

PastureBase Ireland – Capturing Grassland Data on Commercial Irish Farms

Micheál O’Leary, Anne Geoghegan, & Michael O’Donovan

Animal and Grassland Innovation Centre, Teagasc, Moorepark, Fermoy, Co Cork.

Summary

- Dairy farms recording farm cover regularly on PastureBase Ireland have grown between 12-14 t DM/ha/year over the past three years (2013-15) while drystock farms have grown between 10.5 – 12.3 t DM/ha/year for the same period.
- Dairy Farms finishing their first rotation before 10th April grew 20% more grass in spring 2014 compared to farms who finished the first rotation after 10th April.
- Autumn closing date has a very significant impact on what level of grass is available the following spring. Each week delay in closing in autumn, spring grass accumulation is reduced by 77 kg DM/ha.
- Spring DM production is variable on farms. Top producing farms are achieving 1.7 t DM/ha with other only growing 0.3 t DM/ha between the 1st January and 10th April.
- There are approximately 1,300 farms on PastureBase Ireland, yet there are 17,000 dairy farms and over 100,000 drystock farms in Ireland. The number of farms measuring needs to increase drastically.

PastureBase Ireland (PBI) has been in operation since January 2013. At this stage significant trends in grass dry matter (DM) production and grazing management are becoming evident from commercial farm data. PBI is a web-based grassland management tool incorporating a dual function of grassland decision support while collecting and storing a vast quantity of grassland data from dairy, beef and sheep farmers in Ireland in a central national database. At the moment the vast majority of farms recording measurements on PBI are dairy farms, with drystock farms only accounting for 10 - 15%.

What PBI is informing us is that farmers need to have a good handle on current grass supply in order to manage grass well. No knowledge of farm cover, grass demand or grass growth leaves a huge gap in how grass can be managed correctly in any grazing system. The crucial point on any farm is utilising the feed resource inside the farm gate. Any farm that is depending on imported feed is very exposed in the current volatile environment.

The database stores all grassland measurements within a common structure. This will allow the quantification of grass growth and DM production (total and seasonal) across different enterprises, grassland management systems, regions, and soil types using a common measurement protocol and methodology. The background data such as paddock soil fertility, grass/clover cultivar, aspect, altitude, reseeding history, soil type, drainage characteristics and fertiliser applications are also recorded. PBI will also for the first time link grass growth on farms to reliable Met Eireann local weather station data.

Grass DM production on all farms - PastureBase Ireland data

It is obvious that there is huge variation in grass DM production on farms. High grass DM production can be achieved on all farms with good grazing and soil fertility management irrespective of location. This is one of the key early findings already emerging from PastureBase Ireland in 2014. There are many reasons for this, including differences in stocking rate, soil fertility and grazing management practices. If soil fertility and grazing management can be improved, many farms are very capable of increasing their DM production substantially. Increasing grass utilised by 1 t DM/ha increased net profit by up to €267/ha, while 1 t DM/ha utilised on a drystock farm is worth €105/ha.

Figure 1. Grass dry matter production from PastureBase Ireland dairy farms across the country in 2015.

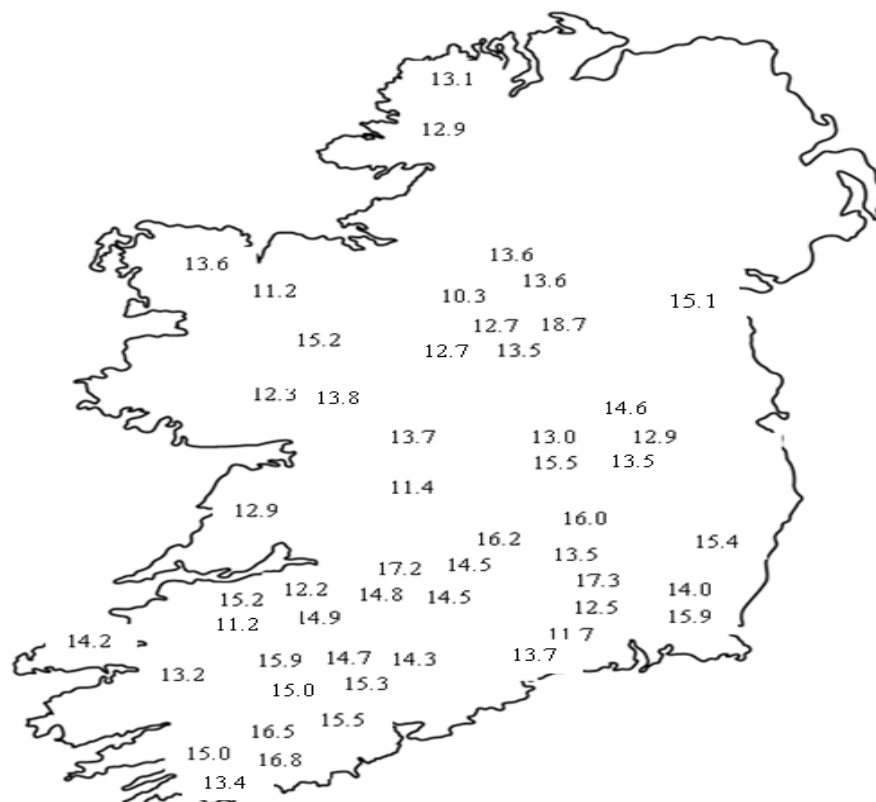


Figure 1 shows the annual DM production data from farms across the country in 2015. These farms have >30 weekly farm walks completed. In 2013, these farms produced an average of 12.2 t DM/ha. This increased to 13.5 t DM/ha in 2014, highlighting the large year effect on grass output. The variation between farms is very high, the difference between the lowest and highest producing farms was 9.4 t DM/ha. An important aspect of the grass production data is that the highest producing farms are growing >16.0 t DM/ha, with little variation between paddocks. The lower producing farms have much greater variation between individual paddocks. In 2015, again there was an increase of 0.6 t DM/ha compared to the previous year where on average dairy farms grew 14.1 t DM/ha. Much of the extra DM produced in 2015 was grown by April, and the mid-year grass growth profile was consistent with 2014.

Table 1. Total dry matter production (t DM/ha) from 95 dairy farms from PastureBase Ireland grass recordings in 2013, 2014 & 2015.

	Mean	Maximum	Minimum	Range
2013				
Total DM production (t DM/ha)	12.2	18.0	7.3	10.7
Grazing DM production (t DM/ha)	10.3	16.8	6.2	10.6
Silage DM production (t DM/ha)	1.89	5.0	0	5.0
No. of grazings per paddock	6.2	9.1	4.5	4.6
2014				
Total DM production (t DM/ha)	13.5	18.8	9.4	9.4
Grazing DM production (t DM/ha)	11.1	17.8	7.2	10.6
Silage DM production (t DM/ha)	2.4	6.1	0.2	5.9
No. of grazings per paddock	7.8	12.0	5.3	6.7
2015				
Total DM production (t DM/ha)	14.1	18.7	7.5	11.2
Grazing DM production (t DM/ha)	11.9	18.6	6.4	12.2
Silage DM production (t DM/ha)	2.2	4.9	0.2	4.7
No. of grazings per paddock	7.0	11.0	4.9	6.1

Performance on Drystock farms

Figure 2 shows the annual DM production data from farms across the country in 2015. These farms have >25 weekly farm walks completed on PBI. In 2014, the average grass DM production on drystock farm was 11.8 t/ha which was a 1.3 t DM/ha increase from the previous year up from 10.5 t/ha which was anticipated as 2014 was a superior year for grass growth. Mean DM production of drystock farms who completed >25 walks in 2015 show that there was an increase of 0.5 t DM/ha when compared with DM production in 2014.

Investigating the annual DM production further, it showed that the range in DM production that existed between drystock farms in 2015 was very large. Some drystock farms only produced 8 - 9 t/ha while, the top drystock farms on PBI exceeded >14 t/ha, with some farm achieving >8 grazing on the grazing platform.

Figure 2. Grass dry matter production from PastureBase Ireland drystock farms across the country in 2015

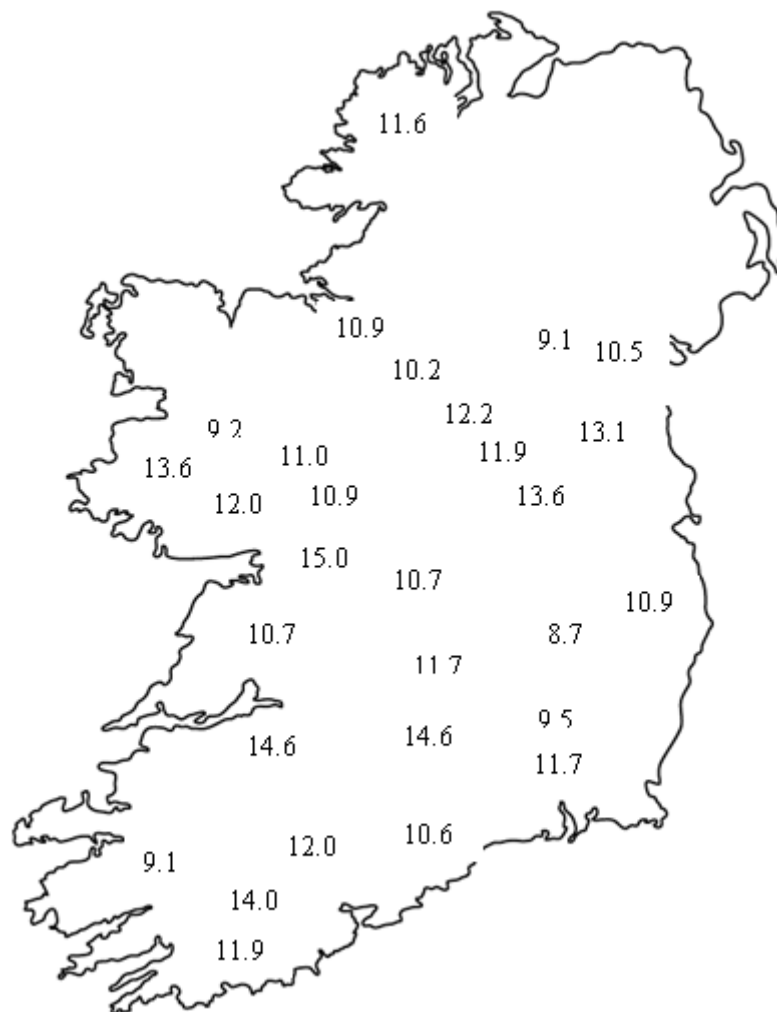


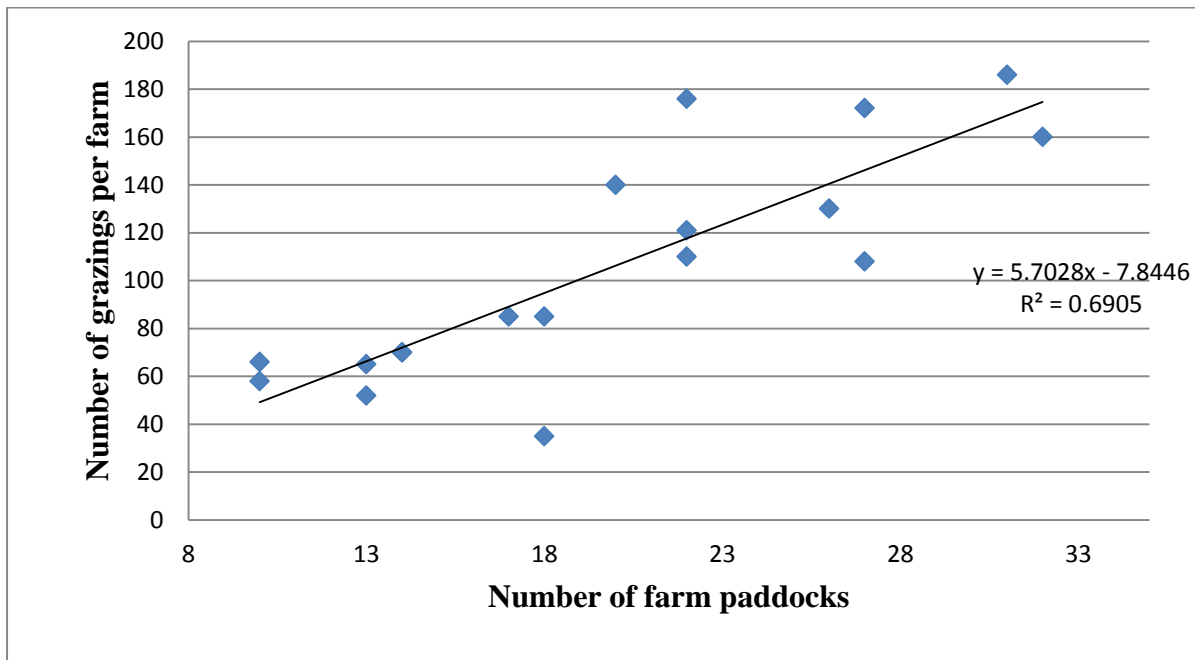
Table 2. Total dry matter production (t DM/ha) from drystock farms from PastureBase Ireland grass recordings in 2014 and 2015.

2014	Mean	Max	Min	Range
Total DM production (t DM/ha)	11.8	14.7	8.7	6.0
Grazing DM production (t DM/ha)	10.3	15.1	8.1	7.0
Silage DM production (t DM/ha)	1.5	3.0	0.2	2.8
No. of grazings per paddock	5.0	6.9	4.0	2.9
2015				
Total DM production (t DM/ha)	12.3	14.6	9.1	5.5
Grazing DM production (t DM/ha)	9.8	12.7	7.2	5.5
Silage DM production (t DM/ha)	2.4	4.6	0	4.6
No. of grazings per paddock	5.4	8.1	3.9	4.2

Why and how does this amount of variation in grass production occur on farms? From the data in which we have been collating in PBI over the last three years trends are beginning to be seen in growth rates which are directly related to grazing management. While soil type has an impact, PBI data can show farms in the midlands and northwest producing higher quantities of grass DM than those in the south. Obviously, good grazing management can overcome many issues when we are discussing grass production on farms.

Taking a more in-depth look of why some farms are able to produce high quantities of grass it was clear from the analysis that, delivering more grazings from each paddock during the season is key driver of success. On a high proportion on drystock farms the number of paddocks is inadequate, leading to large paddocks. As a consequence, livestock are grazing these paddocks for too long (residency time is up to two weeks). The productivity of these paddocks is then significantly reduced. Where regrowths are not protected, they are being continually regrazed, nitrogen application is not up to date and rotation length is non-existent. Figure 3 shows the relationship between the number of paddocks per farm and the total number of grazings achieved per farm. PastureBase Ireland has identified that the advantage of creating one new paddock on a farm will give five extra grazings on the farm for the year. As a consequence of sub-dividing a farm into paddocks of adequate area, the number of grazings will increase in conjunction with DM production.

Figure 3. The number of paddocks per farm and its association with the total number of grazings per farm

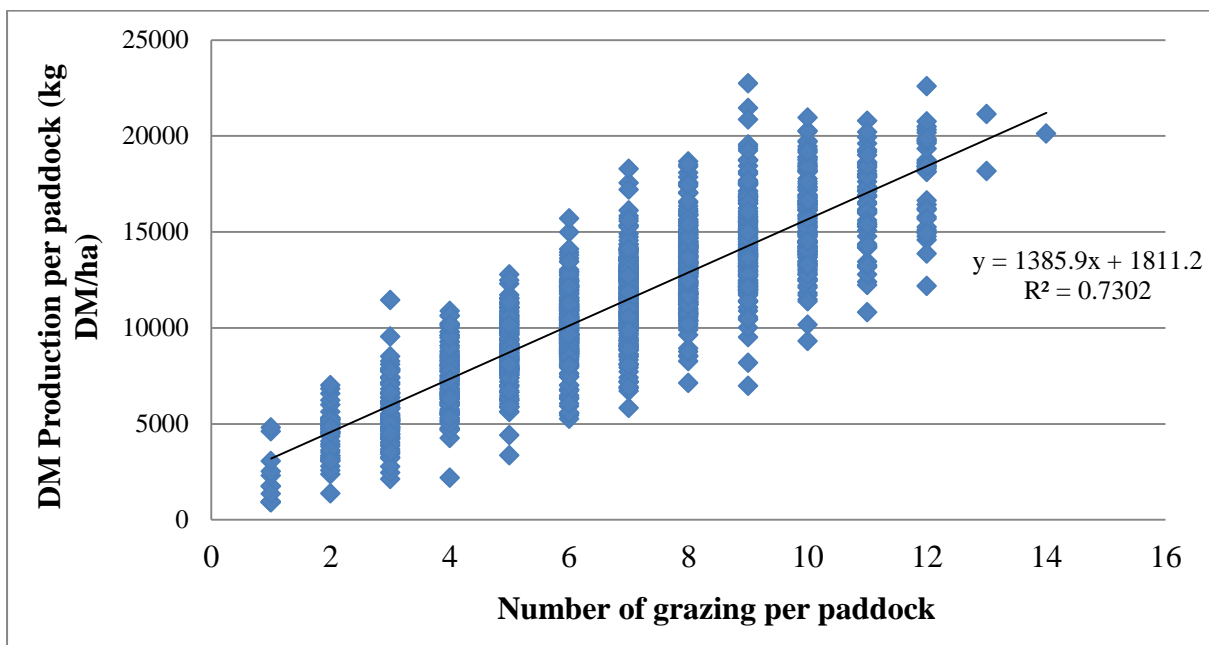


Why are some farms producing high quantities of grass?

1. Rotational grazing system – paddock system
2. Good farm infrastructure i.e. adequate size paddocks and roadways
3. Maximising spring grazing – early turnout and finishing the first rotation on time
4. Addressing soil fertility annually
5. Records a farm cover weekly (>25 walks/year)
6. Making decisions weekly on the information generated after each farm cover
7. Achieving a high number of grazings per paddock per year – top farms achieving >10 grazings per paddock per year.

Figure 4 shows the relationship between the number of grazings achieved per paddock and the associated DM production (dairy data). This highlights that every extra grazing achieved per paddock will increase DM production by 1,385kg DM/ha. It is critical that all farms to sub-divide existing paddocks into more realistic areas. Paddock residency should be no longer than 3 - 4 days on drystock farms during the mid-season while on a dairy farm 36 hours grazing blocks is best practice. Any period longer than this will result in underperforming swards, poor milk solids and live weight gains.

Figure 4. The number of grazing achieved per paddock and annual grazing dry matter production



Reseeding low producing paddocks and expecting every paddock to produce equal quantities of grass are also key aspects for a farm to grow more grass. On high grass producing farms, variation in grass DM production between paddocks tends to be small. One of the strengths of PBI is that on farm grass DM production can be quantified and classified into the different seasons for each paddock. This data enables farmers to target paddocks that have the greatest potential to increase grass growth.

Autumn Grazing Management

Closing date in the autumn, and timing and level of spring nitrogen fertiliser application are the two most important management factors influencing the supply of grass in early spring. In autumn 2015 over 33% of drystock farms delayed the closing of paddocks. In late October – early November these farms closed with an average farm cover below optimum (<600 kg DM/ha). As a result the supply of spring grass was significantly reduced.

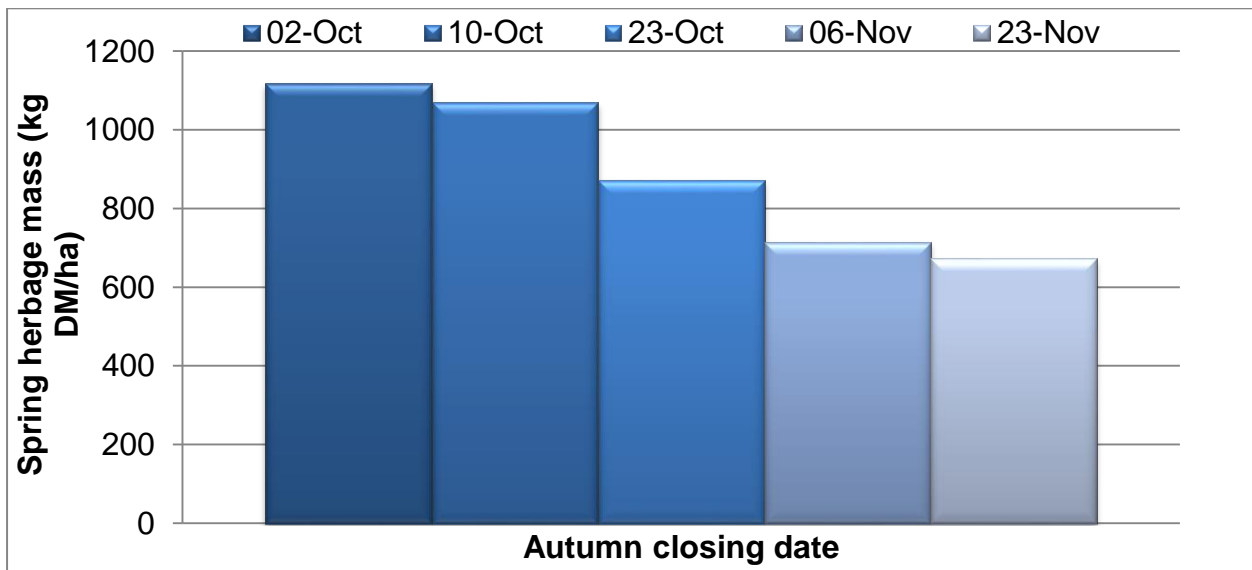
The two main objectives of autumn grazing management are:

1. To maximise the proportion of grazed grass in the grazing animal's diet
2. To finish the grazing season with the desired average farm cover ensuring there will be sufficient grass for early turnout the following spring.

Weekly grassland measuring and budgeting are essential to ensure that these objectives are achieved. Usually from mid-August onwards, the entire farm is available for grazing. Building up grass covers to prolong the grazing season into October/November is necessary in order to maintain animals at grass in late autumn.

PastureBase Ireland allows an investigation of the effects of autumn closing date on spring grass supply. Previous on farm studies and experimental work indicate that the date on which to begin closing paddocks in autumn for spring grazing was October 10th. O'Donovan *et al.* (2002) found that for every day delay in closing after October 10th reduced spring grass supply by 15 kg DM/ha. Figure 4 show a range of autumn closing dates from October 2nd to November 23rd. What this graph clearly shows is that for each week delay in closing in autumn, spring grass accumulation is reduced by 77 kg DM/ha. Autumn closing date has a very significant impact on what level of grass is available the following spring. What is really interesting from this data is the difference in grazing dates in spring were very close to one another, the mean date for grazing October 2nd closed swards was March 17th.

Figure 5. The effect of autumn closing date on spring grass accumulation



Spring grazing management

In general spring grazing management is broken down into having sufficient cow numbers calved early enough to utilise spring grass and then ensuring that a number of key targets are followed based on calving pattern and grazing area. The spring rotation planner (SRP) is an excellent tool to guide farmers in tracking the level of area grazed off at different time points in the spring. The SRP should be used in conjunction with a spring grass budget because the SPR just tracks the area grazed and tells nothing about grass supply to grazing cows or subsequent regrowth levels on the farm. Table 3 shows the critical target during the spring period. Regrowth levels have to be tracked on the farm, especially from early March, so that strategic management decisions around grazing, such as supplementation, can be made.

Table 3. Spring grazing area allocations when grazing from early February.

Week end date	% of total farm area grazed at week end
1 st February	Start grazing
1 st March	30% Grazed
17 th March	66%
7 th April	Begin rotation 2

Why is spring grassland management a concern on Irish farms?

Dairy farms

A survey of some PastureBase Ireland dairy farms was under taken in the first week of March in 2015, to track how spring grazing management was progressing. The following are the main results:

- 75% of cows calved on farms – **On Target**
- Farm cover was >800 kg DM/ha with some farms as high as 1200 kg DM/ha – **On Target**
- Area grazed in March - was 21%, (ranging from 8 -46%) – **Off Target**
- Two farms out of the 30 farms still indoors – **Off Target**
- Cows grazing - allocated 10 kg DM of grass and 3 kg of concentrate – **On Target**
- On average all farms have 30 units of N applied (range 0-60 units/ac) – **Off Target**
- On average, 22% of the platform has received slurry (range 0 – 60%) - **On Target**

Drystock farms

As farmers record weekly covers on PastureBase Ireland, they also enter graze dates after each paddock is grazed. As a result of looking into this data further the following was concluded;

- 66% of drystock farms had little/no stock grazing on the 1st of March - **Off Target**
- The average area grazed on the 17th of March was 20% - **Off Target**
- Top producing drystock farms are achieving 15% grazed by the 1st March and 50% by the 17th of March – **Off Target**
- Only 10% of farms finished the first round by the 10th of April – **Off Target**
- On the 25th of April 45% of farms were finished the first round – **Off Target**

There is a major concern that farms which do not target early turnout or finish the first rotation late, that there will be a build-up of grass on the farm. The aim in spring is to increase the proportion of grass in the diet of the grazing animal while at the same time budgeting so that there is enough grass until the start of the second grazing rotation in early to mid-April. Spring grazing should start in early February and continue until early April (mid-April on drystock farms). This first rotation end date can be brought back on both dairy and drystock farms.

This varies from farm to farm but the overriding aspect of grazing management is to make good use of spring grass. If turnout is too late on farms and the first rotation is too long pre-grazing yields will be too high, grass quality will deteriorate and achieving a post grazing residual of 4 cm will be difficult as utilisation will be reduced. Advantages of finishing the first rotation on time include;

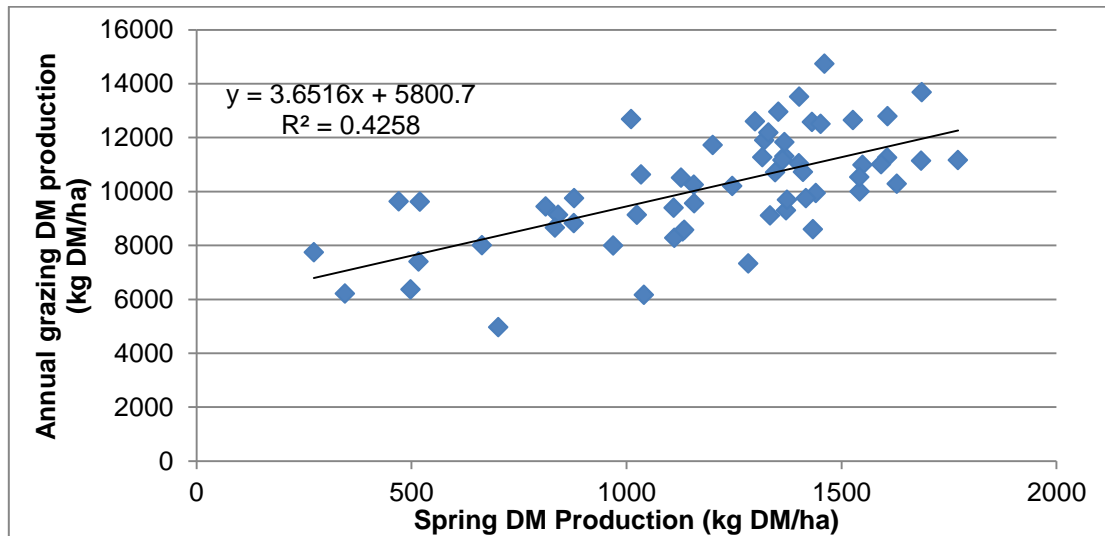
- The first paddock grazed in the second rotation will be an adequate cover for grazing 1100 - 1250 kg DM/ha and have the recommended 12 – 15 days of grass on the farm
- A wedge of grass will be created, highest covers on paddocks grazed early in the spring and lower covers on paddocks grazed last in the rotation
- Early spring grazing increases grass quality in the second, third and subsequent grazing rotations
- Greater animal performance through higher milk solids and weight gains.

More recently, PastureBase Ireland data for 2015 shows that farms which have completed the first grazing rotation in advance of 10th April have grown substantially more grass than farms which finished the first rotation after 10th April. Mean spring grass production from 1st January to 10th April was 1320 kg DM/ha (farms grazed by 10th April) compared to 1030 kg DM/ha for farms grazed after 10th April. This is a 20% increase in grass DM production by advancing the finish date of the first rotation. Most farms in Ireland are finishing the first rotation too late and are missing out on this extra spring grass.

Investigating drystock farms that finished the first round before the 10th of April grew on average 200kg DM/ha (1042 vs 855) more than farms that finished the first round after the 10th of April. On annual DM production, farms that finished the first round before the 10th of April also grew 1.1 t DM/ha more in 2015 (12.2 vs 11.1) than farms finished the first round after the 10th of April.

Another very important aspect of spring grazing and finishing the first rotation on time is that it results in more grazings being achieved on the farm. On many dairy farms the average number of grazings achieved per year can be as high as 10; some of these farms have 2.5 grazings completed by 1st May. Figure 6 shows the association between spring grass growth and annual grazing DM production in 2015. The relationship between these two parameters is positive and 43% of the variation in annual grazing DM production is accounted for by spring grass growth.

Figure 6. Association between spring grass growth (up to April 10) and annual grazing DM production in 2015 on dry dairy farms.



Spring Grazing –Benefit of early turnout to animal performance

Table 4 shows the results of a study comparing spring calving cows that had access to grazed grass full time from calving in early February with a group of cows that remained indoors until early April. The ‘indoor’ cows were offered a high concentrate diet containing 40% grass silage (8.6 kg DM/cow/day) and 60% concentrate (11.1 kg DM/cow/day), while the outdoor cows were offered a daily grass allowance of 15 kg DM and 3 kg of concentrate. There was no difference in milk yield (28.3 vs. 27.3 kg/day) between the two systems but the early spring grazing system cows produced milk of lower fat content (3.86 vs. 4.16 %) and higher protein content (3.36 vs. 3.07 %) compared to the indoor cows. Cows from both feeding systems achieved similar total DM intakes of approximately 15.5 kg DM/cow/day. Significantly, the cows on the early spring grazing system continued to maintain a higher milk protein concentration and higher grass DM intake than their indoor counterparts up to July.

Table 4. The effect of system (Early Spring Grazing; Indoor Feeding) on the milk production characteristics of spring-calving dairy cows from February to April.

	Early spring grazing	Indoor feeding
Milk yield (kg/day)	28.3	27.3
Milk Solids (kg/cow)	2.04	1.97
Milk fat concentration (%)	3.86	4.16
Milk protein concentration (%)	3.36	3.07
SCM yield (kg/day)	26.6	25.9
Bodyweight (kg)	499	517
Bodyweight gain (kg/day)	+0.20	+0.03
Body condition score	2.87	2.92
<i>Intake (kg DM/cow/day)</i>		
Grass	12.9	-
Silage	-	5.7
Concentrates	2.8	9.6
Total intake	15.7	15.3

The results of this study highlight the large benefits (both nutritionally and financially) of including grazed grass in the diet of spring calving dairy cows in early lactation. When modelled on a whole farm basis, early grazing will generate an increased profitability of **€2.70/cow/day** for each extra day at grass through higher animal performance and lower feed costs.

Conclusions

It is clear that Ireland has incredible potential to increase annual DM production with a better focus on grazing management. PastureBase Ireland, the national database, will allow the industry to move forward with better understanding of the performance of grassland farms. PastureBase Ireland has highlighted that all farms need to focus more on early spring grazing. Farms that graze early in the season will stimulate higher grass growth rates earlier (late February/March) and will achieve higher annual DM production, increased milk solids, increase liveweight gain and overall farm profitability.

References

O'Donovan, M., Dillon, P., Reid, P., Rath, M. and Stakelum, G. (2002) A note on the effects of herbage mass at closing and autumn closing date on spring grass supply on commercial dairy farms. *Irish Journal of Agricultural and Food Research*, 41: 265-269.