	1,232	621	+611
Grass allocation (kg DM/cow/day)	12.2	8.5	+3.7
Pre-grazing herbage mass (kg DM/ha)	1,522	1,028	+494
Cumulative concentrate feed (kg DM/cow)	260	260	0
Cumulative silage (kg DM/cow)	150	270	-120
Post-grazing sward height (cm)	3.8	3.4	+0.4
Cumulative milk solids (kg/cow)	195	173	+22
Cumulative milk solids (kg/ha)	574	510	+64

Commencing grazing with a high opening farm cover resulted in more grass available for lactating cows during the 86 day study period (approx. 320 kg DM per cow). The higher grass allocation resulted in an additional 22 kg MS/cow and 64 kg MS/ha produced by May 1st (12% increase in milk output). An additional 64 kg MS/ha at a value of €4.50/kg MS is worth €288/ha, equating to an additional €11,520 in additional milk sales on a 40 ha dairy farm. Hence, having a greater opening farm cover at the start of calving and achieving greater grass utilization has a significant impact on farm performance (physical and financial). If a high farm cover is achieved in spring (similar to 2019), then farms with lower SR have an opportunity to reduce the level of supplementation (concentrate and silage) offered to lactating dairy cows.

Mid-Season management

The primary objective during the main grazing season is to maintain high animal performance from an all-grass diet, while at the same time maintaining pasture quality. In general, from late April onwards, grass supply exceeds demand. Pre-grazing herbage mass should be maintained at 1,300 to 1,600 kg DM/ha, with a grazing residual of 50 kg DM/ha (4 cm post-grazing height). One of the biggest issues during the mid-season is not stocking the farm appropriately to match grass growth. This results in large surpluses (understocked) or large deficits (overstocked) of grass. Farm cover should be maintained between 150 to 180 kg DM/cow from mid-April to mid-August with a rotation length of 18–21 days. Excellent pasture quality is required to maximize the potential animal performance from pasture. Grass quality varies across the season, but some of these changes are influenced by management practices. The current best measure of how well grass is utilised in the field is the post-grazing sward height. In 2016, 33 farms were monitored for post-grazing height from April to September. On average, the results achieved were reasonable, but still showed that grass is being underutilised on most farms. For example, post-grazing sward height increased by close to 0.5 cm in May and stayed at >4.4 cm for the remainder of the year. This has adverse consequences for sward quality, regrowth capacity and animal performance in subsequent rotations.

Maintaining high quality grazed grass during the mid-season can support milk production of 1.7–2.0 kg milk solids/cow per day without concentrate supplementation. For each one-unit increase in organic matter digestibility (OMD), grass DM intake increases by 0.20 kg/day, which supports an increase of 0.24 kg milk/cow per day. Regrowths on well grazed swards (grazed to 4.0 cm) contain a high (80% +) proportion of leaf in the mid-grazing horizon (4 to 10 cm). The proportion of leaf in the grazing horizon has a strong influence on grass DM intake, so it is imperative that swards are leafy to the base. This can be achieved by good grazing management practices. The proportion of leaf in poorly managed swards (grazed >4.5 cm) can be as low as 65% during the reproductive period, resulting in more stem and reduced overall sward quality.

Autumn grazing management

Autumn closing date is the main management factor influencing the supply of grass in early spring. To ensure that adequate quantities of grass are available at the start of calving on highly stocked farms, an average farm cover of 650–750 kg DM/ha is required at closing (December 1st). Moorepark has developed general recommendations for autumn closing management: commence closing between 5th and 10th October; 60% of the paddocks grazed by 7th November; and 100% grazed by the end of November. Farmers must calculate their own spring grass demand, and implement an autumn closing strategy to facilitate the required opening farm cover in spring. Farmers need to use the autumn planner which allocates the area of ground to be closed from October to November and adapt according to the farm requirements. The final decisions regarding closing strategy also require some consideration of the expected grass growth over the winter period (i.e., average of previous five years).

A study was established at Teagasc Moorepark (Autumn 2016–Spring 2019) examining the effect of autumn closing management on late lactation animal performance, over-winter growth rates and spring grass availability. A standard autumn closing strategy (10th October start closing, 60% of the paddocks grazed by November 1st, and 100% grazed by November 24th) was compared with earlier closing of swards (September 25th start closing, 80% grazed by November 1st and 100% grazed by November 10th) and later closing of swards (October 25th start closing, 25% grazed by November 1st and 100% grazed by December 9th).

Extending the grazing season did not result in an improvement in milk production compared to earlier housing, but it lowered the quantity of silage required up to early December compared with animals housed in early- and mid-November (150, 310 and 450 kg DM/cow, respectively). Later closing date did, however, result in a much lower closing farm cover compared to the earlier closed swards (350, 650 and 840 kg DM/ha for the late, normal and earlier closing treatments, respectively). These differences in closing farm cover subsequently resulted in opening farm covers of 630, 860 and 1,100 kg DM/ha, respectively. Each day delay in closing from late September reduced spring grass availability by 16 kg DM/ha. When planning autumn closing management, the large year to year variation in autumn and over-winter growth rates must be considered. As a result, closing swards based on set dates can result in huge variation in spring grass supply (e.g., spring 2018 vs. 2019). During autumn closing, average farm cover needs to be monitored to ensure that it does not drop too low (<650 kg DM/ha). If this occurs, grazing should cease to ensure grass is available the following spring. On the other hand, if AFC is high (>800 kg DM/ha), grazing can be continued as long as closing farm cover is 650–750 kg DM/ha by December 1st.

Conclusions

All farms can grow more grass through improved grassland management. Not enough dairy farmers are routinely measuring farm grass cover. Managing a farm to produce more grass requires attention to detail and better grazing management. Many farms rely on mechanical correction and using concentrate supplementation to overcome poor grazing management, which ultimately reduces farm efficiency. Farmers that regularly monitor farm cover feed their cows more grass, achieve more grazings per paddock, improve grass production and increase farm profit. In addition, this strategy also makes the farm more resilient to milk price fluctuations. For Irish dairy farms to remain competitive, it is necessary to appropriately match stocking rate to the farms ability to grow grass. The implementation of a long-term sustainable strategy to increase grass production must precede any increase in farm stocking rate.