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Lessons from PastureBase Ireland -Improving our focus on spring grass

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Summary

- As calving becomes more compact the demand for spring grass is higher, therefore higher opening farm covers will be required
- Farms finishing their first rotation before April 10th grew 20% more grass in spring 2015 compared to farms who finished the first rotation after April 10th
- The response to spring nitrogen is high at 10 kg DM/kg N – spring N should be applied 3-4 weeks before grazing start date
- Targets within the spring rotation planner need to be adhered to in order to utilise spring grass and ensure a high April grass growth
- Farms recording farm cover regularly on PastureBase Ireland have grown between 12-15 t DM/ha/year over the past three years (2013-15).

Introduction

Food Wise 2025 projects Agri-food exports to grow to €19 billion per annum in value by 2025. This figure represents an 85% increase from the current three year average. Ireland brings the natural advantage of temperate climate to food production which favours ruminant grass based production systems. It is vital that Ireland maintains its grass based competitiveness in the pursuit of these targets. There are major improvements needed in the areas of grass production and utilisation if we are to achieve these targets from a low cost base. While every farm situation is unique with varying soil types, local climatic conditions, stocking rates and farmer management capabilities, grass production is limiting on most farms. If the levels of expansion predicted in recent dairy industry surveys are realised and they will be going by current trends, then farm grass production will have to increase substantially from current levels to meet additional cow requirements. Ultimately, the optimum stocking rate for an individual farm is that which gives sustainable profitability and is dependent on the individual farm's grass growth capability. Many Irish farms are only producing 50% of their grass growth capability. Large increases in grass production can be achieved. Dairy expansion must come from utilising more grass, and not from importing supplementary feed. At present, dairy farmers are utilising 7.5 t DM/ha (from NFS data) nationally, during a 210 day grazing season, from a milking platform stocked at 1.8 livestock units (LU)/ha. In 2014, an analysis of farms completing grassland measurements in PastureBase Ireland and Profit Monitor analysis were used to compare the effect of increasing milk output by increasing grass utilisation or by increasing purchased feed. These farms were, on average, stocked at 2.35 cows/ha, producing 404 kg MS/cow and 950 kg MS/ha and were utilising 9.6 t DM/ha. The analysis included an allowance for the farmers own land and labour. The effect on milk output of providing 1 tonne of purchased feed per cow was lower than the effect of 1 extra tonne of grass DM utilised per cow. Increasing grass utilised by 1 t DM/ha increased net profit by €267/ha. This paper will discuss recent results from PastureBase Ireland farms, and will outline in detail how spring grazing management can improve on farms.

Grass DM production on dairy farms - PastureBase Ireland data (2013-15)

It is obvious that there is huge variation in grass DM production on farms. High grass DM production can be achieved on dairy 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 (Figure 1). 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.

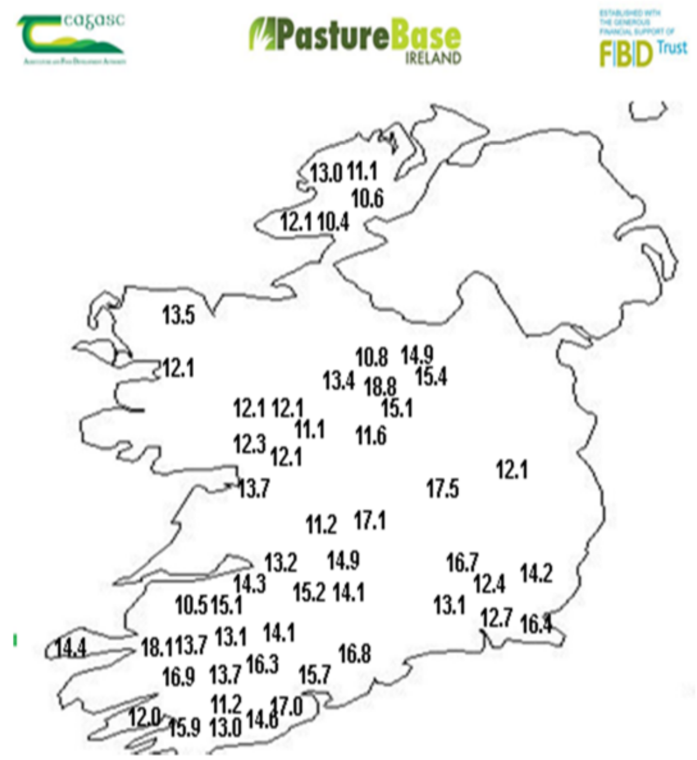

Figure 1. Grass dry matter production in 2014 across the Pasture Base Ireland farms across the country.

Figure 1 shows the annual DM production data from farms across the country in 2014. 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, up to October 1, the DM production on the same 50 farms has averaged 12.6 t DM/ha, however there is probably another 1500-1800kg DM/ha left to produce in 2015. So we would expect 2015 grass production to surpass 2014's. 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 55 dairy farms from PastureBase Ireland grass recordings in 2013, 2014 and 2015 (up to 1st October).

	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)	1.9	5.0	0	5.0
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	0.22	5.9
2015 (up to 1st October)				
Total DM production (t DM/ha)	12.6	16.9	10.0	6.9
Grazing DM production (t DM/ha)	10.6	14.7	7.7	7.0
Silage DM production (t DM/ha)	1.9	4.9	0.16	4.7

The provision of early spring grass

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. 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 spring grass supply was reduced by 15 kg DM/ha. Figure 2 shows 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 the level of grass availability the following spring. Ryan *et al*. (2010) found that 65% of the grass present in a sward on February 20th was grown between closing and November 28th. What is really interesting from this data is, the difference in spring grazing dates, which were very close to one another, the mean date for grazing October 2nd closed swards was March 17th.

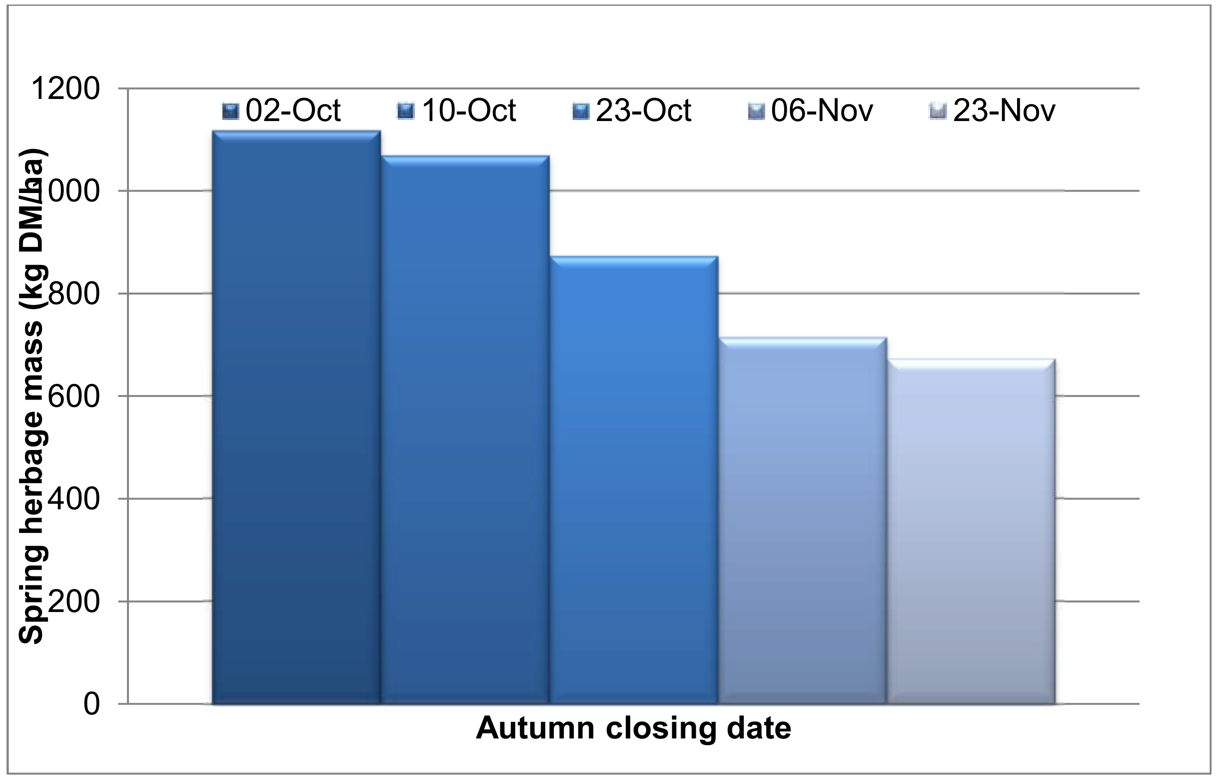

Figure 2. The effect of autumn closing date on spring grass accumulation.

The impact of opening spring cover has a large effect on spring grazing and herbage allocation to the herd. In 2014, the autumn closing cover on 55 farms was 702 kg DM/ha, at opening in spring grass cover was 870 kg DM/ha, therefore overwinter growth was approximately 3 kg DM/ha/day (Figure 3). While expressing the mean can mask some major increases, the range in both closing and opening covers was enormous in the dataset and was far too large to describe in detail.

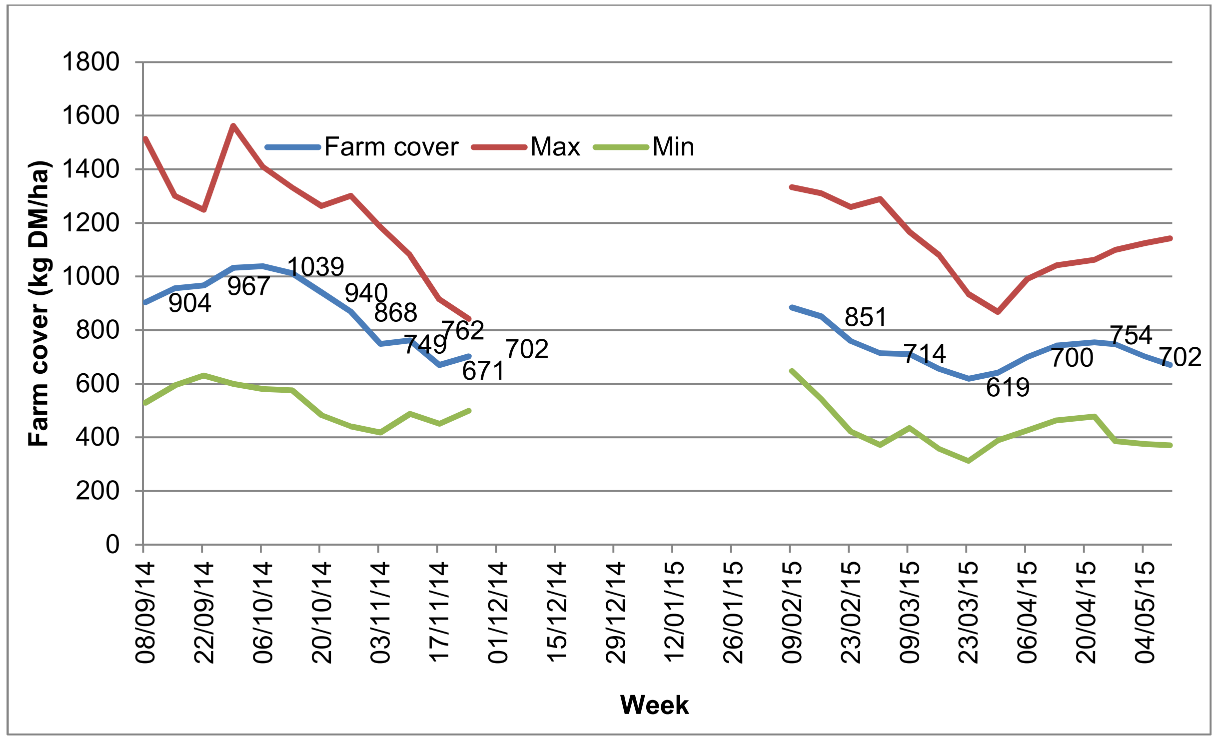

Figure 3. Farm cover (kg/DM/ha) profile from autumn 2014 to spring 2015 (mean, max and min farm covers from 55 farms on PastureBase Ireland).

Maximising the potential from grazed grass in early spring

The period from calving to breeding is a critical time for both cow and grassland management. Cows should be turned out to grass as soon as possible post-calving as this will increase milk production performance, particularly milk solids production raising milk revenues. Profitability will increase as higher cost feeds such as grass silage and concentrate are reduced or eliminated from the diet. The spring rotation planner (SRP) is a tool that is widely used by farmers to budget the available grazing area until the desired end of the first grazing rotation (approximately April 10th; magic day – when grass growth equals grass demand). Farm grass supply (farm cover) will have to be measured in conjunction with the spring rotation planner to ascertain the quantity of grass that will be offered to the cows during the first rotation.

Spring grazing management

In general spring grazing management is broken down into having sufficient cow numbers calved early enough to utilize 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. Regrowth levels have to be tracked on the farm, especially from early March, so that strategic management decisions around grazing, such as grass allocations and supplementation can be made.

Spring Rotation Planner

The best way of managing grass in spring is to set out the area you are going to graze weekly and implement this plan during the spring period. The SRP provides clear guidance at this time. The SPR works off simple parameters; turnout date, grazing area and the targeted finish date of the first rotation. Table 2 shows the proportion of the farm to be grazed by three key points in the early grazing season.

For the plan to be successful, the following is required:

- Stick to the target area allocated by the planner, do not graze more or less per day
- Post-grazing sward height in the paddock should be 3.5 cm ensuring high quality grass in the next rotation
- If, after allocating the correct portion of the farm, post grazing sward height is >3.5 cm then feed allocation is too high and concentrate should be phased out. If grass is in short supply the cows should be supplemented.

Table 2. Spring grazing area allocations when grazing from early February.

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

Are farmers meeting spring targets?

A survey of some PastureBase Ireland 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 findings:

- 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 on March 2 - was 21%, (ranging from 8 -46%) – **Under Target**
- Two farms out of the 30 farms still indoors **– Under Target**
- Cows grazing - allocated 10 kg DM of grass and 3 kg of concentrate – **On Target**
- Average N applied on all farms is 30 units (range 0-60 units/ac) – **Under Target**
- On average, 22% of the platform has received slurry (range 0 – 60%) – **On Target**

What is clear from the survey is that not enough land area was grazed in February. Mean calving date for this group of farms is early; therefore it is important that the target of 30% grazed by the end of February is achieved. The variation across farms is always going to be large with this type of data, the lack of N application and slurry application is very concerning and these should be priority issues when it comes to establishing higher spring grass growth on the farm.

Increasing grass growth with spring grazing

The impact of spring grazing has been advocated on many occasions as growth rates are usually greater on spring grazed swards compared to ungrazed swards. Kennedy et al. (2005), in a comparison of early spring grazing versus late turnout, found that February grazed swards subsequently grew more grass in the second rotation than ungrazed swards (90 v's 82 kg DM/ha, respectively). More recently, PastureBase Ireland data for 2015 shows that farms which have completed the first grazing rotation in advance of April 10th have grown substantially more grass than farms which finished the first rotation after April 10th. Figure 4 shows the profile of spring grass growth on farms who have finished the first rotation before and after April 10th, (32 farms in each category). Mean spring grass production from January 1st to April 10th was 1320 kg DM/ha (farms grazed by April 10th) compared to 1030 kg DM/ha for farms grazed after April 10th. 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 producing this extra spring grass.

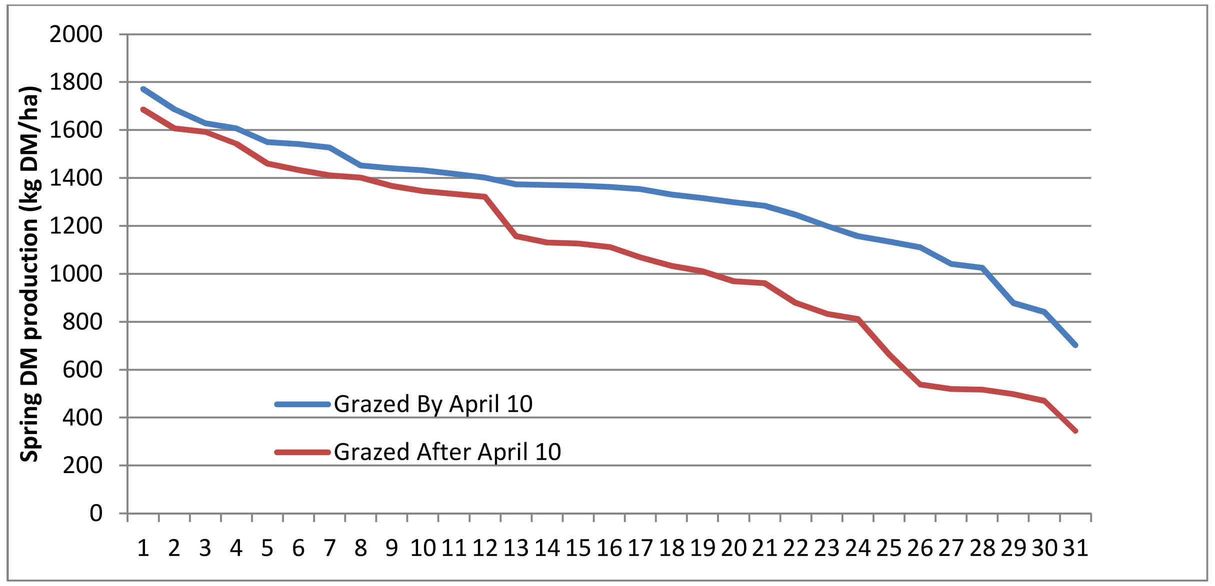

Figure 4. A comparison of spring DM production from farms which have finished the first rotation before and after April 10th (2015) (x axis = Farm).

Another very important aspect of spring grazing and finishing the first rotation on time is the attainment of a greater number of grazings on the farm. On many 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 May 1st. Figure 5 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.

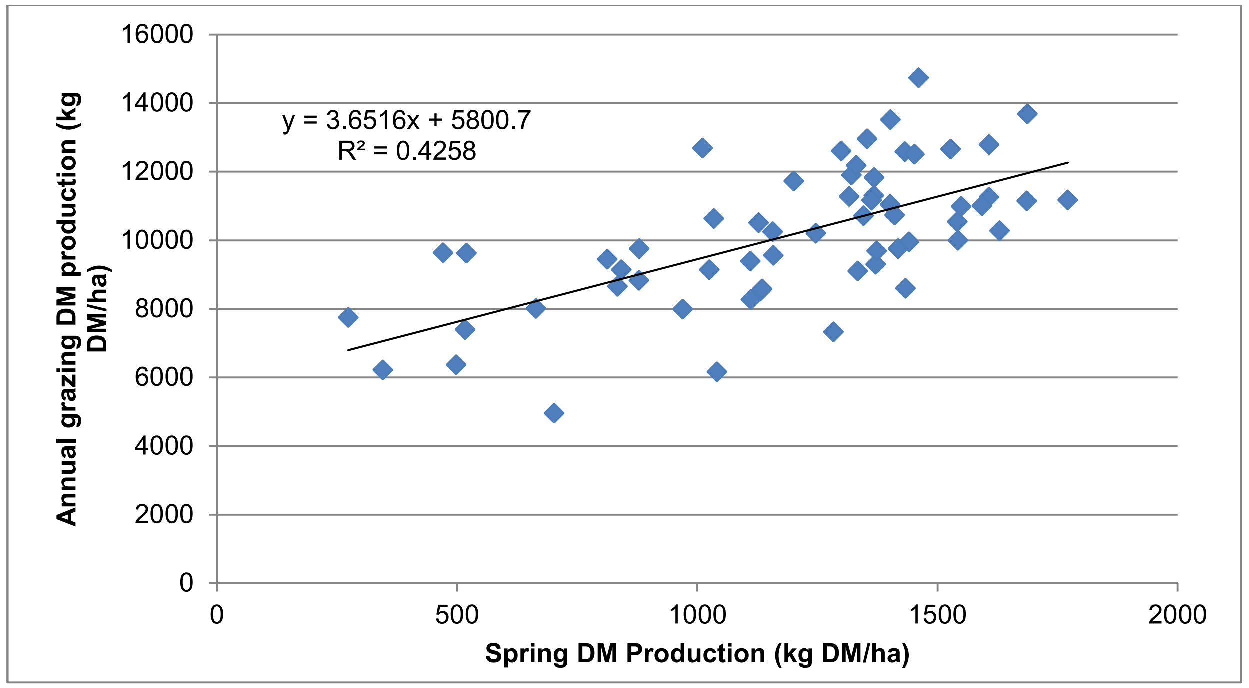

Figure 5. Association between spring grass growth (up to April 10) and annual grazing DM production in 2015.

Importance of spring nitrogen application and its timing

Date of autumn closing and of early spring N application have been shown to be the two most important management factors influencing the spring grass supply. Van Burg (1968) showed that the date in spring at which a given grass yield is obtained could be brought forward by 3 weeks with N fertiliser applied at the correct time. Murphy (1977) suggested that the optimum date for applying N for early spring grass was sometime in January for Johnstown Castle; Stevens *et al*. (1989) suggested that the optimum date for Northern Ireland was in February. O'Donovan *et al*. (2004) completed a three year study investigating the influence of N rate and timing of application on spring DM production at Moorepark. The results suggest that on the March 18th N response was 15.7 kg DM/kg N from a January 12th application, 7.3 kg DM/kg N from a February 3rd application and 5.6 kg DM/kg N from a February 23rd application. On April 8th the DM responses were 17.6 kg DM/kg N from a 12th January application; 11.4 kg DM/kg N from a February 3rd application and 15.1 kg DM/kg N from a February 23rd application. It was shown that highest DM production was achieved from the January application of nitrogen fertiliser.

The effects of "early spring" application of fertiliser N are summarised in Table 3. This data shows that sizeable responses (sometimes >10 kg DM/kg N) to the application fertiliser N can be obtained in early spring from a series of experiments including Grange and Northern Ireland. MacCarthy (1984) reported that N application always advanced, by approximately three weeks, the date in spring by which any given yield of grass was attained. Clearly, the application of N should be carried out as early as circumstances permit.

Table 3. The application levels, timing, harvest date and DM yield response from early nitrogen fertilizer application from a large number of studies.

Reference	Fertilizer application (kg/ha)	Application date	Harvest date	Grass yield response (kg DM/kg N)
MacCarthy (1984) *(Moorepark)*	45	Late Jan	Early Mar	5.3 (11.6)
Stevens *et al.* (1989) *Northern Ireland*	70	Early Feb		14.5 (6.0-22.4)
Murphy (1994)	51	Jan	April	9.6
(*Johnstown Castle*)	103			8.9
Neilan *et al.* (1997)	25	Late Feb	April	7.3
(*Grange*)	50			8.3
	75			7.8
Kelly *et al.* (1998)	30	Early Feb/Mar	May	18.2
Wet soil	60			11.3
Laidlaw *et al.* (2000) *Northern Ireland*	40	Early Feb	>Mid-April	5.3

Practically February is a better month for N application at Ballyhaise, Co. Cavan as it is usually associated with lower rainfall and reduced nitrogen losses compared to March. For the past 10 years, rainfall at Moorepark from January to April was 106 mm in January, 53 mm in February, 80 mm in March and 56 mm in April, and for Ballyhaise the comparative figures were 109 mm in January, 80 mm in February, 85 mm in March and 66 mm in April. Annual rainfall for the last 10 years was 1018 mm at Ballyhaise and 1022 mm at Moorepark.

Comparison of Urea versus CAN.

Currently, quoted prices for urea are in the region of €390 to €410/tonne and for CAN €340 to €360/tonne, which is equivalent to €0.85 to €0.90/kg N for urea, and €1.25 to €1.35/kg N for CAN. Urea is therefore currently 30% cheaper per kg N than CAN. The application of CAN increases the nitrate pool in the soil which is readily available to plants but has a high risk of loss whereas urea must be converted to ammonium-N and then to nitrate by nitrifying bacteria which is then available for uptake by the plant. In contrast, applying CAN in similar conditions can result in higher levels of N loss through leaching. Urea is more slowly available to plants but much more stable in the soil profile. Herlihy (1988) found that there was a better response to urea (46% N) than to CAN (calcium ammonium-nitrate; 27.5% N) applied in spring in terms of herbage DM production and recovery of N by the pasture. Stevens *et al*. (1989) reached a similar conclusion although there were only significant differences between the two fertilisers in three comparisons out of 120. Watson (1986) concluded that urea produced at least 95% of the response of CAN during favourable spring conditions. Therefore, because urea is cheaper than CAN in terms of €/kg N applied in the fertiliser, urea is the more cost-effective fertiliser to apply during the spring.

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
Intake (kg DM/cow/day)		
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.

A more recent study carried out at Teagasc Moorepark investigated the effects of two different post-grazing sward heights on dairy cow milk production performance, grass growth and sward quality from turnout to the start of the breeding season (April 18th). Swards were grazed to either 2.7 cm or 3.5 cm during this 10-week period. After 2 – 3 weeks milk yield differences became evident and continued for the remainder of lactation. Cows grazing to 3.5 cm had higher (+11%) cumulative milk yield and (+17%) milk solids performance than cows grazing to 2.7 cm (Table 5). It is clear that this reduction in performance has a severe effect on immediate and cumulative lactation performance. The recommendation from Moorepark research is to graze to 3.5 cm and avoid overgrazing (grazing less than 3.5 cm) in early spring. If cows are overgrazing then additional supplement should be offered in the form of concentrate or grass silage.

Table 5. Effect of post-grazing height from turnout (February 10th) in spring to the start of the breeding season (April 18th) on dairy cow milk production.

	Grazing treatment	
	2.7 cm	**3.5 cm**
Milk yield (kg/day)	20.3	22.7
Milk fat content (%)	4.27	4.47
Milk protein content (%)	3.14	3.25
Cumulative milk solids yield (kg)	90	108
Bodyweight (kg)	466	477

Spring Grass Quality

Spring grass is generally high in crude protein (CP), organic matter digestibility (OMD) and low in neutral detergent fibre (NDF). Using data from >30 years of grazing experiments at Moorepark (Feb 1 –April 30) the following values have been collected; herbage DM content 184 g/kg DM; organic matter content 893 g/kg DM; crude protein content 228 g/kg DM); acid detergent fibre (ADF) 240 g/kg DM; organic matter digestibility (OMD) 825 g/kg DM. In general, concentrate crude protein levels can be adjusted based on the high level of crude protein available in spring grass.

As we move to trying to push more grass into the spring part of the year, we need to be mindful that closing paddocks early does mean these paddocks need to be grazed early in the spring period. Garry *et al*. (2015) undertook some detailed grass (sheep) digestibility work at Moorepark and found some significant results. Plots were established the previous autumn with three different closing dates (1st October, 15th October and 1st Nov) and were then harvested and offered to sheep at two different periods the following spring (Early: 9th to 25th February) and (Late: 11th to 30th March). Full digestibility measurements were undertaken in this study to establish the relative differences in digestibility between closing dates and spring grazing dates. For the early grazing period there was no effect of closing date on grass digestibility (Table 6). For the later spring grazing dates grass digestibility was 45 and 27 g/kg DM lower for the 1st October closed sward compared to the 15th October and 1st November closed pastures. This means that early closed swards need to be grazed earlier in the first rotation, and preferably in late February, to reduce any negative effects on grass digestibility.

Table 6. Effect of autumn closing date and spring grazing date on in vivo grass digestibility of sheep**.**

	Grazing period: 9th - 25th February			Grazing period: 11th - 30th March		
	Early-Closed	**Mid-Closed**	**Late-Closed**	**Early-Closed**	**Mid-Closed**	**Late-Closed**
Closing date	Oct 1	Oct 15	Nov 1	Oct 1	Oct 15	Nov 1
Days closed	156	142	125	177	163	146
Pre-grazing herbage mass (kg DM/ha)	2364	1647	1070	2977	2263	831
DMD (g/kg DM)	800.1	801.6	804.7	768.6	813.5	795.6

Benefit of early turnout on grass quality

Pastures that are grazed in early spring (February and March) produce swards of higher quality and of higher milk production potential in the mid-April to early July period than swards initially grazed in mid-April (Table 7). High quality grass is achievable by grazing pastures to low grazing residuals (3.5-4 cm) early in spring. In an experiment, two swards were established, one was grazed once between February and mid-April; the other remained ungrazed since the previous October/November. This study commenced in mid-April and continued until early July during which four 21-day rotations were completed. Grazed grass was the sole feed for the duration of the experiment. Each of the swards were grazed at two stocking rates, 5.5 and 4.5 cows/ha on the early grazed swards, and 5.9 and 5.5 cows/ha on the late grazed swards (Table 7).

Table 7. Effect of initial grazing date and stocking rate on milk yield and composition from mid-April to early July.

	Early grazed swards		Late grazed swards	
Stocking rate (cows/ha)	**5.5**	**4.5**	**5.9**	**5.5**
Grass intake (kg DM/cow/day)	16.3	17.5	15.2	16.7
Milk production				
Milk yield (kg/day)	22.7	24.5	20.9	22.4
Fat (%)	3.89	3.78	4.00	3.78
Protein (%)	3.29	3.41	3.21	3.27
Milk solids (kg cow)	1.63	1.76	1.51	1.57

The cows on the early grazed swards at a stocking rate of 4.5 cows/ha achieved the highest yield of milk, fat and protein; highest protein content, milk solids and grass DM intake. There was no difference in animal performance between the cows grazing the early and late grazed swards stocked at 5.5 cows/ha, even though the early grazed swards had already been grazed once that spring. The results of this study suggest that swards grazed early in spring have increased milk production potential, grass DM intake and herbage utilisation in early summer. The production benefits of swards grazed in early spring are due to a higher leaf proportion and hence greater digestibility than later grazed swards during the main grazing season.

Conclusions

Increased focus must be placed on utilising grass early in lactation and trying to stimulate high farm grass growth rates earlier (late February/March). More focussed grassland management will need to be achieved in spring, flexibility in spring grassland management is required, spreading nitrogen to influence spring growth and hitting the grazing targets across the spring period are part of this process. Grazing management skills evolve and improve over time with better use of measurement. PastureBase Ireland, the national database, will allow the industry to move forward with better understanding of the performance of grassland farms. As a feed we all underestimate the potential of grass, we must realise if we don't take advantage of our comparative advantage, we will not reach our potential.

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Evolving Grassland Management Practices on my Farm

Shane Crean

Dairy Farmer, Doneraile, Co. Cork

Introduction

I'm married to Joann and we have 3 children - Annie 6, Seanán 4 and Hugh nearly 1 year old. I'm originally from Tralee Co. Kerry. We farm together with my parents John and Diana who live in Tralee and look after all the young stock. We are based in Doneraile, Co Cork.

Background

I grew up on a 50 acre dairy farm in Tralee town, milking circa 100 Holstein Friesian cows. Our calving pattern was 50:50 autumn:spring. We supplied our local co-op, Lee Strand for the liquid milk market.

In 1994 we converted a heifer rearing out farm (45 acres) to a milking platform. Here we built a 10 unit milking parlour with the intention of milking 60 cows. Once I had completed college, I began farming here as a qualified young farmer. This allowed me to purchase milk quota.

At this stage, the number of cows on the home farm had reached 150 (7.5 cows per ha). These cows were typical to a liquid milk herd, with average yield approx. 8,000 litres and protein and fat percentages of 3.3 and 3.6 %, respectively.

Grassland management was very simple where one 20th of the farm was grazed per day throughout the grazing season regardless of pre-grazing cover. The busiest machine in our yard at the time was our Keenan feeder, which was going all year round. We fed a range of feed products like super pressed pulp, brewers' grains along with maize and grass silage together with a high level of concentrates per cow (>1.5 tons). This system was very labour intensive and stressful on both ourselves and the cows, with and feed and vet bills to prove it!!!

We knew the system wasn't sustainable. Infertility was masked by cows transferring from autumn to spring and visa-versa. Our milking platform was too small for the number of cows we wanted to milk. We needed to find a block of land to accommodate a minimum of 250 cows. We were now looking for a suitable block of land where we could amalgamate both herds. We focused our search in Munster and in 1999, we bought an 88 hectare tillage farm in Doneraile Co. Cork. Once the farm was purchased, we moved our heifer rearing to Doneraile and ceased renting land in Tralee.

Education

After my Leaving Cert, I went to Clonakilty Agricultural College for a year. I completed my Green Cert, after this I decided to further my studies in England where I completed the Advanced National Certificate in Dairy Herd Management.

Travel

In 2003, I was awarded the Stephen Cullinane scholarship trip to New Zealand. I spent 6 months there and worked on 3 farms (220 cow, 700 cow and 1500 cow herds). I was immediately drawn to the low input, grass-based system and a crossbred cow for that system. The 220 cow herd, in particular was a real education for me. This herd size was comparable to our own at home. The major difference was that it was managed by a leisurely elderly farmer, with 1 full-time herdsperson and a student for calving season. There was minimal machinery in the yard, stress-free cows, less intensive labour and a more sustainable system. All replacements were contract reared. I could now see the real potential of the Doneraile farm both from a business and lifestyle perspective.

Systems Change

Setting up Doneraile

After returning from New Zealand full of inspiration and enthusiasm, work started on the Doneraile farm in 2004. With the unsuitable location of the existing farm yard and the building type, we made the decision to centrally locate the facilities on a greenfield site.

The first major step in this development was to decide on the type of parlour we would build. While in New Zealand, I visited Bill O'Sullivan. He was milking 500 cows through a 50

point Dairymaster rotary. It was a one person operation to milk the cows with ease, in this parlour. It was very labour efficient with excellent cow flow. It was an obvious choice for me that this was the type of parlour we needed. As the farm was previously growing cereals, the whole farm needed to be reseeded, paddocked, roadways laid down and all paddocks serviced with water. We employed the services of Grasstec to map the farm, laying out paddock sizes and roadways. At the time this was a huge investment, and one that needed to be done right from day one. A 250 cow cubicle shed was built as winter accommodation along with a lagoon for slurry storage.

In June 2005, both herds were amalgamated (230 cows) and moved to the Doneraile farm. The two Tralee parlours were closed down and Tralee became the heifer rearing block. At this stage calving was 60% spring and 40% autumn. My biggest challenge now was to manage cows on a grass based system with little previous experience.

Table 1. Change in cow numbers, herd EBI and milk composition over the last five years

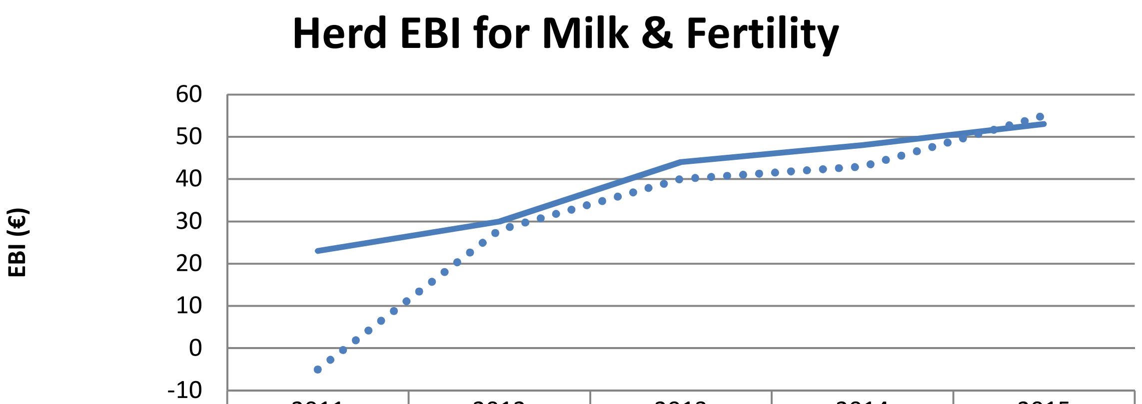
	2011	2012	2013	2014	2015
Cow numbers	290	320	310	317	330
Herd EBI (€)	16	57	106	112	135
Milk SI (€)	23	30	44	48	53
Fertility SI (€)	-5	28	40	43	55
Milk Protein (%)	3.29	3.3	3.3	3.34	3.62
Milk Fat (%)	3.77	3.9	4.0	4.3	4.35

Cow Type

When we first started milking in Doneraile in 2005 the herd was made up predominately of Holstein Friesian genetics. From my experiences both in New Zealand and in Kerry, I knew that this breed was unsuitable for the system we were moving to. In 2008, we started cross-breeding the herd with Jersey genetics. I believe that the Jersey type cow was more robust for a big herd. As a consequence of chasing milk production with years, in 2005 the average EBI across the herd was - €6. The breeding policy needed to be changed quickly. All the research at the time pointed in the direction of the cross-bred cow, where hybrid vigour would be exploited and genetic gain is larger, leaving more money in your pocket through higher milk constituents and improved fertility. In Table 1, you can see the huge gain that was achieved in the last 5 years alone.

Today, 80% of the herd is cross-bred with Jersey. We are now milking Friesians out of Jersey-crosses (25% Jersey). Also the in-calf heifers (EBI €168) are mostly Norwegian Red crossed out of Jersey cross-breds with some Norwegian Red out of Friesian. High culling rates and carrying cows over from autumn to spring calving was draining the profit out of the farm. I needed a cow that was going to calve every 365 days and maintain this interval in a spring calving grass based system. Substantial improvements in EBI have been made over the last number of years our focus is now on fertility sub index.

We are 100% spring calving since 2013 and we fed 550kg of meal/cow at a stocking rate of 3.3 cows/ha last year. We have 370 cows and heifers to calve this spring with an intention to milk 330, selling late calvers. Once the heifer calves are weaned, they are sent to Kerry where they are reared by my parents. They return as in-calf heifers in November before calving. All bull calves are sold at 2 weeks old.



	2011	2012	2013	2014	2015
EBI Milk	23	30	44	48	53
EBI Fertility	-5	28	40	43	55

Figure 1. Improvement in Milk and Fertility Sub-Index for the last five years

Soil Fertility

As the farm was historically a tillage farm, soil fertility had to be a main focus for us. Soil sampling is carried out every 2 years on the farm in December, with the last sampling taking place in December 2014. In 2005, soil fertility was poor with half the farm having a soil pH of less than 6.3 and all the farm in index 1 and 2 for phosphorus (P) and potassium (K). As a result of this we have placed a large emphasis on increasing the soil pH, P and K over the last number of years. Lime is applied in November to all paddocks with a soil pH below 6.3 based on soil sampling results. At reseeding 2 t/acre of lime is applied. We purchase and apply what P is allowable on the farm. All slurry is spread back onto the milking platform. We avoid taking silage from all paddocks that have the lowest index for P and K.

December 2014 soil sample results showed 52% of the farm had a soil pH of greater than 6.3; we would have hoped to have more of the farm with a greater pH than 6.3 by this stage. We are still working on it and hope to increase this to 75% of the farm with a pH of >6.3 in the next two years. Currently 77% of the farm is in index 3 and 4 for P, this is due to our focus on increasing P in the past. Potassium however has not had a similar trend with only 25% of the farm in index 3 and 4. Our plan for the next 5 years is to focus on increasing soil pH, and P and K index's on the proportion of the farm with poor soil sample results and maintain soil fertility on the paddocks with adequate pH, P and K. We plan to now soil sample the farm on a yearly basis rather than every second year. By doing this we hope to be in a better position to be more strategic with our application to paddocks.

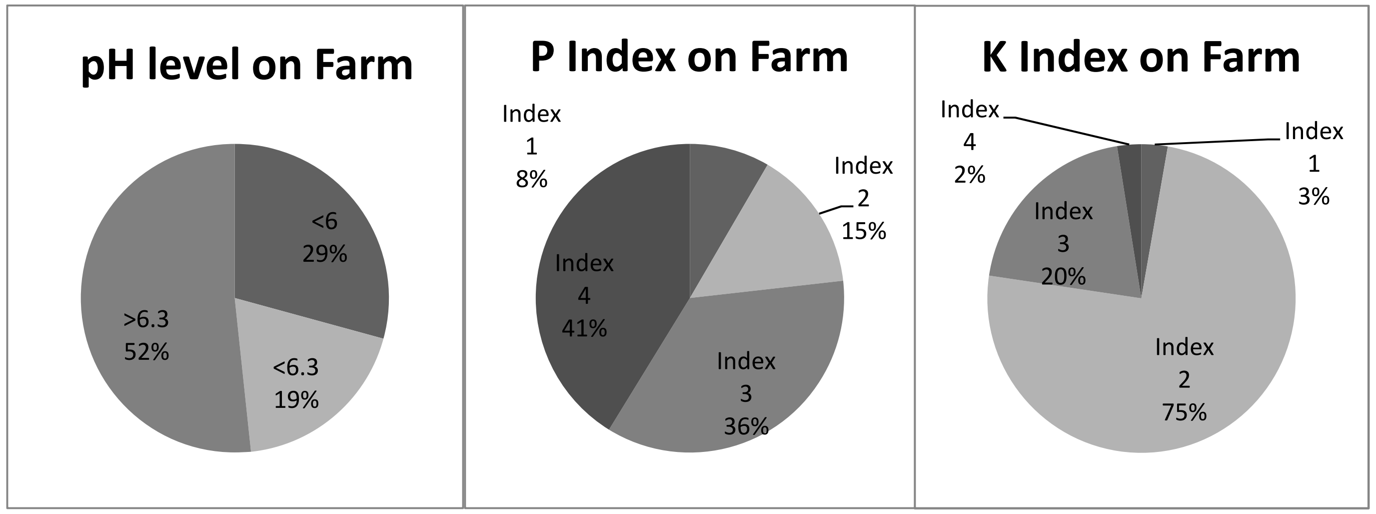


Figure 2. Shows the soil pH, Phosphorus (P) & Potassium (K) status of the farm

Reseeding

As the entire farm was reseeded in 2004 prior to the start of milking, there has been relatively little reseeding done in the past. In recent years we have reseeded approximately 6% to 8% of the farm per year. We have selected the paddocks for reseeding based on poor performance, easiness to graze, openness and spring production. When reseeding paddocks we apply 2 tonnes of lime/acre and 3 bags of 10:10:20. We select cultivars from the Pasture Profit Index and try to select cultivars that will give good spring growth, good persistence and good palatability.

In recent years I have sown monocultures on my farm and I am very happy with them as they are my highest producing paddocks this year. Monocultures include Abergain (two paddocks which have produced over 20t DM/ha each this year), Aberchoice, Tyrella and Astonenergy. Older swards on the farm consist of a mixture on Navan, Portstewart and Denver, while in recent year I have also used Astonenergy and Tyrella in a 60:40 mixture.

Grass Management

One of the biggest changes from the previous farm in Kerry to Doneraile was the way that we managed the grass on the farm.

I joined a very progressive discussion group in 2006. Most of the farmers in this group had a good handle on grass measuring and budgeting. It was their priority to keep the grass right in front of the cows at all times during the grazing season. This is where I learned the skill of grass measuring and budgeting. It soon became the number one priority for my farm each week to measure and budget grass. It is an absolutely invaluable tool.

With the change of system in Doneraile, grass is now the most important feed on the farm. Without managing the grass on my farm I would be unable to maintain a stocking rate of > 3 LU/ha with < 700 kg concentrate per cow. Walking my farm on a weekly basis helps me make the decisions I need to maintain sufficient quantity and high quality grass on the farm for the cows. I walk the farm weekly from the end of January to the beginning of December and record the walk on PastureBase Ireland.

From 2006 to 2010, we grew approximately of 8 – 10 tonnes DM/ha. In the past three years we have increased out cumulative herbage production from 14,055 kg DM/ha in 2013 to 14,547 kg DM/ha in 2014, and in 2015 we grew 16,107 kg DM/ha (Figure 3). In 2015, the top 33% of our paddocks averaged 18,500kg DM/ha (Figure 4). I believe this is achievable on the whole farm, so our target now is to increase the remaining 67% to produce similar yields, with particular emphasis on the poorest 33% producing 13,500kg DM/ha. Our top producing paddocks on the milking platform have been reseeded within the last 3 years. One major benefit of grass measuring is I can easily identify under preforming paddocks and now I am targeting these paddocks for reseeding and to increase soil fertility to grow >18,000 kg DM/ha on all paddocks.

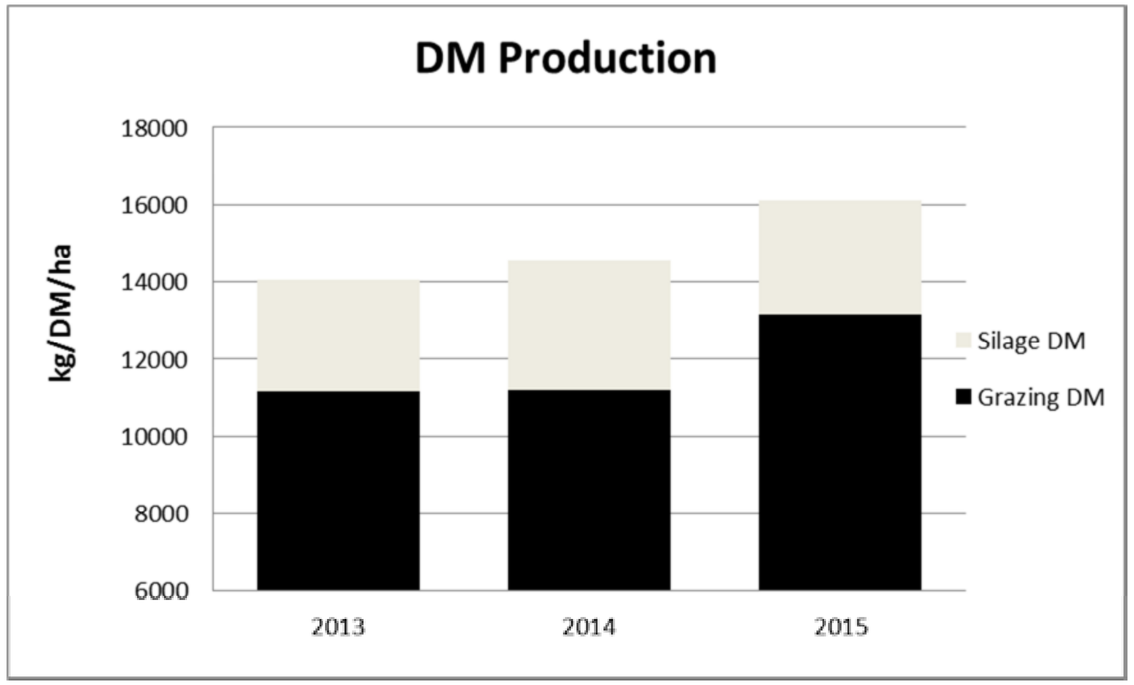


Figure 3. Improvement in Total DM Production over the past three years

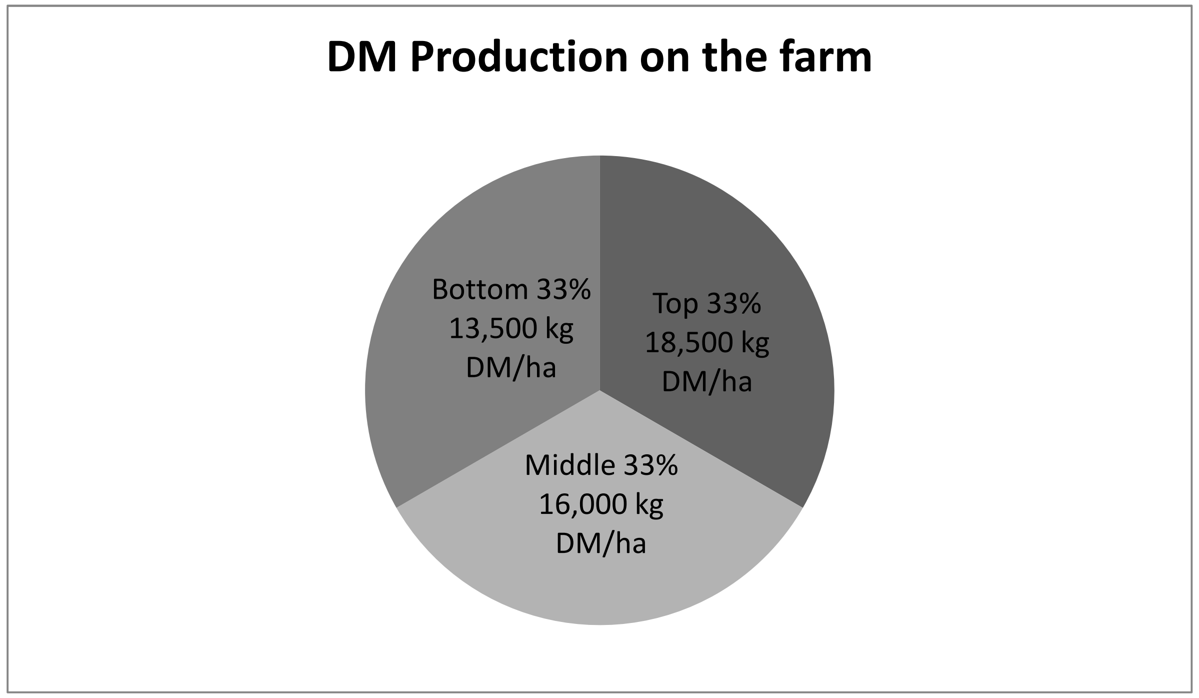


Figure 4. DM Production broken down into bottom, middle and top producing paddocks

Spring Management

The primary objective of spring management on my farm is graze the farm early by putting as much grazed grass into the cow's diet as possible. In doing this I am reducing my costs of production and increasing the value of my milk as constituents are always higher when cows are grazing. Spring grass is much higher quality compared to any silage I make on the farm. We follow the spring rotation planner diligently and supplement if and when required with silage/concentrate. In the past we grazed 30% of the farm by the end of February, however in the past few years we increased this to 40%. Similarly we now finish our first round by the end of March, where previously it was usually between the 7^{th}-10^{th} April. We feel it is better to graze 40% of the farm in February and feed silage at the end of March/early April if necessary. In the past when we were grazing 25-30% in February and continuously feeding silage to "stretch grass", it depresses growth rate and pushes the first round beyond Magic Day. You can then find yourself "wading" through heavy covers to finish the first rotation whilst the February grazed plots are growing too strong. We feel that because of the way that we have altered N fertiliser application pattern and graze a greater proportion of the farm in February the spring rotation planner is vital, as grass that is grazed grows quicker. As a result of this we have increased our spring DM production from 668 kg DM/ha in 2013 to 1,211kg DM/ha in 2015.

We feel that the 2000 kg DM increase in total DM production from 2013 to 2015 is as a result of our change in how we manage the spring grass, we are growing 600kg more DM in spring. My farm is 98ha so this is equivalent to 59 tonnes of grass DM more in the system, which is close to 21 days more grass available in spring for our cows. According to the PPI this additional grass is worth €0.16/kg DM equating to €87/ha, €8500 for my business. In the past number of years we have altered out N fertiliser application in the spring. We now apply 90/100 units of chemical N by 1st April. Immediately after the closed period for fertiliser and slurry application, 20% of paddocks with the lowest cover of grass (<600kg DM/ha) receive 3,000 gallons of slurry per acre. The remainder of the land area receives 30 units/acre of nitrogen, with a further 30 units/acre in mid-February and again 40 units/acre in mid-March. Urea is used for the first 2-3 applications as it remains 30% cheaper than alternatives on a price/kg N basis. Within 2 to 3 days of paddocks being grazed, we spread 2500 gals/acre of watery slurry. During inclement weather on/off grazing is practiced if necessary to avoid damage to paddocks. When setting up the farm on day one we put in multiple entry/exit points in every paddock to cope with wet weather.

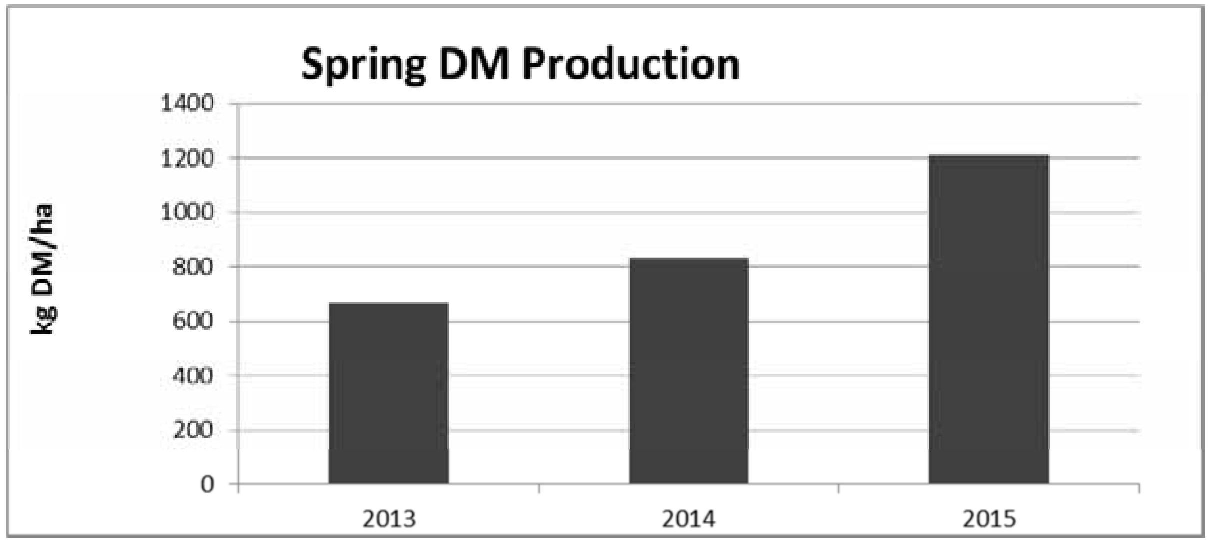


Figure 5. Spring DM Production for the last three years

Mid-season management

A farm walk is completed weekly assessing the covers on each paddock which takes approximately two hours. During weeks of high growth rates I walk the farm twice a week. Rotation length is generally 16 – 20 days. Cover per cow is maintained between 140 – 180 kg DM/cow. Average farm cover is between 500 – 625 kg DM/ha. During the mid-season we spread fertiliser once a week following the cows with 20 – 25 units of Sulfa CAN. Strong paddocks (>1600kg DM/ha) are taken out of the rotation and are cut quickly, usually baled or pitted with a wagon. These paddocks get 3000 gallons of watery slurry per acre after cutting.

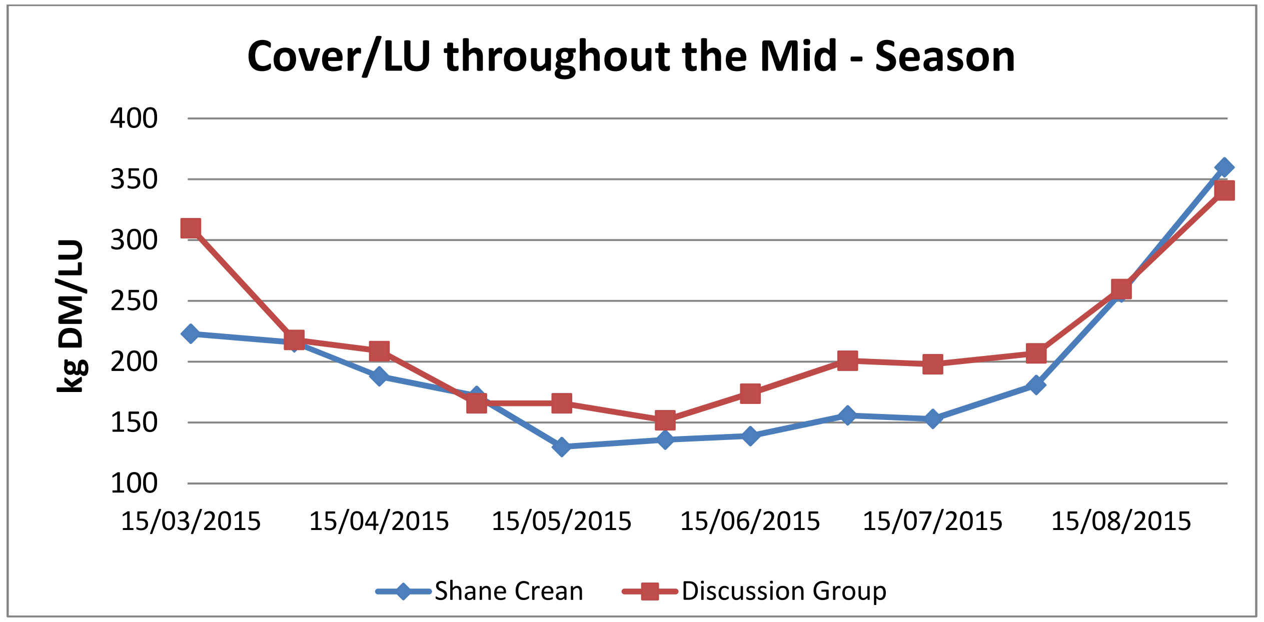


Figure 6. Comparison of mid-season cover (per LU) with discussion group average

Autumn management

The main aim during this period is to keep as much grass in the cow's diet for as long as possible while achieving residuals and closing the farm at the appropriate cover for my farm and calving pattern. In late August/early September we feed approximately 5 kgs DM silage/per cow for 10 to 12 days to help build cover while growth rates are still good. We target a peak cover of 1300 kg to 1350 kg DM/ha for mid to late September (400kg DM/cow). We aim to build up a wedge of grass to take us into late November. On/off grazing is practiced if necessary. We close our first paddocks on 5th October and aim to have 60% closed by 1st November. If we are behind target I graze light covers to speed up the area grazed. On 14th October, all closed plots get 3000 gallons of watery slurry per acre. In a typical autumn, grazing finishes around 20th – 30th November.

In previous years we closed the farm at an AFC of 450 – 500 kg DM/ha. We now close the farm at 600 – 700 kg DM/ha. Another benefit to grass measuring is that you will be able to calculate the amount of grass your farm will grow over the winter period (1st December - 1st February). On average over the last three winters my farm has the potential to grow 250kg of grass DM over this period (4kg DM/day). Knowing this is invaluable as this is an indicator of what cover I need to close my farm with in late November. As my six week calving rate is high, there will be huge demand for grass come to spring time. Grass is more valuable to us in spring than autumn as cows are reaching their peak milk production, and getting ready for breeding.

Future years

The two biggest components which make my business successful and profitable are to utilise more grass per hectare and increase my six week calving rate to >85%.

Grassland Gains

My primary objective in relation to grassland management is to increase the quantity of grass grown per hectare. Last year my farm produced on average 16,000 kg DM/ha. 33% of the milking platform produced 18,500 kg DM/ha. My aim now is to grow 18,500 kg DM/ha across the whole farm through reseeding 8-10% of the farm each year, improve soil fertility where needed and to get cows out as early as possible in the spring to utilise this extra grass and achieve more grazings per paddock.

Cow Capability

As regards cow fertility, the herd has gone through dramatic improvement over the last decade. My six week calving rate is an area which I feel still needs improvement. At the moment my six week calving rate is 78%. Everyday that my cows are not producing milk they are costing the business money. Every 1% increase in six week calving rate is worth

€8.22 per cow. In other words, if I could increase my six week calving rate from 78% to 90% this equates to over €32,000. I need to produce as much milk solids per hectare as possible. An increase in stocking rate to 3.5 – 3.6 LU/ha and feeding 500 kg meal/cow may be viable. Currently I am selling 400 kg milk solids per cow which equates to 1320 kg MS/ha. I have set a target for my herd to sell 1,600 kg MS/ha in the next two to three years with limited supplement. This increase will be achieved as my herd matures and with a small increase in stocking rate over the next few years.

Costs are Key

Since I moved to Doneraile the cost to produce a kg of milk solids was always my benchmark. Over the last number of years I spent €0.50/kg of MS on both feed and on fertiliser. When I was farming in Kerry I was spending three times more on feed when compared with fertilizer. If my cost base was to increase by €0.01/litre €17,000 would be automatically taken off my bottom line. This is the equivalent of half a labour unit for a year. My goal is to reduce my cost base and retain more money from my farm.

My view is that there are cheaper milk solids to come from the farm by:

- Increasing grass utilisation, achieved by more grazings from each paddock
- Increasing six week calving rate to >85%
- Increase milk solids sold per hectare as the herd matures
- Keeping a close eye on production costs

Labour on the farm includes myself, one full-time herds person and one part-time person (1 day per week). We employ another person for a 10 week period in the spring. My parents manage the replacement stock in Kerry. We believe there is more labour efficiency to be achieved by the use of a contractor for slurry spreading and bulk fertiliser spreading.

The last 15 years has been challenging but very rewarding to say the least. We will remain focused on running an efficient grass-based system with a primary focus on keeping a good work/life balance.

Strategies to manage milk price volatility

Tadhg Buckley

Agri Advisor, AIB Bank

Introduction

2015 was a landmark year for the Irish Dairy Industry as it marked the first year in three decades that dairy farmers were not bound by production limits. This seismic change brings with it new opportunities but also significant challenges. The removal of milk quotas and the associated dismantling of internal EU market supports has coincided with a substantial increase in milk price volatility. This increased level of volatility is now part and parcel of the industry and should now be viewed as normal practice rather than an exceptional occurrence.

The increased volatility in milk prices brings with it a whole new set of challenges for dairy farmers. This paper reviews the common characteristics of high performing dairy farmers – who tend to cope better with milk price volatility – outlining also some steps dairy farmers can take in the short-medium term to better position their businesses to cope with an environment where a volatile milk price is the norm.

Why is price volatility now more evident?

For dairy producers in the European Union (EU), price volatility is a relatively new phenomenon. Prior to 2007 milk price was remarkably stable across the EU, as the European Commission (EC) managed the internal dairy markets, keeping prices stable through various market management mechanisms. However, these controls had significant market-altering effects on international dairy markets. As part of the 2003 Luxembourg Agreement, the EC significantly reduced internal market support and allowed internal EU milk markets to become more closely aligned with international dairy market movements. The effect has been dramatic, with significant price movements evident since this policy shift.

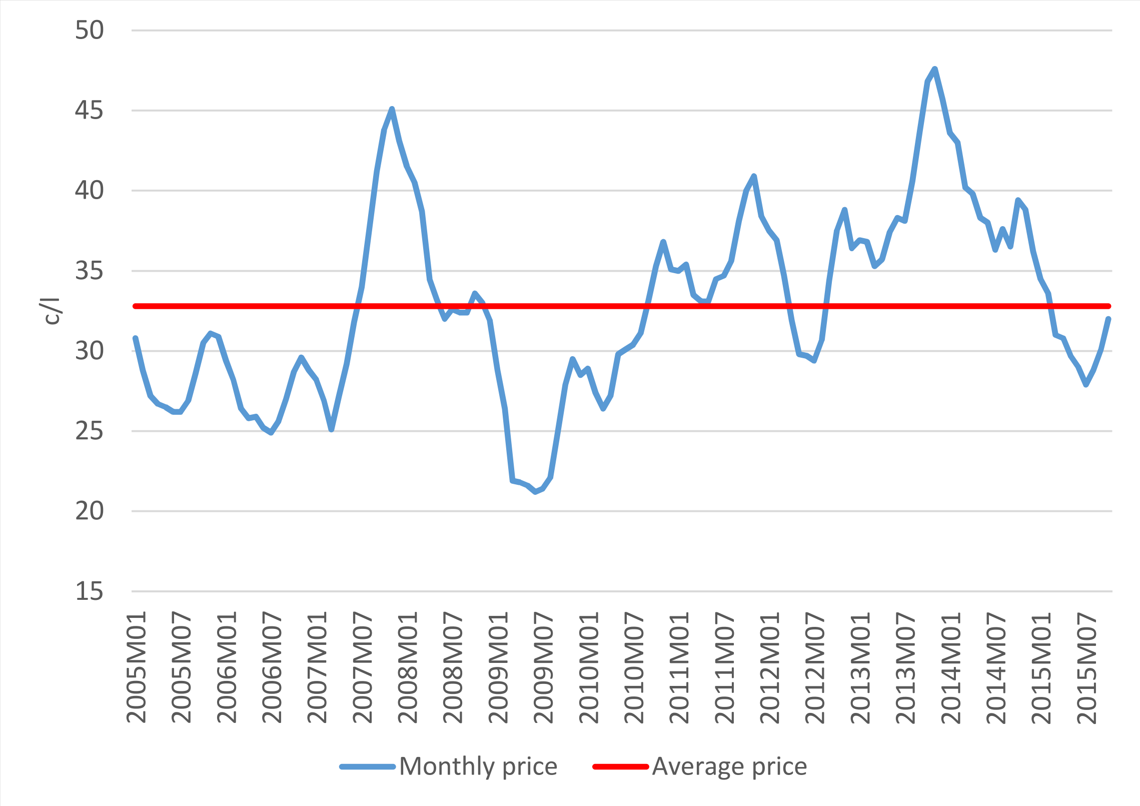


Figure 1. Irish manufacturing milk price[1] (CSO, 2005 - 2015)

Figure 1 represents the monthly Irish milk price for the past 11 years. While average milk price for the period was 32.8 cent/litre the range in milk price is considerable, with peak price of 47.6 cent/litre (in November 2013) and a trough milk price of 21.2 cent/litre (in June 2009).

This increased price volatility has not been solely as a result of EU dairy policy changes. There are a number of reasons why dairy prices are more volatile than before. These include:

- Dairy (and other food) commodities are inelastic in terms of price demand. This means that a modest scarcity of product causes a major increase in prices and vice versa.

[1] Monthly manufacturing milk price, including VAT, actual fat and protein

- Supply response in terms of increased production of dairy products is slow following a change in price. This is due to the nature of the production cycle in dairy farming which is prolonged when compared with other production cycles e.g. pigs.
- Increased globalisation of dairy commodity trade and increased price transparency which is substantially aided by Fonterra's Global Dairy Trade online trading platform.

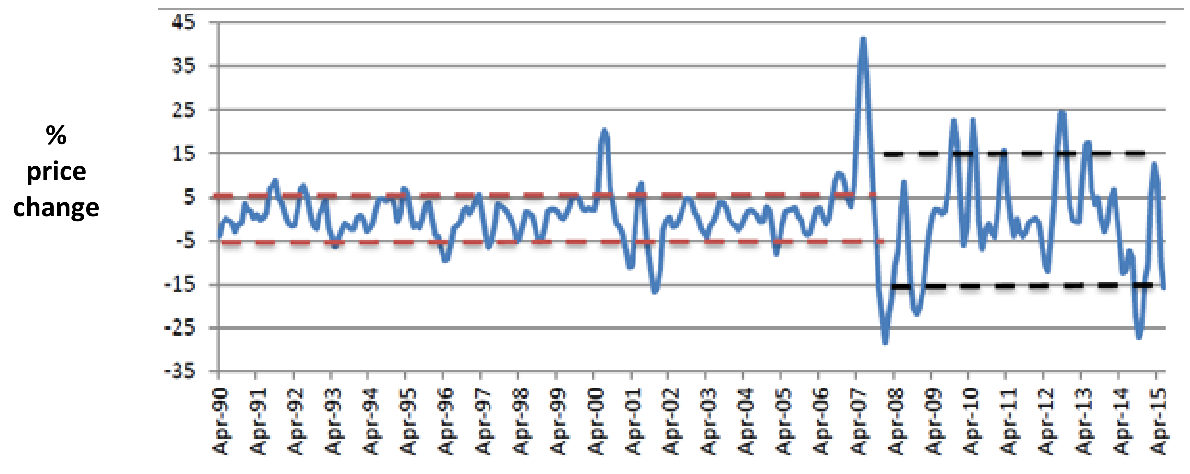


Figure 2. 3-month percentage change in EU Skim Milk Powder price (O'Connor et al., 2015)

Figure 2 illustrates the level of volatility that has been evident over the past 25 years and shows that, prior to 2007, Skimmed Milk Powder (SMP) price seldom varies by more than 5% in a 3-month period. However, it is clear that there has been a marked increase in volatility since 2007 with variances of greater than 15% a regular occurrence.

Why farmers are most exposed

Farmers are more exposed than others in the dairy industry to the worst effects of price volatility for a number of reasons. These include:

- Farmers are price takers rather than price makers and are unable to easily pass on input price increases. In addition, farmers are exposed to both input price and output price risks. Milk processors and end users can limit their risk by passing on input price increases – this option is not readily available to primary dairy producers. It should be noted though that the increased power of retailers is making it more difficult for processors to pass on input price increases also.

- Irish and EU milk producers have limited, albeit increasing, options to hedge their milk price to reduce the worst effects of volatility. Hedging is defined as making an investment to reduce the risk of adverse price movements. In practical terms, it would involve a dairy farmer fixing the price of his/her milk for a defined period of time in order to provide milk price stability.
- The Irish Dairy Industry is heavily export-dependent and is a seasonal producer of mainly commodity products. This makes the Irish dairy sector more exposed to volatility than other EU countries.

Common traits of farmers better able to manage volatility

The performance range among dairy farms, no different from any other business sector, varies considerably. While certainly an influence, the variance in performance or profitability cannot necessarily be explained by size, land type or location in isolation as the technical and managerial capabilities of the individual farmer is of fundamental importance to farm productivity and performance.

Farmers, regardless of their farm size, are business managers. Their daily tasks can include production management, financial management, people management, and regulatory management as well as many other tasks. In larger organisations these functions are often separated into distinct divisions with managers designated to oversee each. Farmers do not have this luxury and need to be competent in all these areas. This presents a challenge and how well farmers overcome this will drive the overall performance of the business.

While there are numerous variables that influence the overall business performance of a dairy farmer, there are a few key characteristics that are common to high performing farmers. These are listed below along with an associated brief commentary.

Have a strong network

High performing farmers generally have a strong network to gather information and feedback from. These networks can be both formal (e.g. discussion groups) or informal. In addition, while information will be gathered from numerous sources, high performing farmers are able

to process the information and apply it effectively to their existing farming operation to help improve performance. They are also more adept at taking advice from the right sources and leaving aside information that will not impact positively on farm performance.

Simple and stable farm system

High performing dairy farms are more often built around a simple system. The farm is driven by defined core objectives (albeit often unwritten which is not necessarily desirable) such as maximising grazed grass. The farm does not deviate from the system due to short-term changes in market conditions such as a spike in milk price. A more simplified farm system allows more attention to detail as it reduces other distractions, making it easier to manage as scale increases or possibly replicate on a second dairy unit.

Strong financial awareness

A strong understanding of the financial position of the business is another key characteristic of high performing farmers. Strong financial management is consistently evident with buffers (e.g. deposit funds) in place to help overcome any short-term financial difficulties should they be encountered.

Excellent people managers

Regardless of whether a farmer has direct employees or not, people management is absolutely essential to maximise farm business performance. Often, people management is seen as necessary only for larger farms with full-time employees when in reality it is as important for a farmer with no direct employees. A farmer's people management skills will ensure they have strong relationships with key stakeholders in their businesses including the machinery contractor, vet, agricultural advisor, milk advisor and bank manager to name a few. Without the ability to manage these relationships effectively a farmer may struggle to maximise their potential.

Make timely decisions and get more of them right

Management, regardless of industry, involves constant decision making. Even the best managers do not always make correct decisions but the best managers get more of the critical decisions right. Decision-making drives overall business performance with international research indicating that decision effectiveness is directly related to financial performance of a business (Blenko et al., 2010). Having a simple farm system with clearly defined goals lends itself to better decision making for a couple of reasons. Firstly, there are fewer decisions to be made on a daily basis and secondly, if the core objectives of the farm are clear then it is easier to make decisions that align with the overall objective of the farm business.

Good managers also make daily farm management decisions promptly and often do so without full information. In many cases, it is better to make an imperfect managerial decision and correct it in due course when further information comes to hand than procrastinate and make no decision at all. However, when making a decision critical to the long-term performance of the business such as capital investment, the top farmers ensure they are fully informed before making a final decision.

How to manage price volatility at farm level

Price volatility will not impact on all dairy farmers in a similar fashion. The potential impact will be very much down to the competitive position of the farmer in question. Before any farmer makes a judgement about how best to cope with volatility he/she must first establish their competitive position. This will govern what effect price volatility will have on their business. The competitive position of the dairy farm will be driven by what its break-even milk price is. By calculating this, a farmer can make a more informed decision on potential options available to reduce price volatility such as fixed price contracts.

What is your farm's break-even cash milk price?

Calculating a farm's break-even milk price is an entirely farm specific exercise. It is the milk price that your farm business needs to meet all cash commitments. This calculation should include both capital and interest financial repayments, drawings/household expenses and taxation. It should also exclude depreciation as it is a non-cash expense (the capital portion of repayments is included in its place).

In order to establish your break-even milk price a good starting position is to review total farm income and expenditure for 2015. The following table is a simple example of income and expenditure on a 100-cow dairy farm in 2015 (Table 1).

Table 1: Example of Annual Income and Expenditure on 100-cow spring-calving dairy farm

Dairy Farm Income & Expenditure			
Income		**2015 (€)**	
Milk Sales (litres)	510,000		
Net Milk Price (c/l)	32		
Milk Sales		163200	
Cull Cow Sales		10,450	
Calf Sales		7500	
Direct Payments		18000	199150
Expenditure			
Purchased Feedstuffs		21000	
Fertiliser & Lime		22250	
Contractor		13250	
Vet, Med, AI		13250	
Misc. variable costs		3500	
Machinery Maintenance		7500	
Motor, Electricity, Phone & Insurance		11000	
Land Rental		1250	
Wages		2000	
Superlevy Repayment		3500	
Professional fees		2000	
General Maintenance & repairs		7000	107500
Surplus Before Drawings, Tax & Financials			**91650**
Less:			
Household Expenses		44000	
Taxation		11500	
Financial Repayments incl. O/D Interest		18500	74000
Net Surplus			**17650**
Farm Break-even Milk Price (cent/litre)		**28.5**	

Break-even Calculation	
Milk Price Received (cent/litre)	32
Less Net Surplus in cent/litre (€17,650/510k litres)	3.5
Break-even milk price (cent/litre)	**28.5**

(Figures used are for indicative purposes only)

This exercise allows a farmer to establish at what milk price their business will be in cash deficit. In this particular example which has been simplified, at a solids-adjusted price of 28.5 cent/litre the farm is operating at a break-even level. This assumes the value of non-milk sales remain constant. This figure will vary substantially from farm to farm and will be influenced by a number of factors including the level of household expenses the farm has to support; the level of taxation the farm will incur (now and in the future), and how substantial financial repayments/land lease costs are. This farmer knows that, should their output levels and expenditure remain static, they can cope with a milk price 3.5 cent/litre lower than the price they received in 2015. Completion of this exercise along with an annual projection for 2016 based on the 2015 figures is essential for all dairy farmers and will guide what actions they need to take in the short and medium-term.

Farm competitiveness will influence how to deal with volatility

Once a dairy farmer is aware of what their cash break-even milk price is they can then formulate an approach on how best to deal with volatility in the short-medium term. The following diagram aims to explain how volatility impacts farmers differently depending on their cost of production.

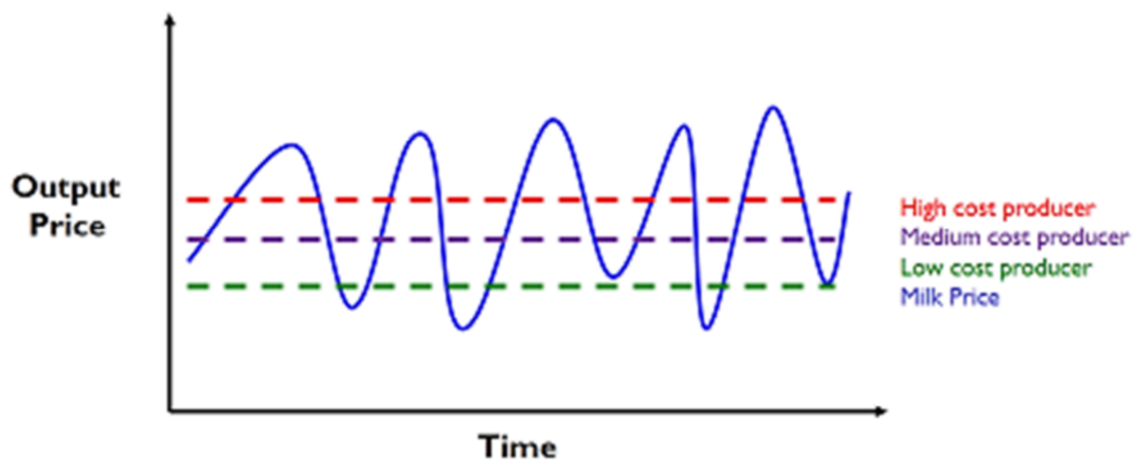


Figure 3. Competitiveness comparison – high cost vs low cost producer (Buckley 2010)

The erratic line in Figure 3 represents a volatile milk price while the broken lines represent the cost of production of three different producers. These three different producers have been categorised into high cost, medium cost and low cost.

High cost producer

Managing price risk and volatility is less of an issue here, as the overall efficiency of the dairy farm is the core issue. This producer will struggle to operate profitably with the exception of unusually high milk price periods and will struggle to meet all on-farm and off-farm commitments unless he/she improves efficiency. Price adequacy rather than price volatility is the issue in this case – the average milk price in the medium-term is not adequate to sustain the business at its current cost of production.

A dairy farmer in this position is likely to incur a cash deficit in 2016. In the short-term this farmer will need to finance this either through bank finance, creditors or own funds. It is likely that any financial deficit incurred will take more than 12 months to repay – therefore, short-term working capital facilities will not be sufficient to fund the deficit incurred. Other options, such as a term loan may be more suitable in this case.

More importantly, the main objective for this farmer in the medium-term should be to reduce his/her cost of production and/or increase their average output price (mainly through improving milk solids) to a sustainable level. If this farmer does not improve efficiencies they will find themselves under constant financial pressure. Price volatility is not the root cause of the pressure but significantly exacerbates it.

Medium cost producer

This producer will benefit from managing milk price volatility. Availing of options such as fixed milk price schemes will not improve their average milk price, (if anything it may slightly reduce it), but this producer will manage better financially with periods of low milk price such as what we are currently facing. It is therefore a prudent business decision to avail of fixed milk price schemes as it provides partial income certainty for these producers.

In preparing for 2016, this farmer needs to complete a monthly cash flow to establish if existing working capital facilities will be sufficient to cover any deficits. In addition, all non-essential farm expenditure should be postponed.

In the medium-term this farm should continue to focus on managing price volatility by availing of options such as fixed milk price schemes if available, seeking also to improve on-farm efficiency and/or cost control. A medium-cost producer may be very efficient at farm level but have a very high fixed cost base or a high level of household expenses. Accordingly, their capacity to reduce costs may, in some cases, be limited.

Low cost producer

This producer can cope with periods of very low milk price relatively comfortably. Therefore, managing milk price volatility is not as much of a priority as for higher cost producers as milk price volatility does not have any significant long-term financial implications. Effectively, this farmer is already managing volatility by running a highly-efficient, low cost dairy farm.

In preparing for 2016 this farmer needs to complete an annual cash flow to establish their break-even cost of production. This should be re-visited if milk price falls further to ensure the farming operation remains in a cash surplus position.

Efficiency gap

The efficiency gap between the top and bottom 10% of dairy farmers remains very substantial. Figure 4 compares the net margin of the top 10% of dairy farmers in the Teagasc profit monitor with the bottom 10%.

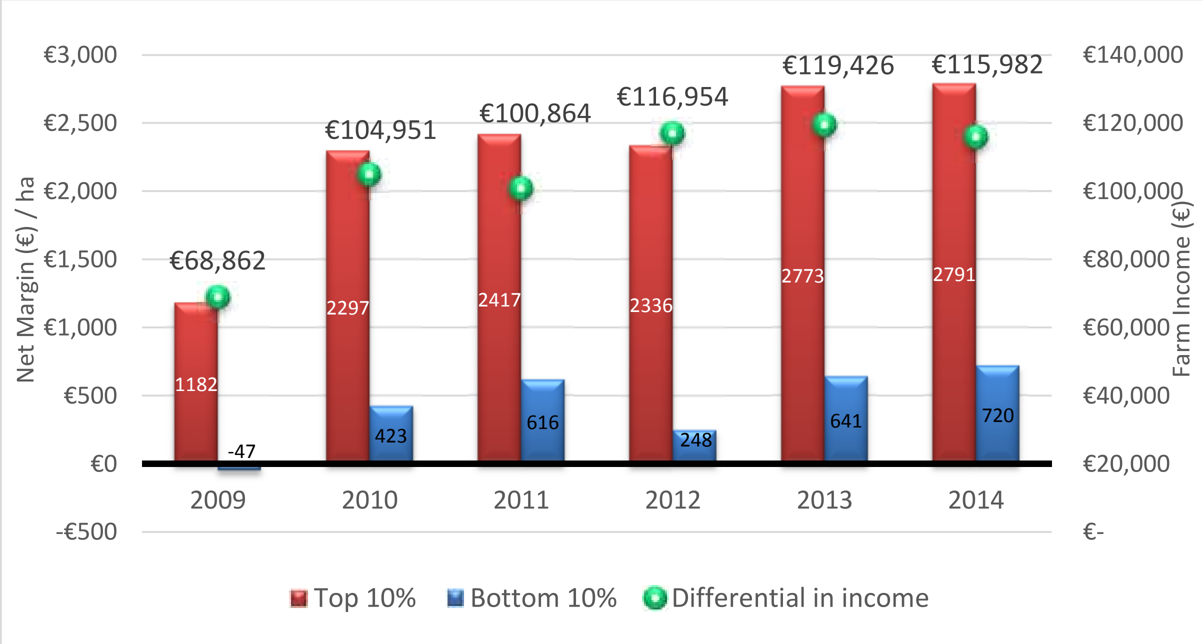


Figure 4. Dairy farm net margin comparison 2009-2014[2] (Teagasc Dairy Profit Monitor, various years). With a net margin differential of over €100,000 between top and bottom performers, there is scope for significant efficiency improvement on many dairy farms.

A similar picture develops when co-op milk price is compared. Looking at 2014 Teagasc Profit Monitor data in isolation there is a difference of 2.35 cent/litre in the milk price received by the top 10% compared with the bottom 10% of farms. This can be almost entirely attributed to better milk solids constituents and further reinforces the capacity for efficiency gains.

Conclusion

Milk price volatility is a relatively new phenomenon for Irish dairy farmers; however it is clear that it will be a constant feature of dairy farming into the future. The impact that milk price volatility will have on your farming operation will be heavily influenced by the competitiveness or efficiency of your business. For highly efficient low-cost producers volatility will cause a level of discomfort and uncertainty but will not have a significant negative impact on financial performance in the medium-term. Medium-cost producers will

[2] The top 10% and bottom 10% of farmers is based on a Net Margin/litre basis. The differential in income assumes an average farm size of 56 ha.

be more affected by volatility and will find strong benefits in volatility management tools such as fixed milk price schemes. For high cost producers, volatility merely exacerbates fundamental inefficiencies in the business. Inefficiency rather than volatility is the core issue – this will need to be addressed regardless of the level of milk price volatility encountered in the future.

Irrespective of existing performance, it is important to have a plan in place and to build a strong set of resources including people, skills and a cash reserve to position your farm business to cope with future volatility. Now is the time to develop your resources. I would encourage farmers experiencing or anticipating cash flow difficulties as a consequence of existing challenges to make early contact with their bank. Solutions are best tailored at an early stage and early contact is key.

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Teagasc Dairy Profit Monitor, various years.

PERSONAL DETAILS

(BLOCK LETTERS PLEASE)

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Address____

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Home number ________________________________

Mobile number _______________________________

Email address_________________________________

BTE Herd/Flock Number__________________________

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Annual IGA Journal	Yes / No		
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Irish Grassland Association

SEPA Direct Debit Mandate

SEPA Direct Debit Mandate

Unique Mandate Reference (UMR) – to be completed by the Irish Grassland Association

By signing this mandate form, you authorise (A) the Irish Grassland Association to send instructions to your bank to debit your account and (B) your bank to debit your account in accordance with the instructions from the Irish Grassland Association. As part of your rights, you are entitled to a refund from your bank under the terms and conditions of your agreement with your bank. A refund must be claimed within 8 weeks starting from the date on which your account was debited.

Please complete all the fields marked *.

Debtor Name / Your Name	*	
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Debtor account number – IBAN	*	
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Creditor's name	*	IRISH GRASSLAND ASSOC.
Creditor identifier	*	IE50SDD305846
Creditor address	*	COOKSTOWN
Town	*	KELLS
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Country	*	IRELAND
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Date of signature	*	

Signature(s)

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Please send this mandate to the creditor (Irish Grassland Association, Cookstown, Kells, Co. Meath.)

Dealing with Milk Price Volatility

Barry Murphy

Regional Manager, FDC Accountants

Context

While the abolition of dairy quotas in 2015 has removed production constraints within the industry the key issue facing dairy farmers in our view will be price volatility.

As "price takers" little can be done in terms of influencing the milk processors and one can only hope that they continue on the road of focusing on the production of higher margin products and the expansion of their markets. The hope would also be that the processors would look at greater levels of co-operation and/or rationalisation.

In terms of addressing volatility therefore the only thing a farmer can really influence and control is what takes place within the farm gates.

The Most Vulnerable

We believe that the new entrant and expanding farmers are the most susceptible to price volatility issues. Typically these enterprises need to be very focused on the significant costs associated with expanding livestock numbers and the investment required in supporting infrastructure. Our experience in many cases is that this required investment is very often underestimated and not properly assessed or resourced.

Addressing Volatility

Attitude

The first issue in our view is the farmers **attitude and outlook**.

As milk prices have fluctuated in the past we have seen many farmers move swiftly and seamlessly from pessimism to euphoria while allowing these moods to directly influence their immediate decisions – a management approach that could be best described as "reactionary"!

What we in FDC recommend is a proactive approach based on a medium term outlook incorporating a five year rolling business plan, periodic market assessment, financial management and cashflow projections.

Farm Management

- Knowing costs of production on the farm.
- Knowing the key elements influencing cost of production and reappraising these in a structured and focused way.

Financial Management

- Putting a five year rolling business plan in place.
- Financial management system that provides the farmer with an ability to calculate the anticipated cashflow implications of changes to milk and input prices so that any issues are well flagged to the supporting bankers in advance.

Expansion Issues

- Expansion plans need to be properly assessed and costed.
- Associated bank loans need to be sufficient with appropriate terms that relate to farm cash availability and lifespan of the asset funded.

Bank and Tax

- Tax planning
- Keep your bank informed – they are very often a key stakeholder in your business and they don't like surprises!
- Proper and timely information to your Bank = lower perceived risk = lower interest rate charged.
- Avail of banks products that reduce loan payments during periods of adverse milk price / weather events. A key rule in FDC is that no client meets a bank on their own!

Cutting your Cloth!

Noel Gowan

Grasstec, Kilpatrick, Mallow, Co. Cork

For the second January in succession much of the discussion on farms in Ireland and the UK revolves around milk price volatility and projections going forward. The short-term outlook is relatively poor and unfortunately for many, the projected price will be lower than the associated costs of production. So it is time to plan. Financial budgeting and cashflow projections are a must, but this paper highlights the importance of understanding what makes a profitable grass based dairy system and an associated low, but flexible cost structure.

Quotas gone & forgotten!

Nine months into the "non-quota" regime, and thankfully the conversation has moved from superlevy to expansion, progression, new entrants, and the like. While low milk price may have slowed progress in Ireland over the past 9 months, it is worth while looking at the UK situation, which effectively worked under a non-quota regime for many years (Table 1).

Table 1. Change in number of UK dairy farms and cows from 2004 to 2014

	2004	2014	Difference	% Change
No. Dairy Farms	21,616	13,815	-7801	-36%
No. Dairy Cows (m)	2.10	1.84	-0.26	-12%
Ave Herd Size	97	133	36	+37%
Ave Milk Yield/Cow	6763	7916	1153	+17%
Source DairyCo.				

During the past 10-15 years there was an industry viewpoint in the UK that the national quota would not be breached, which allowed both herd size and milk yield per cow to increase significantly at farm level. However this increase in "per cow output" is almost single handed on the back of imported feed & additional concentrates with little or no increase in farm profitability. So lesson learned there and not to be repeated!

A fundamental problem within the UK dairy industry is the lack of understanding of the key profit drivers of their dairy enterprise. In the absence of national independent research and advisory, other service providers have been allowed to set the scene in this regard. Inside the farmgate it is perceived that "output/cow" and "margin over purchased feed" are the drivers of profit and so the systems are geared towards this - but also leading to higher costs of production, with less margin per litre especially at low milk price.

Figures 1 and 2 show the range in costs of production, and associated revenues for Ireland and UK. Looking at the UK data first (Figure 1), it is clear that there is 25% of the UK industry with little or no margin irrespective of milk price. It is also clear that year to date in 2015 most will fail to show a clear profit. The Irish data shows a similar story. Based on 2014 costs of production, it is likely 50% of Irish dairy farmers will not generate profit in 2016 based on milk price projections. So, time to take action.

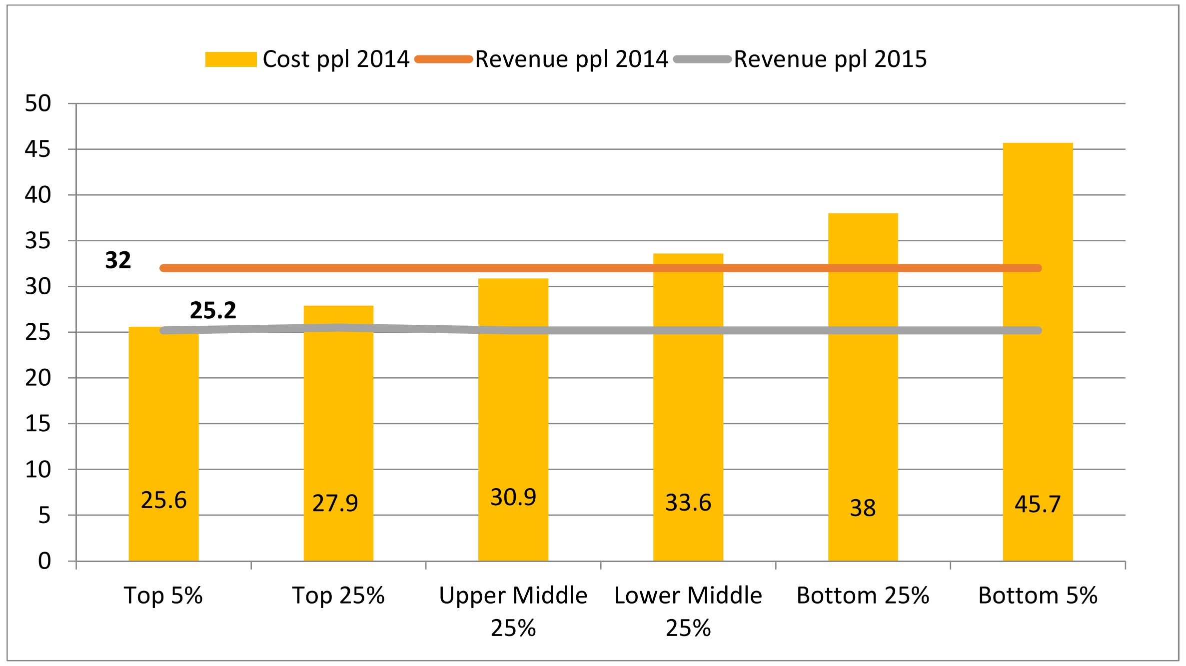

Figure 1. Range in costs of production, and associated revenues in the UK *(Source DairyCO)*

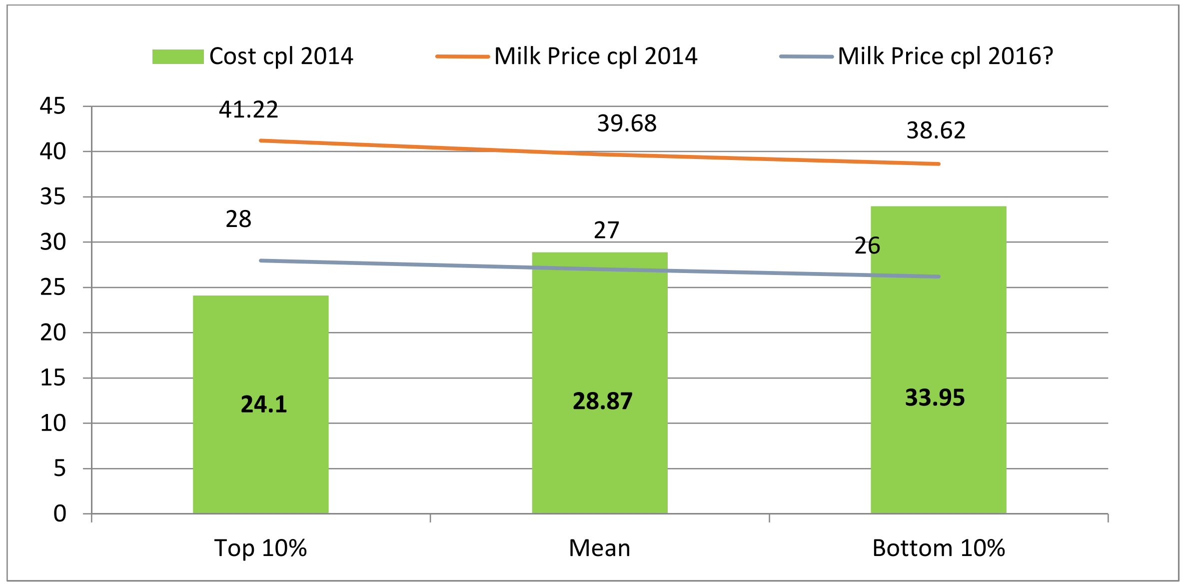

Figure 2. Range in costs of production, and associated revenues in Ireland *(Includes own labour charge 6cpl)*

What are the main drivers of Profit?

1. **Costs of Production**

There is enough categorical evidence from on-farm data in Ireland, UK and New Zealand to show that "Costs of Production" have the biggest effect on farm profit. Datasets regularly show that cost of production explains approximately 70% of the difference in profit between farms. Nothing new in this you might say but it is detailed analysis of your costs base that will have the biggest bearing on your ability to cope with low milk price and the best aspect of this analysis is that you are fully in control.

Knowing where milk price is likely to be next year, the first, and very simple retrospective analysis is to establish what is the break even cost of production you must achieve to allow for personal drawings, bank repayments and tax. For example:

100 cow herd producing 5,200 ltrs per cow with solids corrected milk price of €0.285 c/l & sale of 70 calves @ €150/calf

100 x 5200 = 520,000 ltrs x 0.285 = €148,200
70 Calves @ €1250/calf = €10,500
Total Income = **€158,700**

Minus

Personal Drawings - €42,000

Bank Repayments - €25,500

Projected Tax from previous year - €15,000

Amount Remaining - **€76,200** to produce milk and calf sales or **14.65c/l** breakeven cash costs of production. This must be your starting point in analysing your costs.

We are now in a time of the year when the perennial discussion about the previous years profit monitor data and associated costs of production. At a recent meeting of a UK grass based discussion group the topic of cost cutting in 2016 was discussed - as preparation for the meeting, each group member was asked to provide 3 techniques they were going to apply in the coming year to reduce their costs base by 15%. Their suggestions are presented in Table 2.

Table 2. Techniques to reduce costs by 15% in 2016

Cost Cutting Strategy	Reason/Comment
Feed Supply & Usage	
Higher level of grass measurement & budgeting	More grass / less concentrate & less feed cost
Mineral supplementation	Wide range in price within the market – Shop around
Buying "straights" instead of Formulated feed	Saving expected of £35-40/tonne
Concentrate type feeding to compliment grass intake	Low level concentrate feeding in the form of high energy cereal or pulp product
Veterinary & Breeding	
Reduce/remove fertility drug usage	Questionable as to whether they are necessary in first place given improved herd fertility
Minimise herd vaccination program	Proceed with caution – only if herd health screening allows and closed herd.
Minimise vet callout	Callout usually means costly on-going treatment. Must NOT be in contradiction to animal welfare
Dry Cow therapy or teat seal, not both	Not both – decide with once off late lactation milk recording for SCC
No teat dip when at grass day & night	Simply not necessary if grazing & ground conditions are good.
If Metrichecking – do it yourself	Don't need technician or vet to do it?

Cost Cutting Strategy	Reason/Comment
Strategic AI semen selection	Big difference in price/straw within the market – choose wisely.
Routine veterinary products	Avoid well known branded products – generic products just as good - the active ingredient and its strength is what should be compared.
Fertiliser Usage	
Urea instead of CAN	Split N usage between urea and CAN. Use urea when conditions allow.
Strategic N application	N application should be a function of demand on the farm especially in the mid-season. Further alter application subject to grass measurements (surpluses/deficits)
Slurry application in short term to address P & K deficiencies	Slurry is a resource – you are going to have to bear the cost of spreading it anyway – do it wisely
Postpone Lime application	Unless levels are too low
Postpone Reseeding	Self explanatory
Postpone Weed Spraying	Self explanatory
Other Costs	
Electricity supply	Shop around – savings to be made
Electricity usage timing	Self explanatory – more on night rate
Dairy Chemicals	Shop around - there is a lot of competition within the market – take advantage of it
Reduce some hot washes	Self explanatory – subject to milk quality results
Reduce contractor/machinery usage	Coupled with more strategic grassland management. No pre-mowing, topping, hedge cutting.
Negotiate rate per hour for contractor	Move from rate per acre for some activities, especially where facilities are good
Liquidate machinery	Especially those with regular maintenance cost
Farm labour	More strategic sourcing and use. Staff sharing between farms?
Farm maintenance	Can you postpone some maintenance jobs – but must NOT be at the expense of farm safety.
Staff training	Provide staff training - Can daily routine jobs be done in-house e.g., hoof care, DIY AI. Can annual maintenance jobs be done in-house – e.g. fencing, welding etc.
Reduce stocking rate – Cull non-productive animals	Especially if winter feed is limiting. Also releases some cash.
Join a purchasing group	Strength in numbers – will lead to cost savings.

The conclusions from this group meeting were that;

- In an effort to reduce cost, you should not focus on one particular aspect of cost. Cost cutting is multi-factorial.
- A lot of cost cutting options are available – all not applicable to every dairy farmer – some are applicable to most. These are the inches that make up the miles
- Development of "Cost Cutting Mindset" is essential from the outset. Whenever you have to make a purchase ask the question is it something I MUST HAVE/DO or WOULD LIKE TO HAVE/DO. If the answer is MUST then you MUST purchase. If the answer is WOULD LIKE TO then avoid. Be honest!!

Time to introduce the concept of **discretionary expenditure**. Discretionary expenditure are the costs to your business that have least effect on the output of the herd in an individual year…. put another way, if you choose not to spend it, there will be little effect on the revenue of the farm. It is your ability to identify your discretionary expenditure within your cost base which will lead to the most strategic cost saving and resilience, especially in a low milk price scenario.

So what can be considered discretionary expenditure? Some suggestions…

- Capital expenditure
- Maintenance & repairs
- Reseeding
- Milk Recording
- Scanning
- Weed Control
- Soil Testing
- Lime / Expensive Compound Fertilisers?

So, the suggestion is that this discretionary expenditure should come out of your cost base during low milk price years. Equally, this must be balanced by their inclusion in other higher milk price years – and in some instances even at a higher rate. For example, no reseeding in low milk price years balanced by higher rates of reseeding in high milk price years.

2. **Grass Utilisation**

Probably the least understood but highly important indicator of profit on Irish dairy farms. Usually an end of year calculation, it refers to how much of the energy required by the herd and its output, is supplied by home grown grass. Expressed as t DM/ha, the most recent data from 2014 NFS data which uses only specialised dairy farms and is taken on a milking platform basis shows that for every one tonne increase in DM utilised per ha will increase profit by approximately €267/ha (Figure 3).

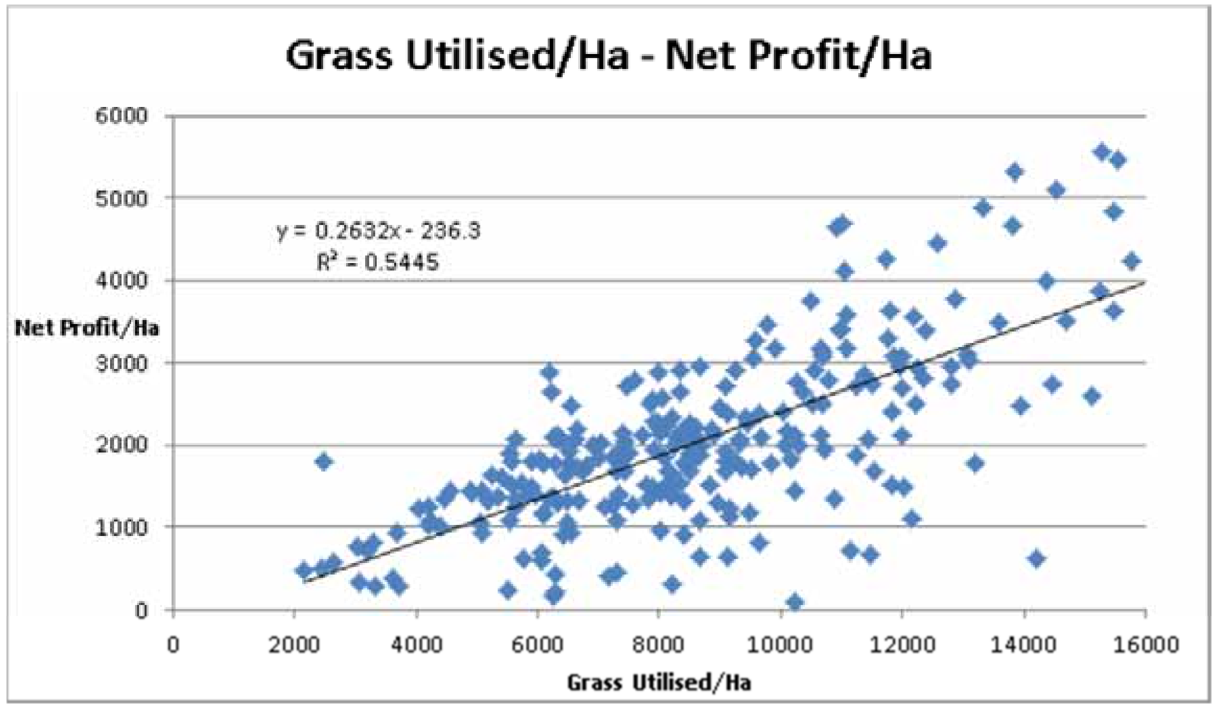

Figure 3. Relationship between grass utilised/ha and net profit/ha (*Source: Shalloo et al. 2015)*

Grass utilisation calculation (t DM/ha) is primarily driven by stock numbers (higher stocking rate = higher utilisation) and imported feed (lower concentrate = higher utilisation) and it transpires that those with relatively high stocking rate and high output/ha from low concentrate inputs are those who are driving high profit from their system.

But there is a limit - the farms ability to grow high tonnages of grass. With grass growth also expressed as t DM/ha, we need to target grass utilisation of 85% of what the farm grows. In the context of low milk price it is essential that you don't over extend yourself in this regard.

For example, there is no point in carrying a high stocking rate in an attempt to realise 13.5 t DM/ha utilised when realistically the farm grows on average 13.8 t DM/ha. It is inevitable that growth will be below demand through the year and you will be forced to intervene with expensive imported feed which will ultimately increase cost and decrease utilisation and drop profit. Your grass growth / grass utilised relationship is the basis of a resilient system, able to cope with low milk price and also to take advantage when milk price rises.

Don't forget Grass Growth

So we have established that grass utilisation is key driver of profit and that grass growth underpins grass utilisation. It is therefore imperative that we understand the factors that affect grass growth. The main factors affecting it are:

1. Weather
2. Soil Fertility
3. Species
4. Management

While not particularly ranked in order of importance it is weather that has the biggest effect, and similar to milk price, is totally out of our control.

Weather, like milk price, is volatile – even more so and therefore we must work harder to limit its effect on grass growth when it conspires against us.

It is no longer acceptable to have sub-optimum soil indexes and pH. It is no longer acceptable to have a high proportion of weed grasses in the sward. It is no longer acceptable to mis-manage your swards and grazing practises. Let weather do what it likes, at least you have done your bit!

Body condition score, resumption of cyclicity and uterine health affect subsequent fertility performance in dairy cows

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Introduction

Milk production in low cost seasonal calving pasture-based systems is dependent on the efficient conversion of grazed grass into milk solids. Compact calving before turnout to pasture allows seasonality in grass growth patterns to be exploited and allows herdowners to maximise milk solids output and pasture utilisation (Dillon *et al*., 1995). Reproductive performance of dairy herds has long been recognised as a major contributor to the overall profitability of sustainable and resilient dairy farm systems. In the context of fertility in seasonal calving systems, the critical key performance indicator is six week calving rate; the most profitable 10% of Irish dairy operations achieve the industry target of a six week calving rate of 90%. The national average six week calving rate is 57% (ICBF, 2015). Shalloo *et al*. (2014) demonstrated that increasing this figure to the industry target of 90% was associated with an additional €264/cow/year. Achieving a compact calving pattern in spring is entirely dependent on achieving a high pregnancy rate within a short period following the planned start of mating. The objective of this paper is to highlight the importance of body condition score, resumption of cyclicity, and uterine health status in achieving excellent fertility performance.

Body Condition Score

Body condition score (BCS) is a tactile and visual appraisal of stored energy reserves of an animal based on the amount of palpable body fat that an animal possesses, independent of frame size and body weight (Roche *et al*., 2009). It is expressed on a scale from 1 (emaciated) to 5 (extremely obese) with increments of 0.25. Monitoring of BCS and BCS change throughout the gestation-lactation cycle allows efficiency and level of milk production to be optimised, while minimising reproductive and health disorders (Roche *et al*., 2009). After calving, lactating dairy cows experience a rapid increase in milk yield, a slow rise in dry matter intake, and increased mobilisation of adipose tissue. The gap between energy output in milk and energy intake from the diet is called negative energy balance. It is normal for cows to undergo a period of negative energy balance in early lactation, resulting in mobilisation of fat reserves. The period of greatest fat mobilisation is during the first two weeks after calving. It is typical for lactating dairy cows to lose 30-40% of their initial fat reserves after calving, but this figure can rise to as high as 80% with inadequate nutrition (e.g., inadequate pasture availability/insufficient concentrate supplementation in early lactation). Both BCS and BCS change can be used as an indirect measure of the energy status of an animal during the early postpartum period and during the period when cows are bred. The degree of BCS loss provides an indication of the severity and duration of negative energy balance early postpartum, which directly affects fertility performance. Results from the Farm Fertility Study clearly demonstrated that cows in poor BCS at calving or cows that experience excessive BCS loss (> 0.5 BCS) between calving and breeding are less likely to ovulate before the planned start of mating, have reduced submission rates to AI, reduced conception rates, and increased likelihood of pregnancy loss (Buckley *et al*., 2003).

Ensuring the target BCS is achieved at breeding requires correct management throughout late lactation and the dry period; see Figure 1 for key periods to assess BCS and BCS targets. If a cow fails to calve at the correct BCS, it is virtually impossible to achieve BCS gain in early lactation. Therefore, if a cow calves down thin, she will remain thin throughout early lactation and the breeding season. Poor BCS cows often fail to exhibit oestrus during the pre-breeding period. Cows with extremely poor BCS (< 2.50) often present with small inactive ovaries at ultrasound examination. The recommendation is to allow these animals time to replenish body energy reserves and resume normal cyclicity. The bottom line is the presence of a large number of animals below target BCS at the planned start of breeding represents a massive challenge to maximizing submission rates. Failure to identify and correctly manage poor BCS cows in early lactation can have a hugely deleterious effect on six week incalf rates, thus eroding the possibility of achieving and/or maintaining a compact calving pattern. The ability to assess BCS is a key skill that will allow the energy status of the herd to be closely monitored throughout the gestation-lactation cycle. This will allow more informed nutritional management decisions to be made in a timely manner to optimise the milk production and fertility performance of the herd in the current/subsequent lactation.

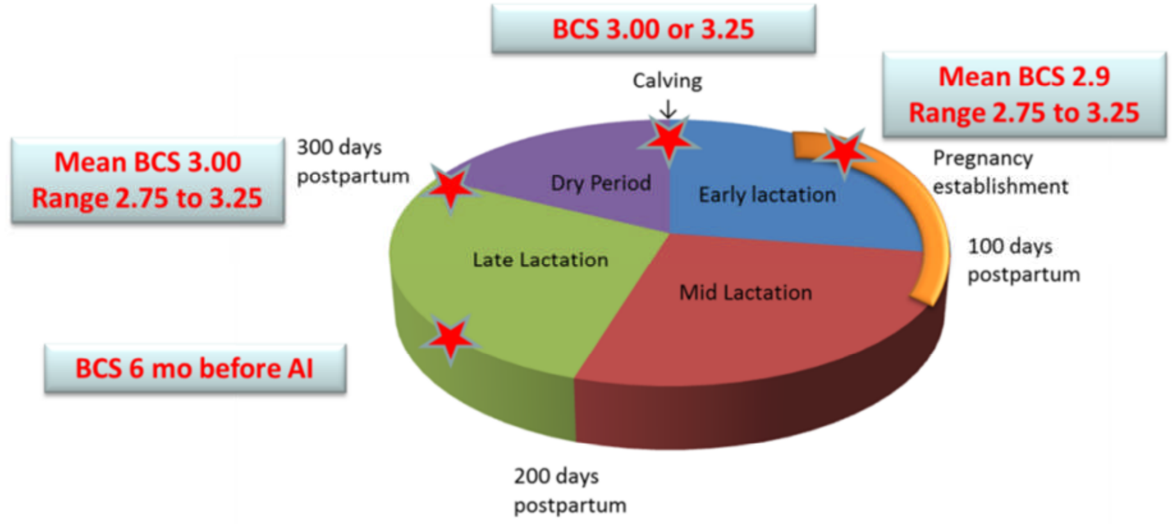

Figure 1. Key periods to assess BCS are indicated by ★ Herd average BCS targets for various stages of the gestation-lactation cycle are as follows (range in parenthesis): 1) Pre-calving: 3.00 or 3.25; Start of breeding: 2.90 (2.75-3.25); Drying off: 3.00 (2.75-3.25).

Resumption of Cyclicity

The number of days to first ovulation after calving typically averages approximately 30 to 35 days. The first heat is often silent, and the first cycle after this heat is usually short (8 to 12 days). This means that most cows should have displayed behavioural oestrus by 38 to 47 days post-calving or earlier. Early return of ovarian cyclical activity is generally accepted to be beneficial for subsequent fertility. Failure to display signs of heat by 60 days after calving is called postpartum anoestrus. This can be due to true anoestrus or suboestrus. Suboestrus occurs when cows have normal cyclic ovarian activity, but are not detected in oestrus due to weak or silent heats, or due to inadequate observation. True anoestrus occurs when cows have inactive ovaries. In seasonal calving dairy herds, between 13 and 48% of cows are diagnosed as being in anovulatory anoestrus at the start of the breeding period (Rhodes *et al*., 2003). As mentioned previously, the postpartum interval to first ovulation and likelihood of conception following insemination are influenced by both the severity and duration of negative energy balance. The return towards zero energy balance after the negative energy balance nadir provides an important signal for initiation of cyclic ovarian activity in dairy cows. In seasonal calving dairy herds, cows with an extended interval from calving to first ovulation have increased intervals from calving to conception and are more likely to be culled compared with cows with a short interval from calving to first ovulation. Another significant factor with a major influence on reproductive performance during the breeding season is the number of days from calving to mating start date, and this interval is a direct reflection of the reproductive performance during the previous breeding season. Cows that calve early will have resumed cyclicity, be regularly displaying strong behavioural oestrus, have completed uterine recovery, have passed peak milk production and finished losing BCS by the time the breeding season commences. As a result, early calving cows are more likely to be submitted for AI during the first 3 weeks of the breeding season and have high fertility.

Completing pre-breeding oestrous detection is critically important to identifying non-cycling cows that will dramatically reduce overall submission rates after mating start date. As part of a reproductive management plan for the breeding season, it is also critically important to treat problem cows early. Doing nothing is not a solution for problem cows. The most effective approach is to treat non-cycling cows with a timed AI program that begins approximately 10 days before the mating start date so that the first AI occurs on the first day of the breeding season (Figure 2). Inclusion of progesterone (CIDR or PRID) in these protocols is important and improves conception rates to timed AI. Regardless of how they are bred, problem cows will have reduced conception rate. This is especially true for late-calving cows submitted to a timed AI protocol. Using timed AI will ensure 100% submission rate to first AI, advance the time of second AI in cows that do not conceive to first AI and increase the total number of pregnancies. Several studies have been carried out at Moorepark to examine the potential impact on herd reproductive performance through aggressive whole herd intervention with protocols to synchronise oestrus or ovulation (Herlihy *et al*., 2011; Herlihy *et al*., 2012; Herlihy *et al*., 2013). The results from these studies have demonstrated that use of timed AI protocols results in shorter intervals from calving to first service and from mating start date to conception. Progesterone supplementation as part of a timed AI protocol resulted in a higher proportion of these animals successfully establishing pregnancy during the first 42 days of the breeding season, which was vitally important for seasonal calving herds. Importantly, the results also clearly indicated that when using hormonal intervention, it is important to use progesterone-based synchronisation programs incorporating timed AI to improve fertility in poor BCS animals, non-cycling animals, and later calving animals. Having a plan in place and making a decision to treat non-cycling cows earlier will help to maximise the proportion of cows that establish pregnancy within the first six weeks of the breeding season.

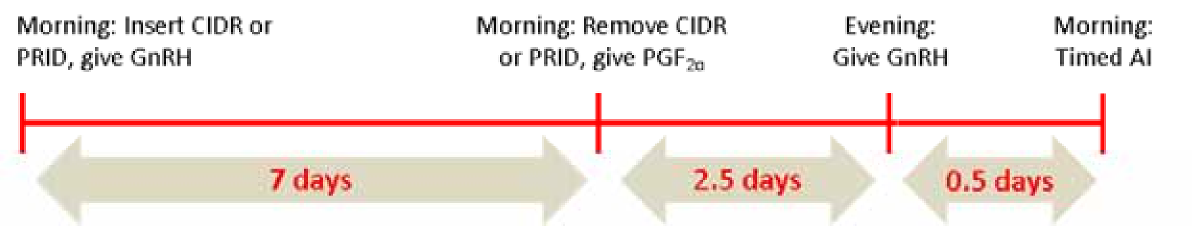

Figure 2. A 10 day progesterone-based timed AI program for use on lactating dairy cows. This program is suitable for cows that are at least 30 days calved.

Uterine Health

The main risks associated with calving are: 1) risk of physical damage during the birth process, 2) failure to release the placenta after parturition, 3) risk of increased microbial infections. It is generally accepted that exposure to bacteria and microbial contamination of the uterus are very common after calving. Up to 80–100% of animals have bacteria in their uterine lumen within the first 2 weeks after calving. Although the immune response of the cow progressively eliminate the microbes, up to 40% of animals still have a bacterial infection 3 weeks after calving. The two key factors that determine if uterine disease will develop after calving are the type of bacteria involved and the immune response of the cow. After calving, uterine involution or shrinkage, regeneration of the lining of the uterus, elimination of bacterial contamination from the uterus, and the return of ovarian cyclical activity must occur before a cow can conceive again. The placenta is normally expelled within 6 hours of expulsion of the calf but if still present by 24 hours, it is defined as a retained placenta. The incidence of retained placenta is between 2% and 5% of animals in a herd, but can be increased in cows with twins and after dystocia. A recent publication by Sheldon *et al*. (2006) defined the different types of uterine disease observed in dairy cows. *Puerperal metritis* is defined as an animal with an abnormally enlarged uterus and a fetid watery red-brown uterine discharge, associated with signs of systemic illness (decreased milk yield, dullness or other signs of toxaemia) and fever > 39.5 °C, within 21 days after calving. Animals that are not systemically ill but have an abnormally enlarged uterus and a purulent uterine discharge detectable in the vagina, within 21 days after calving, may be classified as having *clinical metritis. Clinical endometritis* is characterised by the presence of purulent (> 50% pus) uterine discharge detectable in the vagina 21 days or more after calving, or mucopurulent (approximately 50% pus, 50% mucus) discharge detectable in the vagina after

26 days. In the absence of clinical endometritis, a cow with *subclinical endometritis* is defined by > 18% neutrophils in uterine cytology samples collected 21–33 days after calving, or > 10% neutrophils at 34–47 days. *Pyometra* is defined as the accumulation of purulent material within the uterine lumen in the presence of a persistent corpus luteum and a closed cervix. From a practical perspective, the presence of clinical endometritis can be determined at one month before mating start date using a Metricheck device, which is specifically designed for vaginal mucus scoring (Figure 3). Intrauterine infusion of Metricure (cefaparin antibiotic) is an effective treatment for all cows with clinical endometritis that are at least 14 days calved. Prostaglandin $F_{2\alpha}$ is an effective treatment for cows with endometritis that are known to be cycling.

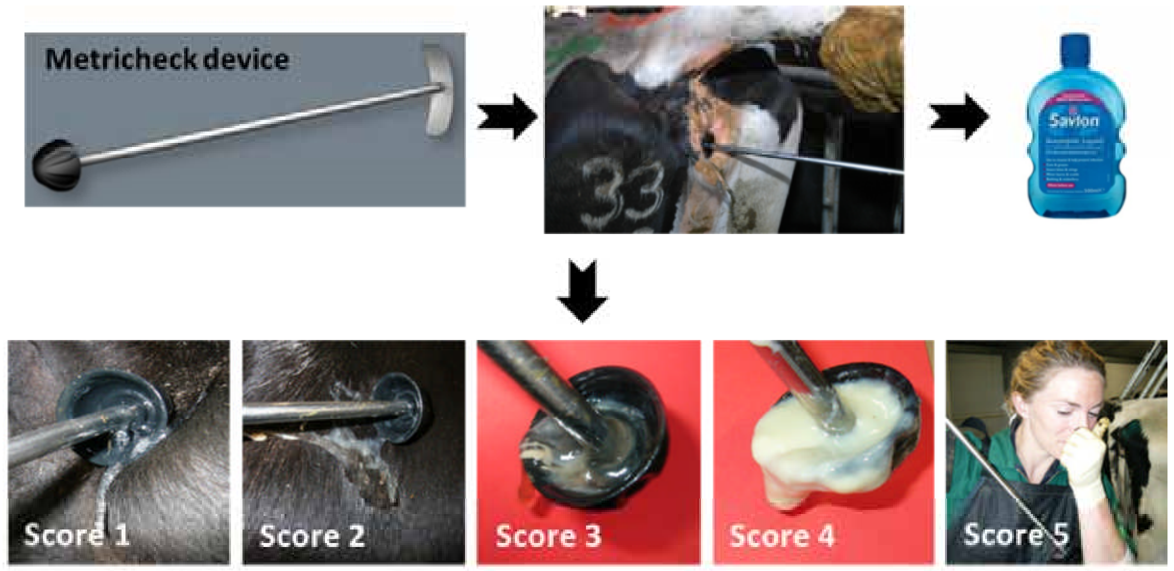

Figure 3. The Metricheck device can be used to sample vaginal mucus from cows before mating start date. Firstly, clean the vulva and perineal area. Insert the Metricheck device into the vagina and advance it gently towards the anterior of the vagina, adjacent to the cervix. The handle of the Metricheck device should be raised slightly and the Metricheck device should be retracted caudally to collect a sample of mucus from the floor of the vagina. Material within or adherent to the rubber cup should be scored as follows: 1 = clear and translucent mucus; 2 = mucus containing flecks of white or off-white pus; 3 = < 50% white or off-white mucopurulent material; 4 = ≥ 50% white or off-white mucopurulent material; or 5 = ≥ 50% white or off-white mucopurulent material with fetid discharge. It is essential to sanitize the Metricheck device between cows.

Role of Genetics

A series of studies have been completed at Moorepark over the last few years to explore the effect of genetic merit for fertility traits on key fertility phenotypes (Butler *et al*., 2014). These studies have clearly demonstrated that reproductive performance of lactating dairy cows is under genetic control. For example, cows with good genetic merit for fertility traits (Fert+) had improved reproductive performance, maintained greater body condition score, had earlier resumption of cyclicity, and superior uterine health status compared with cows with poor genetic merit for fertility traits (Fert-) (Cummins *et al*. 2012; Moore *et al*., 2014). Long term selection using the EBI will improve these key fertility phenotypes.

Key Messages for PLANNING AHEAD: 2016 Breeding Season

Gaining control of calving pattern and setting a goal to calve more cows early in the calving season will increase herd fertility and overall profitability. The main goal should be to maximise the proportion of the herd that successfully establish pregnancy in the first six weeks after mating start date, as this is a prerequisite for a concentrated calving period in the following spring. With calving season imminent, now is the time to start planning for a successful breeding season in 2016. Every decision made from now until the planned start of breeding will dictate the likelihood of successful pregnancy establishment for cows within your herd during the upcoming breeding season. The following are reproductive management strategies to improve herd fertility performance that are specifically focussed on body condition score, resumption of cyclicity, and uterine health status:

- Maintain accurate records of calving difficulty, retained foetal membranes, endometritis, displaced abomasum and metabolic disorders early postpartum. These cows are at highest risk of turning up as "*problem cows*" at the time of breeding.
- BCS and nutritional management are critical. Monitoring BCS at key stages throughout the gestation-lactation cycle is necessary to maximise fertility performance.
    - Good BCS (≥ 3.00) at the start of breeding increases likelihood of pregnancy establishment.
    - Thin cows (i.e., BCS < 2.75) at mating start date will have poorer submission, conception, and six week incalf rates compared with cows with BCS ≥ 2.75.
    - A cow that calves thin will stay thin through the breeding season.

- It is essential to identify and treat cows with uterine infection before the planned start of mating
    - One month prior to the mating start date, use the Metricheck device to identify cows with clinical endometritis.
- Delayed return to cyclicity after calving (anovulation) is one of the key challenges limiting fertility performance in lactating dairy cows.
    - Complete pre-breeding oestrous detection to facilitate early identification of non-cycling cows.
    - 10 days before mating start date, treat non-cycling cows calved > 30 days with a progesterone based timed AI protocol, to set them up for timed insemination on the mating start date.

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Dry and transition cow nutrition for the grazing Irish dairy herd

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Introduction

The period directly before and directly after calving is a critical period for the health and welfare of the dairy cow (Mulligan and Doherty, 2008). The issues that might arise at this time can also impact on herd profitability through an extended influence on lameness (Bicalho et al., 2009), herd fertility outcomes (Walsh et al., 2011), herd somatic cell count and mastitis (O'Rourke, 2009). In Ireland, the typical scenario for cows in the transition period is a grass silage-based dry cow diet and a grazing early lactation diet. The following paper will emphasise some of the key issues for these diet types and the production system in general related to nutritional and metabolic status in the dairy cow. The observations contained within this paper are based on relevant published research and the herd cases referred to the Dairy Herd Health Group, School of Veterinary Medicine, University College Dublin. This paper will concentrate on nutrition *per-se*. However, on many farms, husbandry factors are very important for nutritional status. Issues such as inadequate access to feed and water, insufficient comfortable cubicle beds, and moving cows to the home farm close to calving, are much too common on Irish farms. These issues must be addressed for an optimal nutritional status.

The dry cow diet

Provision of an appropriate energy allowance for dry cows

Dry cows (600kg) require 6.4, 7.1 and 8.1 UFL per day when housed 3 months prior to, 2 months prior to and in the last month prior to calving, respectively. These requirements assume that cows are dried off with an appropriate BCS (Table 1). Grass silages are extremely variable in their major nutritional qualities. A very comprehensive study of pit silages carried out in Northern Ireland (Steen et al., 1998) reported huge variation in grass silage quality (see Table 2). When consumed at a typical consumption level by dry cows (1.8 to 2.0% of body weight; Butler et al., 2011), some grass silages will provide an insufficient amount of energy for pregnant dry cows (depending on BCS) and some will provide too-much energy.

Table 1. Dry cow diet: Daily UFL and PDI recommendations (600 kg cow housed; BCS on target)

Months pre-calving	UFL/day	g of PDI/day
3	6.4	475
2	7.1	535
1	8.1	605

Add 0.35 UFL and 25 g of PDI per 50 kg increase in weight.

Dietary major minerals and DCAD

Calcium	0.45% (none added unless DCAD is -100 to -200 meq/kg DM)
Phosphorous	0.3% of the diet DM
Magnesium	0.4% of the diet DM
Potassium	≤ 1.8% of diet DM (many silages will be higher)
DCAD	0 to 150 meq/kg of DM (many silages will be higher)

Supplemental daily vitamin allowances

Vitamin E	1,200 IU
Vitamin D	25,000 IU
Vitamin A	75,000 IU (NRC daily allowance is 100,000 IU)

Supplemental daily trace element allowances[1]

	Normal concentration in forage	Deficiency in forage
Copper*	150	450
Se	3	5
Iodine	12	60
Zinc	335	750
Manganese	350	415
Cobalt	5	10

All values are for added trace elements in elemental form in mg/cow/day.
[1]Source: Control of Mineral Imbalances in Cattle and Sheep (Rogers and Gately, 1992; 2000)
*Deficiency recommendation to be used where Mo > 2.0 mg/kg of silage DM.
Maximum permitted levels in the EU are 35 mg/ kg DM of Copper, 0.5 mg/kg DM of Selenium and 5 mg/kg DM of Iodine.

If grass silage quality is very poor, cows may lose BCS in the dry period. Furthermore, in years of low milk price and or poor grazing conditions in the autumn, cows may dry-off with a low BCS. In this case, care must be taken to ensure that cows end up with an appropriate BCS of 3.0 to 3.25 at calving (Roche, et al., 2009; Table 3). Thin cows have been proven to have a significantly increased risk of lameness (Bicalho et al., 2009), uterine health and retained foetal membranes issues (Heuer et al., 1999, Hoedemaker et al., 2009). If the low BCS persists to the breeding season, low fertility performance will result (Buckley et al., 2003).

Table 2. Typical grass silage feeding value variation

	Mean	Minimum	Maximum
Dry matter (%)	21.9	15.5	41.3
Crude Protein (g/kg DM)	130.0	80.0	210.0
Ammonia N (% of total N)	12.3	4.5	38.5
Lactic acid (g/kg DM)	66.0	0	144.0
Acetic acid (g/kg DM)	29.0	4.0	63.0
Butyric acid (g/kg DM)	7.0	0	32.0
pH	4.1	3.5	5.5
Organic matter digestibility (%)	71.0	56.0	83.0
Voluntary intake by beef cattle (kg/day)	6.6	4.3	10.9

Steen et al., (1999)

Typical mineral and trace element variation in Irish grass silages

	Mean	Minimum	Maximum
Calcium (% of DM)	0.69	0.25	1.61
Phosphorous (% of DM)	0.31	0.10	0.72
Magnesium (% of DM)	0.18	0.08	0.43
Potassium (% of DM)	2.35	0.63	5.59
Sodium (% of DM)	0.36	0.04	1.03
Sulphur (% of DM)	0.31	0.08	0.98
Copper (mg/kg DM)	10.4	2.8	32.0
Selenium (mg/kg DM)	0.09	0.02	2.3
Iodine (mg/kg DM)	0.27	0.04	0.98
Zinc (mg/kg DM)	29.7	10.0	94.0
Manganese (mg/kg DM)	103.5	2.0	477.0

Rogers and Murphy (2000)

To increase BCS by 1 unit will require a feed allowance above those suggested in Table 1 of 200 UFL over the length of the dry period. If the herd is thin in late lactation (e.g., 50% of cows at BCS 2.5 and less), the option exists to dry off cows early, especially in years of low milk price. If dried off early (e.g., a 12 week dry period), cows fed average quality grass silage (68 DMD) should have an increase in BCS of approximately 0.5 units before calving. If the low BCS is only noticed at dry off, 8 weeks pre-calving, ad-libitum good quality grass silage is enough to increase BCS by 0.30 units approximately (grass silage quality 72 DMD). With average and low quality grass silage and where BCS is very low at dry off (8 weeks pre-calving) concentrate supplementation will be required for dry cows. Table 4 shows the concentrate feeding levels required by dry cows of differing BCS fed different quality grass silages to achieve an appropriate BCS at calving.

Table 3. Target BCS for dairy cattle at different points of the lactation cycle

BCS at Drying off	2.75-3.0
BCS at calving	3.0-3.25
BCS at 42 days in milk	2.75 minimum
BCS at breeding	2.75 minimum
BCS in late lactation	2.75-3.0

90% of the herd should meet these targets

The group of cows that calve from March on are most at risk from over-conditioning as this group often have a prolonged dry period. It has been proven that when dairy cows calve down in an over-conditioned state (BCS 4.0, scale 1-5) they have a higher level of BCS loss post-calving, a compromised metabolic state, and a reduced feed intake in early-lactation (Alibrahim et al., 2010). Furthermore, there is a good deal of data in the literature showing that feeding excessive amounts of energy in the far-off dry period (e.g., the first month after dry-off) in particular, has a negative impact on metabolic status, energy consumption early in lactation and reproductive outcomes (Cardoso et al., 2013). Thus there is nothing to be gained from a cow health perspective from over-feeding energy in the dry cow diet. Therefore, every effort should be made to feed appropriate energy allowances at this time.

Having cows in the correct BCS at all stages of the lactation cycle should always be a priority. The most important aspect of dry cow nutrition is to ensure the correct calving BCS for at least 90% of the herd. Thus, if BCS corrections are required in late lactation or at dry off, a nutritional strategy should be put in place to ensure an appropriate energy allowance is offered. The recommended BCS for dairy cows at each point of the lactation cycle is depicted in Table 3. These are the BCS scores advocated by the Dairy Herd Health Group at UCD. They are largely consistent with other recommendations for dairy cows using the 1-5 BCS scale.

Type of energy for dry cows

There are many theories on why non-structural carbohydrate should be fed to late pregnant dry cows such as developing rumen papillae, acclimatizing rumen microbes and avoiding fatty liver. It is also interesting to note that NRC (2001) advocates a 70% increase in energy density in the close-up dry cow diet. There is not a lot of research evaluating the requirement for these strategies in grass silage-fed dry cows going to grass post-calving. However, data from Burke et al. (2010) for New Zealand dairy cows indicates that feeding non-fibrous carbohydrate in the late pregnant dairy cow diet had no effect on reproduction in grazing dairy cows. In Irish data, McNamara et al. (2002) reported prolonged negative energy balance in early lactation as a result of feeding 3kg of concentrate for 4 weeks pre-calving. It is interesting that a large on-farm study recently completed in Northern Ireland did not find any benefit on milk production, fertility or culling as a result of supplementing concentrates for the final three weeks pre-calving for cows with BCS in the desired range. However, for thin cows, supplementing concentrates in the final 3 weeks pre-calving reduced the culling rate at 60-days post-calving (AgriSearch, 2010). Thus the requirement for concentrate in the dry cow diet of most Irish cows (ca 5000litres of milk; 400kg fat and protein) should be driven primarily by concerns about BCS and silage quality. The requirement for the development of rumen papillae and to acclimatize rumen microbes for dry cows coming off a grass silage-based diet and receiving 4kg or less of concentrate feed in a grazing scenario, is unlikely to be significant, if BCS is on target. For cows that will be fed 8kg of concentrate or more in early lactation, a conservative approach in keeping with the normal digestive physiology of the cow and international research (McCarthy et al., 2015) would be to feed 1kg of starch in the last 2 weeks pre-calving. This could be 2kg of a dry cow nut, 2kg of barley or 10kg of maize silage or whole crop wheat silage (as fed). This concentrate (starch) feeding at this time may be of increased importance for thin cows.

Table 4. Recommended concentrate allowance for 12 weeks and 8 weeks dry periods with grass silage quality 64 to 72 DMD, and different BCS at dry off.

12 weeks dry	**3 months pre-calving**	**2 months pre-calving**	**last month**
BCS 3.0 to 3.25			
64 DMD	RE	RE	0.4
68 DMD	RE	RE	AL
72 DMD	RE	RE	AL
BCS 2.5 to 2.75			
64 DMD	AL	0.6	1.8
68 DMD	RE	AL	1.2
72 DMD	RE	RE	0.6
BCS 2.0 to 2.25			
64 DMD	1	1.8	2.9
68 DMD	0.4	1.2	2.3
72 DMD	AL	0.7	1.8
8 Weeks dry		**2 months pre-calving**	**last month**
BCS 3.0 to 3.25			
64 DMD		RE	0.4
68 DMD		RE	AL
72 DMD		RE	AL
BCS 2.5 to 2.75			
64 DMD		1.2	2.3
68 DMD		0.7	1.8
72 DMD		AL	1.2
BCS 2.0 to 2.25			
64 DMD		3.0	4.1
68 DMD		2.4	3.6
72 DMD		1.9	3.0

RE, Restricted energy advised, AL, Ad-libitum feeding of silage advised.

Dry matter intake assumed at 1.8% of body weight. Assumed 200 UFL required for 1 unit increase in BCS. Assumed concentrate is 0.9UFL/kg as fed. Appropriate supplementation for major minerals, trace elements, protein and vitamins should always be practised.

Provision of appropriate protein allowance for dry cows

The requirement for protein (PDI) in the last 3 months of the pregnancy for dry cows is approximately 475, 535 and 605g/d for a 600 kg cow (O'Mara, 1996; Wolter and Ponter, 2012; Table 1). In most cases, with grass silage only diets this amount of PDI will be supplied. However difficulty arises if either the PDIN or the PDIE value of grass silage is less than 60g/kg of DM. Difficulties with PDI provision will also arise where straw or low protein forages might be included in the diet of the dry cow. It is important that silage is analysed to determine the need for supplementary protein. Although other feeding standards organisations (NRC, 2001) recommend higher protein allowances than the PDI allowances, research work carried out in Ireland found no benefit to supplementing high levels of protein to dry cows fed grass silage based diets. However, for diets based on grass silage and straw fed in restricted amounts, improvements in milk protein concentration were noted in early lactation following supplementary protein feeding in the dry period (Murphy, 1999). Thus PDI balances should be calculated based on the farm specific forage(s) used in the dry cow diet, it is likely that supplementary protein will be required for almost all dry cow diets containing straw, low protein forages or low PDI grass silages. It is certainly noteworthy that the feeding of straw to dry cows has become more popular and that a greater proportion of grass silages are lower in protein than was the case 10 to 15 years ago.

Major minerals for dry cows

The most important issue to be considered with regard to the major mineral nutrition of the dry cow is to establish a good basis for the control of milk fever and subclinical hypocalcaemia. Research with grazing cows in other regions has demonstrated that even where milk fever is relatively well controlled (clinical milk fever recorded in ca. 5% of cows at calving) that approximately 33% of the cows may experience subclinical hypocalcaemia (Roche, 2003). It is important to note that all cow types have a significant challenge to their calcium status at calving. Interestingly, recent work published internationally has indicated that 25% of first lactation cows may experience subclinical hypocalcaemia (Reinhardt et al., 2011). Subclinical hypocalcaemia has been linked to reduced immune system competence, and the UCD Dairy Herd Health Group has come across transition cow issues related solely to subclinical hypocalcaemia.

One of the most important aspects of maintaining control over milk fever and subclinical hypocalcaemia in an Irish context is to maintain BCS within the desired range at calving. It has been shown that both high BCS and low BCS at calving increase the risk of milk fever. The magnesium content of the diet is also critical for the provision of an adequate calcium status. It has been reported that magnesium concentration is the single most important dietary factor with regard to milk fever control (Lean, 2006). Based on typical magnesium concentrations found in Irish grass silage samples (Rogers and Murphy, 2000; Kavanagh et al., 2011), 20-25g of magnesium will be required from the dry cow mineral. For grass silages with below average magnesium status, the provision of 30g of magnesium per cow per day in the dry period is justified. The next major mineral of importance in the dry cow diet is potassium. High levels of potassium in the dry cow diet induce metabolic alkalosis. Once this metabolic state is established it becomes more difficult for the cow to mobilise bone calcium which she must do to maintain an adequate level of calcium in the blood immediately after calving. High levels of potassium also tie up magnesium in the rumen, thus having the potential to negatively affect calcium status through two separate mechanisms. The average potassium concentration in Irish grass silages is typically 1.8% to 2.4% (Rogers and Murphy, 2000; Kavanagh et al., 2011). However, there is a wide variation in the potassium content of Irish grass silages. Grass silages with a potassium concentration above 2.75% are particularly problematic and often cause problems in dry cow diets with clinical milk fever or the conditions which arise from subclinical hypocalcaemia (retained placenta and uterine infection). Rogers and Murphy (2000) reported that 11% of Irish grass-silages have a potassium concentration of more than 3.1%. In herds where this type of grass-silage is the sole dry cow feed, a carefully planned milk fever control strategy is warranted. Combining these grass silages with straw may well be appropriate, but correction for energy and protein allowance may be required depending on grass silage quality and cow BCS. The recommended phosphorous content of dry cow diets is 0.3% of the DM (NRC, 2001, Lean el al., 2006). In many cases, Irish grass silages will supply sufficient amounts of phosphorous. However, in cases where silages have significantly lower than 0.3% phosphorous, then supplementation with 5 to 10g of phosphorous daily from the dry cow supplements may well be warranted.

Trace elements for dry cows

International research continues to demonstrate the important roles that trace elements play in transition cow health and milk production (Bicalho et al., 2014; 2009; Cope et al., 2009).

Herd cases of trace element deficiency also arise relatively frequently in Ireland (UCD Dairy Herd Health Group) without any systematic recording or reporting. Rogers and Murphy (2000) reported that within Irish grass silages 63% are low in copper, 43% are very low in iodine, 69% are very low in selenium and 29% are low in zinc. Despite this fact there are cases where farmers decide not to supplement grass silage-based diets with minerals and trace elements in the dry period. This strategy cannot be advised and farmers should ensure that dry cows are supplemented with major minerals, trace elements and vitamins during the dry period. Trace element and mineral feeding should be based on a farm specific forage analysis as some grasses and grass silages have high concentrations of certain trace elements and toxicity may arise.

The start of lactation for the transition cow

In the typical seasonal breeding spring-calving Irish dairy herd achieving good fertility is an absolute priority. It has been very well established that negative energy balance and poor metabolic status have negative consequences for fertility outcomes (Walsh et al., 2011; Leroy et al., 2008). Therefore, we must aim to limit the severity and duration of the negative energy balance experienced in the first weeks after calving and to provide a positive metabolic status to enable good fertility. We do of course need to be mindful that for financial sustainability of the farm business, this goal needs to be achieved in the most cost efficient manner possible.

Provision of sufficient energy in early lactation

In Ireland the Irish net energy system for cattle and sheep is used to provide appropriate energy allowances for dairy cows of different types and production levels (O'Mara, 1996). For a typical 600kg grazing dairy cow, 6UFL per day are required for maintenance and approximately 0.42 – 0.45UFL are required per kg of milk produced. In addition, the system calculates an extra requirement arising from reduced digestive efficiency when forage and concentrates are combined in diets, or when net energy intake rises to the high levels expected for lactating cows (O'Mara, 1996). For typical grazing dairy cows producing 5,000 litres of milk per lactation (370 to 400kg of fat and protein), a peak daily requirement of 17.5 to 18 UFL is likely to be a sufficient energy allowance at peak milk production. This UFL provision is possible with a mostly grazing diet. For a 600kg cow producing 26kg of milk at 3.8% fat, an allowance of 2.3kg of concentrates (as fed) if provided with a grass dry matter intake of 15.0kg per day would meet 100% of the UFL requirements of this animal (Table 5). On the other hand, a 600kg cow producing 34kg of milk at 3.8% fat would require 6.7kg of the same concentrate where grass intake is 15.0kg of dry matter. Where grass dry matter intake is restricted to 12kg of DM, higher concentrate allowances will be required to provide 100% of energy requirements. In particular, the requirement for UFL from supplements is high when cows are fed grass-silage by night and grazed grass by day early in the grazing season.

For grazing herds, farmers should be encouraged to meet as much of the UFL requirement as they can from grazed grass, but they should also be encouraged to feed energy to 100% of UFL requirement to prevent BCS loss and poor metabolic status in early lactation. It should be remembered that for cows calving down with a BCS of 3.0 or greater, where BCS loss is greater than 0.5 units in early lactation then a reduction in 6 week pregnancy rate of approximately 8 percentage units could be expected in comparison to cows losing 0 and 0.25 units of BCS in early lactation (Buckley et al., 2003). It should be noted that feeding cows to 90% of UFL requirement instead of 100% on a continuous basis, will result in approximately 1 unit of BCS loss in 3 months. Irish research has shown that BCS levels below 2.75 in the breeding season will reduce fertility performance (Buckley et al., 2003). Appropriate concentrate allowances for a standard grazing cow with different grass dry matter intake levels and for grass silage / grazing diets are outlined in Table 5.

Strategies used to alter metabolic status in early lactation

Diets that are mostly based on grazed-grass will contain a high energy density, which is very beneficial to the early lactation cow. However, high quality perennial ryegrass-based swards are likely to contain a high crude protein and PDIN concentration, which will increase blood urea nitrogen. Furthermore high protein diets would seem to partition nutrients towards milk production at the expense of energy balance (Whelan et al., 2014). In recent research carried out at UCD, Whelan et al. (2012) demonstrated that concentrate type had a significant positive impact on metabolic status in early lactation dairy cows at grass. In this study, grazing cows fed 6kg of a 14% protein compound based on maize grain had significantly reduced blood urea nitrogen and betahydroxybutyrate in comparison to cows fed 6kg of an 18% protein compound based on barley. It was very interesting that the yield of fat and protein for cows fed the 14% protein compound based on maize was not significantly different to that of the cows fed the 18% protein compound based on barley. In the study of Whelan et al., (2012) it was not possible to investigate the impact of this improved metabolic status on reproductive outcomes. However, in similar New Zealand research, supplementation of cows fed grazed and ensiled perennial ryegrass with non-structural carbohydrate improved metabolic status and reproductive outcomes (Burke et al., 2010). In this study feeding a corn and barley-based concentrate at 5kg dry matter per day increased dietary non-structural carbohydrate and reduced dietary crude protein concentration. Cows fed the high non-structural-carbohydrate supplement had significantly shorter post-partum anovulatory interval and significantly improved six week pregnancy rate.

The fresh cow in the grazing herd

Dairy cows often have the most severe underfeeding of the year in the first and second week after calving. Although the milk yield is low in these weeks, the very low feed consumption at this time results in the greatest energy deficit. Generally speaking the optimal husbandry for the cow at this time would be to ensure maximal dry matter intake of high energy well balanced diets. Many cows calving in January and early February will have a number of weeks lactating indoors (depending on grazing conditions). In these cases, it is critical that high quality grass silage is used (minimum 70 DMD) and that diets are fortified with appropriate levels of concentrate for the yield and milk constituents of the cow. The use of poor quality grass silage will require a high level of concentrate supplementation during this period. Where cows can go to grass immediately after calving, concentrate allowances should be calculated based on the total UFL requirement of the cow and the gap that exists when you have estimated the UFL supplied from the grass alone. Where grass dry matter intake is maintained low to manage sward quality, it is important to continue to supply the UFL requirements of the cow. For higher milk output cows (7000-7500 litres; 550-575kg of fat and protein), research at UCD Lyons Farm has demonstrated that a high energy TMR type diet fed indoors for the first three weeks post-calving improved metabolic status in early lactation and grass dry matter intake at six weeks post-calving (Alibrahim et al., 2013). This strategy may suit a certain cohort of Irish farms. However, for strictly grazing low input farms with cows producing ca 5,000 litres of milk (370 to 400kg of fat and protein), the priority should be on meeting the energy requirements with a mainly grazed-grass diet and the required level of supplements to bridge the UFL gap.

Table 5. Recommended supplementary concentrate allowance to supply 100% of UFL requirement in early lactation for cows of differing milk yield with varying grazed grass and silage intake.

	Milk yield (kg/d)								
	18	**20**	**22**	**24**	**26**	**28**	**30**	**32**	**34**
[1]6 kg Grass DM 6 kg 64 DMD	4.0	4.9	5.9	6.9	7.9	8.9	9.9	10.9	11.9
6 kg Grass DM 6 kg 70 DMD	3.5	4.4	5.4	6.4	7.4	8.4	9.4	10.4	11.4
6 kg Grass DM 6 kg 74 DMD	3.2	4.1	5.1	6.1	7.1	8.1	9.1	10.1	11.1
Grass dry matter intake (kg/d)									
12	1.9	2.8	3.8	5.0	6.0	7.0	8.0	9.0	10.0
13	0.8	1.7	2.7	3.6	4.9	5.9	6.9	7.9	8.9
14	0.0	0.6	1.5	2.5	3.4	4.8	5.8	6.8	7.8
15	0.0	0.0	0.4	1.4	2.3	3.7	4.7	5.7	6.7
16	0.0	0.0	0.0	0.3	1.2	2.2	3.1	4.6	5.6
17	0.0	0.0	0.0	0.0	0.1	1.1	2.0	3.0	3.9
18	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.8	2.8

[1], Concentrate allowance for 6 kg of grass dry matter and 6kg of grass silage dry matter (64-74 DMD)

Assumptions: Cow weight is 600kg, milk fat = 3.8%, cow activity grazing assumed in all circumstances.

Grass assumed to have 1.0 UFL/ kg of DM.

Total forage intake assumed at 12 kg of DM when cows are grazing by day only in early spring.

Energy requirements in underlined figures taken from Table 3.1 O'Mara, 1996 (30% concentrate in the diet) plus an allowance of 0.5 UFL/day for activity at grazing.

Grass silage of 64, 70 and 74 DMD assumed to have 0.71, 0.79 and 0.84 UFL/kg DM.

This table contains concentrate allowances to supply UFL only. Supplementation may be warranted for protein, major minerals, trace elements and vitamins.

Assumed concentrate is 0.9UFL/kg as fed.

Major minerals and trace elements for milking cow

The main problems encountered by the UCD Dairy Herd Health Group in this area are phosphorous, copper and iodine deficiency. A 2013 study on Irish grazing farms indicated that on average grass supplied only 85%, 73%, 52%, 50% and 38% of lactating cow requirements for phosphorous, copper, iodine, zinc and selenium (Curran and Butler, 2015). For copper, appropriate supplementation seems to overcome the deficiency with many well supplemented milking herds showing no signs of copper deficiency on pasture where young stock have deficiency issues. In the case of iodine deficiency, previous reports have highlighted that many unsupplemented milking cows have iodine deficiency in Ireland (Mee, et al., 1993). The Dairy Herd Health Group at UCD has in some cases had concern that iodine deficiency was causing lower than desired milk yield (in mid-late lactation cows). Furthermore, well recognised nutritional bodies (NRC, 2001) recognise that deficiency of phosphorous, iodine and copper all have implications for reproductive outcomes. Thus, it is important that all milking cows are supplemented with appropriate allowances of major minerals and trace elements.

Conclusion

The most important aspect of dry cow nutrition is to ensure an appropriate BCS at calving of 3.0 to 3.25 for 90% of the herd. Grass silage-based dry cow diets can be and are often used successfully. Care should be taken to ensure grass-silages are always analysed so that appropriate energy, protein, mineral and trace element allowances can be provided. For early lactation cows, diets should be balanced to supply 100% of UFL requirements where possible. This will ensure that BCS loss is minimised and that negative energy balance is not a major factor in reduced fertility performance. Concentrate type may have an influence on metabolic status and subsequent reproductive performance in the grazing cow.

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Keep focused and stick to your knitting!

William & Siobhan Kingston

Dairy Farmer, Toureen, Skibbereen, West Cork

I farm in Toureen, Skibbereen with my wife Siobhan and three children Cathal (9), Grace (6) and Paul (3). My father also keeps an active interest in the farm. We have one full-time milker (Denis Leahy) and numerous students throughout the year. Back in 2002 I was one of the two farms selected to host the Irish Grassland Association dairy summer tour. Reflecting back over how the farm has changed since then, I've prepared a short list of some of the do's and don'ts that I would advise any other farmer to stick to:

- **Keep everything simple**: Take for example breeding policy on my farm. I was crossbreeding at the time of the summer tour and had used GeneIreland AI sires. Mixing and matching the Holstein Friesian sires across the first cross Jerseys is getting too complicated. Now all I do is criss cross the herd over and back to jersey or Friesian. So first cross Friesian x Jerseys get Friesian again and the three quarter Friesians are bred to Jersey. Roughly the herd is 50:50 Friesian : jersey on a whole herd basis – don't get lost in the detail about the individuals.
- **Stick to your knitting**: I returned from New Zealand around the same time thinking that you only needed to breed for three weeks and then put plenty of bull power in. Big mistake. Now I use AI for 7 weeks, use dairy AI the whole time and put in the minimum number of bulls. If you're in dairying stay at dairying – leave other farmers to look after beef.
- **Be patient**: I started keeping a beef enterprise because I was getting frustrated about the quota situation back then. When I look back on it this was a mistake. In the coming years I can see people getting frustrated with for example a lack of land mobility on their own doorsteps and buying land away from home. Hold tough, farm as well as you can on your own farm and the opportunities will come your way.
- **For the host farmers**: Some of the greatest satisfaction that I've got in the past number of years is from teaching the next generation of young farmers. It's not that I

don't expect them to work I do but I've found putting the time in to teaching them and treating them well has been a very rewarding experience.

- For the young people in the audience I would offer the following advice:
    - Mix with people outside your immediate circle. Even if it's only to confirm what you already know
    - Write your plan down – when its committed to paper, you will stick to it better and be amazed at how much you can achieve in a short space of time;
    - Keep off social media – farm and don't blow your own trumpet – you have a lot to achieve before you start talking too much about it;
    - Last but not least, you too need to stand up and act like leaders!

Biosecurity & Stock Movement: steps to minimise the herd health risk in an expanding dairy herd

Riona Sayers

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Keeping your herd free of disease is challenging at the best of times. During an expansion phase, however, the risk to the health of a herd increases dramatically (Faust et al., 2001). It has been shown in numerous international (van Schaik, et al., 1998; Boelaert et al., 2005; Raaperi et al., 2010) and Irish studies of infectious disease (O'Doherty et al., 2014; Sayers et al., unpublished data) that increasing herd size poses a greater disease risk. This is particularly true where expanding herds purchase new stock, increase farm fragmentation (including contract heifer rearing) and introduce new management systems, including a new labour structure, to the farm.

In any herd farmers and veterinary practitioners must be mindful of both infectious and production diseases, prominent examples of which are outlined in Table 1. Additionally, the highest standards of animal welfare must be maintained at farm level in order to underpin disease control programmes. This paper will concentrate on infectious diseases and the contribution of stock movement to their spread. Farmers and veterinary practitioners, however, should always be aware that stock movements, most notably purchase of stock, can also result in the introduction of the 'so-called' production diseases to a herd e.g. mastitis and infectious causes of lameness. The steps outlined below can also be used to assist in the control of such production diseases. However, ensuring that adequate resources are available, including infrastructure, labour and time, is often the most critical element in the control of production diseases.

Table 1: Prominent production and infectious diseases on Irish dairy farms.

Production diseases	Infectious diseases
Mastitis	BVD
Lameness	Johne's disease
Milk fever	IBR
Displaced abomasum	Parasitic disease
Ketosis	Salmonellosis
Calf mortality	Lameness (infectious)

The spread of infectious disease can occur in two ways:

1. It can be introduced to the farm through newly purchased/introduced cattle or,
2. It can already exist on the farm and be passed to new introductions to the herd.

Two-way interactions therefore exist, and biosecurity measures must be employed to prevent both disease introduction and disease spread. An effective biosecurity plan at an absolute minimum should include a good purchasing strategy, quarantine procedures, vaccination protocols and pre- or post-purchasing testing of bought-in animals. A table of further measures that can be employed on-farm on a day to day basis are listed in order of importance in Table 2.

Table 2: Biosecurity/biocontainment measures that can be employed on farm to prevent disease introduction and spread.

Biosecurity Measure	Ranking
Maintaining a closed herd	Very Important
Quarantine for newly introduced animals	Very Important
Farmer understanding of infectious disease spread	Very Important
Stock-proof boundaries	Very Important
Isolation of sick animals	Very Important
Avoiding importation of manure / slurry / poultry litter /	Very Important
Veterinary advice	Very Important
Routine diagnostic testing	Important
Vaccination	Important
Good hygiene (housing, yards, parlour, etc.)	Important
Accurate disease records	Important
Using a new needle per animal when giving medications	Important
Preventing access of cattle to watercourses	Important
Rapidly disposing of dead cattle	Important
Well maintained footbaths	Moderately Important
Inspecting cattle trailers for cleanliness and disinfection	Moderately Important
Restriction of farm visitors (e.g. other farmers, sales people)	Moderately Important
Minimising visitors to and visitor movement about the farm	Moderately Important
Routine cleaning of water troughs	Moderately Important
Regularly cleaning oral drenching equipment	Moderately Important
Having written biosecurity guidelines in place	Moderately Important
Preventing mixing of different farm animal species	Moderately Important
Signs to emphasize disease control measures	Moderately Important
Pest control	Moderately Important
Cleaning vehicles entering the farm	Moderately Important
Annually disinfecting all cattle housing	Of lesser Importance
Logbook of all visitors to the farm	Of lesser Importance
Testing of water supply	Of lesser Importance

See AHI website (www.animalhealthireland.ie) for a full range of information leaflets on biosecurity, IBR and Johne's Disease.

The following guidelines aim to highlight the necessary strategies that should be employed in order to prevent disease introduction, whatever your reason for purchasing/introducing new cattle. Remember that re-introductions to your herd i.e. heifers returning from an outside farm or contract rearer, should be considered as new introductions to the main herd.

1. Establish your current disease status before introducing cattle. Bulk milk testing provides a practical and economical means of determining prior exposure to BVD, IBR, salmonellosis and parasitic disease. Individual milk and blood samples are required for Johne's disease and the AHI voluntary dairy herd Johne's pilot programme provides an ideal vehicle through which to determine a herd's status. Include your practitioner in the process in order to maintain a source of reliable advice throughout the process. Knowing your current disease status will allow a decision to be made on the best vaccination strategy for new purchases in order to prevent them becoming ill from infections they acquire after introduction to your herd.

2. Buy all cattle from a single source if possible. This will minimise the stress of mixing as well as establishing a full history for the herd of origin. If this is not possible, buy from as few sources as possible, ensuring that each has a good health status.

3. Talk to the seller. Request test results, previous health history and vaccination status of both the individual animals you are purchasing and the source herd. BVD results and Johne's reports for herds engaged in annual testing are now available to the herd owner (and their vet if permission has been granted) on the ICBF database. It is also beneficial to speak directly with the seller's vet (with the seller's permission) with regard to the health status of the animals being purchased.

4. Quarantine all newly purchased cattle i.e. isolate them for at least 30 days in an area that is at least 3m from other cattle groups, with no sharing of feed or water troughs and no mixing of dung and urine. Remember that groups of animals purchased from different sources should ideally be quarantined separately. It is often possible to organise your purchasing strategy in order to ease the quarantine process. For example, to minimise the level of housing required, purchase animals in the summer and quarantine new introductions in paddocks with their own water supply. Also, purchasing of dry animals will prevent any quarantine-associated complications in the milking parlour and reduce the risk of introducing a contagious mastitis.

5. Ensure that all housing for new purchases, particularly of young stock, is adequately cleaned and disinfected using an approved Department of Agriculture, Food and the Marine disinfectant. It is essential to clean housing prior to disinfection (power-hosing is very effective), as many commercial disinfectants will not work optimally in the presence of dung or other organic material. A list of approved disinfectants is available on www.agriculture.gov.ie

6. Vaccinate all new purchases over 6 months of age for leptospirosis and salmonellosis, if not previously vaccinated. Animals that have never been vaccinated will require two injections with an interval of approximately 4 weeks between doses. Additional vaccinations can be administered based on herd testing and test results of newly introduced stock.

7. Test every purchased bull for BVD virus and IBR antibody before purchase or while in quarantine. If found to be persistently infected with BVD virus or previously exposed to bovine herpesvirus-1 (IBR), remove the bull from the farm immediately. Do not breed from this bull or allow him to mix with the remainder of the herd. It is also highly beneficial to purchase bulls from a herd that has a high level of confidence of being free from Johne's disease (based on repeated negative results from herd tests and ideally operating as a closed herd) and a herd either free from or vaccinated against salmonella and leptospirosis.

8. Test all purchased females for BVD virus and IBR antibody. If economically feasible and if the seller's herd history suggests there may be an issue, leptospirosis, Johne's Disease, *Salmonella dublin*, and *Neospora caninum*, should also be investigated, and appropriate action discussed with your vet should animals prove positive. Your vet can organise testing either by bulk milk or blood sampling for these diseases.

Results of this testing will allow a decision to be made on whether the cattle are suitable for introduction to the herd and provide advice about the strengths and weaknesses of individual and bulk tank tests for each of these diseases.

NOTE : In buying a pregnant heifer or cow, you are essentially buying two animals (dam and calf), both of whom need to be investigated in terms of their health status. A healthy in-calf heifer or cow may be harbouring a BVD persistently infected calf.

9. Dose all purchased animals for parasites most importantly gut-worm, lungworm and liver fluke. Ensure that only licensed medications are used and observe withdrawal times.

10. Footbath all new cattle on arrival at the farm to prevent introduction of infectious causes of lameness.

11. Discuss an on-going testing strategy for infectious diseases with your vet. Bulk milk testing is an economical way to continually monitor the health status of your herd and in turn provides you with valuable information when you are selling your stock. Additionally, consider joining the AHI voluntary Johne's disease pilot programme if not already signed up.

12. Continue to implement a vaccination strategy suitable for your farm and use results of pre- and/or post-movement testing to inform your on-going strategy. Additionally, ensure to discuss vaccination with your vet as he/she will be aware of disease issues in the area as well as your test results. Using vaccination as a replacement for testing of existing and purchased animals is ill-advised. Vaccines can be overcome by exposure to high levels of an organism and disease may still occur.

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Dinner Ticket