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Influence of perennial ryegrass cultivar, ploidy and the incorporation of white clover to increase performance from grazed pasture.

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Introduction

The removal of milk quotas in April 2015 provides Ireland, in line with the Food Harvest 2020 targets, the opportunity to increase milk production for the first time in 30 years. The target of a 50% increase in milk production by the year 2020 set out in the Food Harvest 2020 report (DAFM, 2010) will be achieved by new entrants entering the dairy industry, increasing production per cow and increasing stocking rate at farm level (i.e. existing farms carrying more cows on the same land area) (Dillon, 2011). However, increasing stocking rate must be achieved by maximising Ireland's comparative advantage in terms of our ability to grow and utilise grazed pasture, which is the cheapest source of feed for animal production.

Perennial ryegrass (*Lolium perenne* L.) is the most suitable type of grass for temperate grazing systems. There are a number of factors that affect pasture growth and DM production, including soil type, soil fertility status, climate, year, grazing infrastructure, grass cultivar and ploidy, grazing management and alternative species mixtures, such as forage legumes. Climate and year will have an effect on pasture growth however; they are factors beyond the control of the farmer. Soil type will affect pasture growth and management factors such as improved drainage and grazing infrastructure can mitigate the effect of soil type on pasture growth and utilisation to some degree. It is a given that in order to maximise pasture dry matter (DM) production, excellent soil fertility, i.e. a soil pH of 6.3 and soil P and K indexes of at least 3, is required. Grazing management, i.e. stocking rate, pre-grazing yields, grazing severity and rotation length, also has a critical, and often undervalued role, in maximising pasture DM production on farm. The focus of this paper will be on some factors that can increase performance, in terms of increasing pasture DM production and animal output, from grazing systems, assuming soil fertility and grazing management are excellent. Therefore, this paper will review recent research into the effect of perennial ryegrass cultivar,

ploidy and the incorporation of white clover on DM production and animal performance from grazed pasture.

Literature review on the influence of grass cultivar, ploidy and the incorporation of white clover on pasture DM production and animal performance

Progress from breeding on cultivar performance

As stated earlier, perennial ryegrass is the most widely used ryegrass species in temperate grazing systems. There has been a consistent effort to improve the performance of perennial ryegrass through breeding improved ryegrass cultivars. Grass breeding has traditionally focused on increasing the annual DM yield of cultivars and also on increasing seasonal DM yields (i.e. winter/spring, summer and autumn DM yield) as these impact performance in terms of stock carrying capacity and animal performance. It has been estimated that the rate of genetic gain for DM yield in perennial ryegrass was between 4 to 5% per decade since the 1970's (Wilkins and Humphreys, 2003). Recently McDonagh *et al*. (2014) reviewed the performance of cultivars on the Northern Ireland Recommended List from 1972 to 2013 and found that the genetic gain for DM yield in perennial ryegrass cultivars was 0.43% per year (4.3% per decade). Spring DM yield has also increased by 15 to 18% per decade due to the selection of late heading and intermediate heading cultivars for early spring growth (Wilkins *et al*., 2000). Other factors that affect performance from grazed pastures, such as sward persistency and nutritive value (e.g. crude protein (CP) concentration, water soluble carbohydrates (WSC), neutral detergent fibre (NDF) and organic matter digestibility (OMD)) have also been the focus of grass breeding. Wilkins and Lovatt (2010) compared 21 new cultivars with two older cultivars that were the first persistent cultivars widely used for agricultural purposes in the United Kingdom. The authors found that 20 of the 21 cultivars had significantly higher DM yields (12 to 38%), 15 had significantly higher mean dry matter digestibility (DMD) (10 to 27 g/kg), 15 had significantly higher mean WSC (25 to 58 g/kg) and 7 had a significantly higher ground cover after three years than either of the two older cultivars. Although these results are from a single experiment and research site, which must be taken into account when considering the results, the results show that grass breeding has led to genetic gains in perennial ryegrass for DM yield and nutritive value characteristics. Therefore, genetic gains in terms of DM yield and nutritive value have been achieved; however; have these genetic gains in perennial ryegrass resulted in improvements in animal performance/output from pasture?

Progress from grass breeding on animal performance

A number of experiments have investigated the impact of grass cultivar on animal performance. Gowan *et al*. (2003) reported that cows grazing later heading perennial ryegrass cultivars from April to September had increased milk yield, solids corrected milk yield and milk solids yield. O'Donovan and Delaby (2005) reported greater DM intake (+ 1 kg DM/day) and milk production (+ 0.8 kg/day) from late heading compared with intermediate heading cultivars. The differences found in both experiments were due to differences in sward structure between cultivars. Sward structure encompasses a myriad of factors such as pre-grazing yield, pasture height, bulk density, tiller density and morphological and botanical composition (O'Donovan *et al*., 2010). O'Donovan and Delaby (2005) reported that the improved performance on the later heading date cultivars was due to a higher proportion of green leaf in the grazing horizon, and a lower stem proportion, which led to the later heading date cultivars having higher digestibility. In both of these experiments ploidy did not affect any of the milk production variables. More recently, McEvoy *et al*. (2013), Wims *et al*. (2012) and Cashman *et al*. (in press) have all compared individual cultivars for milk production and have found differences between cultivars due to variations in sward structure and nutritive value. McEvoy *et al*. (2012) reported that cows grazing tetraploid cultivars had greater milk yield (28.7 vs. 27.3 kg/day) and milk solids yield (2.17 vs. 2.05 kg/day) compared with cows grazing diploid cultivars. Cashman *et al* (in press) reported similar results with the differences between the tetraploid and diploid cultivars observed mainly in the June to September period.

Influence of grass ploidy on animal performance

Dineen *et al*. (personal communication) undertook a meta-analysis to investigate the impact of grass ploidy (i.e. tetraploid and diploid) on milk production. A meta-analysis is a quantitative review that summarises the published research in a particular area. A meta-analysis allows a precise analysis of the effect of tetraploid and diploid cultivars on milk production across a number of experiments. The objective of this meta-analysis was to analyse the effect grazing of tetraploid cultivars compared with diploid cultivars on the milk production of dairy cows. The performance of cows grazing diploid cultivars was taken as the base performance level and the performance of cows grazing tetraploid cultivars was expressed as the actual and proportional change in performance relative to the base (diploid) level. The final database consisted of 8 papers and 34 comparisons of cows grazing diploid and tetraploid cultivars under the same experimental conditions. The results of the meta-

analysis are presented in Table 1. The average experimental length was 101 days, and the majority of the experiments were undertaken during the main grazing season (April to September). Cows that grazed tetraploid cultivars had 4.1% higher milk (0.75 kg/day) and 4.0% higher milk solids (0.06 kg/day) than cows that grazed diploid cultivars. Similarly fat, protein and lactose yield/cow and protein and lactose content was higher for cows that grazed tetraploid cultivars in comparison with diploid cultivars. The fat content of cows grazing tetraploid cultivars was lower than cows grazing diploid cultivars.

Table 1 Change in experimental length and milk production per cow for a change from grazing diploid cultivars to tetraploid cultivars.

	Diploid	Tetraploid	Actual change	Proportional change (%)
Experimental length (days)	101	101	-	-
Milk yield (kg/cow)	21.2	21.95	+ 0.75	+ 4.1
Fat yield (kg/cow)	0.90	0.93	+ 0.03	+ 3.6
Protein yield (kg/cow)	0.72	0.75	+ 0.03	+ 4.6
Lactose yield (kg/cow)	0.94	0.99	+ 0.05	+ 5.5
Milk solids yield	1.61	1.67	+ 0.06	+ 4.0
Fat content (g/kg)	42.4	42.2	- 0.24	- 0.4
Protein content (g/kg)	33.7	33.9	+ 0.16	+ 0.5
Lactose content (g/kg)	45.1	45.5	+ 0.44	+ 1.2

Therefore, it can be concluded that cultivar and ploidy can have an effect on animal performance from pasture and the use of cultivars that have the right characteristics in terms of morphological and botanical composition and chemical composition can improve animal performance from pasture. However, many of these experiments have been undertaken during the main grazing season (April to September) and the differences in milk production between cultivars and ploidies reported, although significant within the experiments, have been relatively small in terms of total lactation production. Therefore, the question must be asked are there other factors that can be added to grazing systems to increase performance.

Influence of incorporating white clover into perennial ryegrass pastures

White clover (hereafter referred to as clover; *Trifloium repens L.*) is the most important forage legume in temperate grazing systems worldwide. There is renewed interest in forage legumes, particularly clover, as it offers important opportunities for sustainable grass-based animal production systems by 1) increasing herbage yield, 2) increasing herbage nutritive value and raising the efficiency of conversion of herbage to animal protein, 3) substituting inorganic nitrogen (N) fertiliser with symbiotic N fixation, and 4) mitigating and facilitating adaption to climate change (Lüscher *et al*., 2014). The proportion of clover in pasture varies depending on the time of year. There are low levels of clover in pasture during the spring and the level of clover generally increases up to a peak in late summer/early autumn. Clover has a lower growth rate than grass at temperatures below 10° C and this is why the proportion of clover in pasture is lower in spring. However, clover growth continues up to 24° C, whereas grass growth peaks at 15 - 20°. Clover and grass complement each other well in that grass growth peaks in May and June and then starts to decline whereas clover growth peaks in July and August. A lot of research has been undertaken, both nationally and internationally, investigating the impact of clover on pasture-based grazing systems. Harris *et al*. (1997) and Ribeiro-Filho *et al*. (2003; 2005) reported that grazing grass clover swards increased DM intake and milk production (on average 1.5 kg/cow per day). In contrast, Humphreys *et al*. (2009) reported that cows grazing grass clover swards had similar annual levels of milk production compared with cows grazing grass only swards (6524 kg and 6422 kg per cow, respectively) at stocking rates of < 2.2 LU per hectare. However, in the study of Humphreys *et al*. (2009) the average proportion of clover in the pasture was approximately 20% and other research (Andrews *et al*., 2007; Harris *et al*., 1997) indicates that the proportion of clover in pasture needs to be greater than 20% in order to see an animal production effect. Therefore, it is of critical importance to see if the proportion of clover can be increased and maintained above 20% under Irish grazing conditions and to see if this will impact on animal performance.

Clonakilty experiment: Effect of tetraploid and diploid swards sown with and without clover on pasture DM production and animal performance

Introduction

In 2012 a new experiment, entitled "The effect of tetraploid and diploid swards sown with and without clover inclusion on the productivity of spring milk production systems", was established at Clonakilty Agricultural College. The farm in the college comprises of an 84 hectare (ha) dairy unit and 29 ha dry-stock (suckler beef and sheep) unit. Forty four ha of the dairy unit were assigned to the experiment with 75% of the experimental area reseeded in 2012 and 25% reseeded in 2013. New roadways, paddocks and a water system were installed in order to facilitate the research. Four separate grazing treatments were sown on the experimental area, a tetraploid only sward (TO), a diploid only sward (DO), a tetraploid with clover sward (TC) and a diploid with clover sward (DC). Twenty blocks of paddocks (each block contained four paddocks) was created and to create the treatments, four diploid (Tyrella, Aberchoice, Glenveagh and Drumbo) and four tetraploid (Aston Energy, Kintyre, Twymax and Dunluce) cultivars were sown as monocultures with and without clover in five different blocks around the farm, thus creating a separate farmlet of 20 paddocks for each treatment. In the clover paddocks a 50:50 mix of chieftain and crusader white clover was sown at a rate of 5 kg/ha. There are 30 cows in each treatment group and treatments are stocked at 2.75 cows/ha, receive 250 kg of nitrogen (N) fertiliser per ha and target concentrate supplementation is 300 kg/cow for each treatment. Each farmlet is walked weekly to monitor average farm cover (using PastureBaseIreland) and when surpluses are identified they are removed in the form of baled silage. If a feed deficit occurs across all treatments, then all treatments are supplemented with concentrate. If a deficit occurs in an individual treatment then cows are supplemented with forage produced from within that treatment. The objective of the experiment is to compare milk and herbage production from tetraploid and diploid swards sown with and without clover.

The results presented in this paper are from the 2014 grazing season, which was the first full season of production from the experiment. As cows calved they were randomly assigned to their treatments and they remained on those treatments for the remainder of the grazing season. The four treatments (swards) were rotationally grazed from mid-February until mid-November 2014.

Results

For the purpose of the paper the four individual treatments are referred to as TO, DO, TC and DC. When discussing the effect of grass only (the mean effect of T and D; GO) versus grass clover (the mean effect of TC and DC; GC) swards the terms GO and GC are used.

Herbage production

The effect of cultivar on DM production is presented in Figure 1. Cultivar did not have a significant effect on total DM production ($P = 0.108$) or on grazing or silage DM production. Although not statistically significant, there were large numerical differences between the highest yielding cultivar (Twymax; 17.5 t DM/ha) and the lowest yielding cultivar (Kintyre; 14.7 t DM/ha), which would have a biological effect at farm level in terms of the ability to grow more pasture.

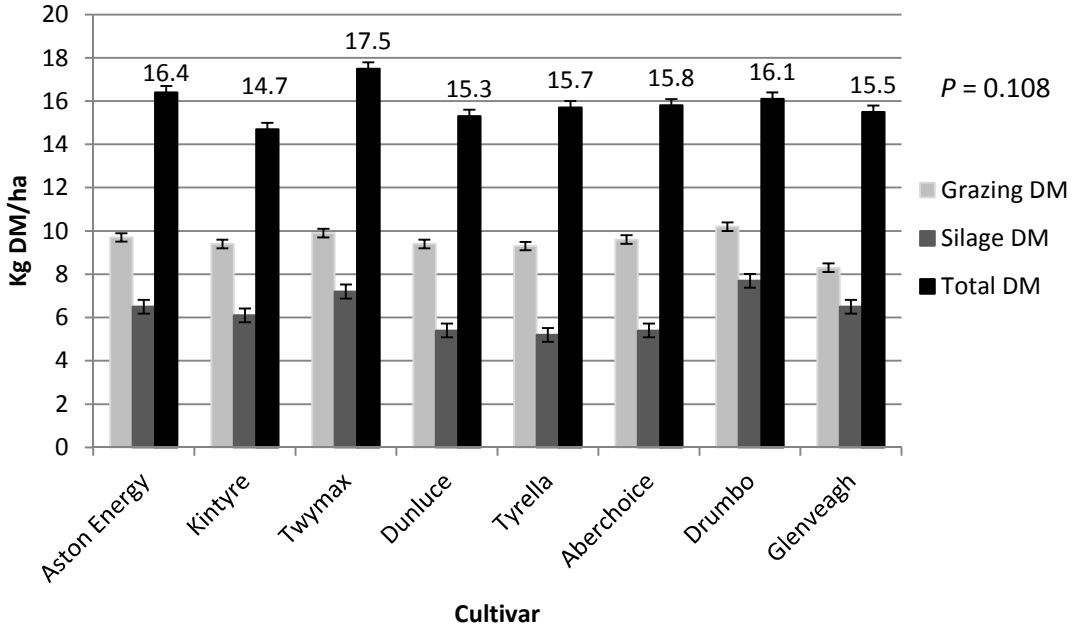

Figure 1 The effect of cultivar on grazing, silage and total DM production in 2014.

The effect of clover inclusion in the sward on daily grass growth is illustrated in Figure 2. Daily grass growth rates for GO and GC swards were similar from January to May. However, from June to September GC swards had greater daily grass growth rates compared with GO swards. The average difference in daily growth rate between GO and GC swards for this period was 20 kg DM/ha per day. In October and November there was no difference in daily grass growth rate between the GO and GC swards.

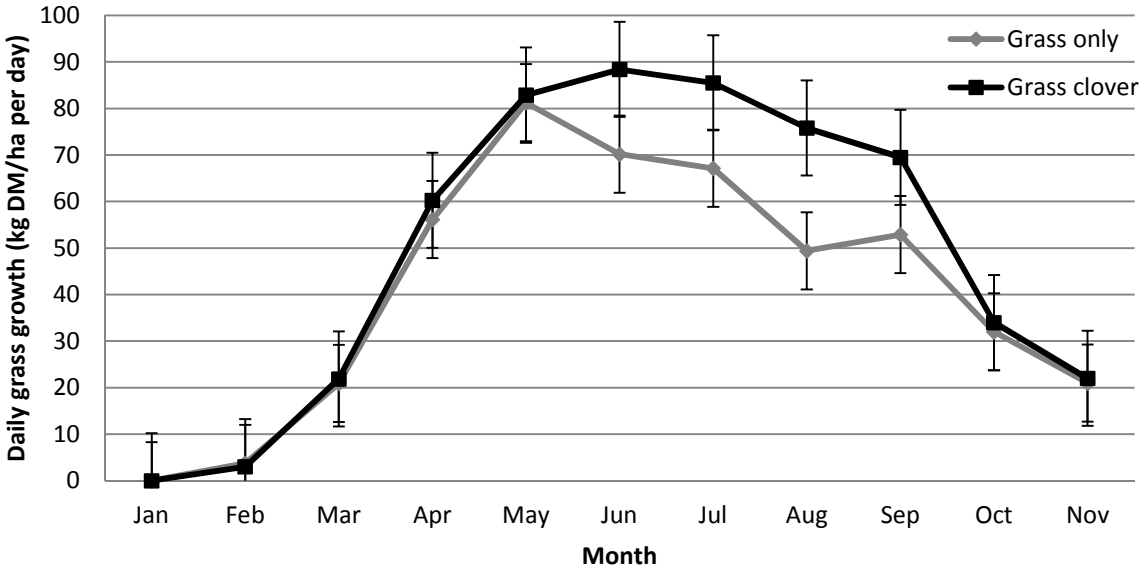

Figure 2 The effect sward type (grass only and grass clover) on daily grass growth rates for each month.

The proportion of clover in the TC and DC swards is presented in Figure 3. Clover proportion in the sward was not measured in February and March. Generally the proportion of clover in the sward is low during these months as clover growth commences at 8° C, whereas grass growth commences at 6° C, which gives grass an advantage in the early spring months. There was no difference between TC and DC in terms of the proportion of clover in each sward and the profile of clover in both swards was consistent with the expected pattern of clover growth. The average clover proportion was 39% and 40% for TC and DC, respectively, for the months measured, which are high proportions in comparison with previous research, although the proportions in February and March, if measured, would be lower and would reduce the overall average of both treatments.

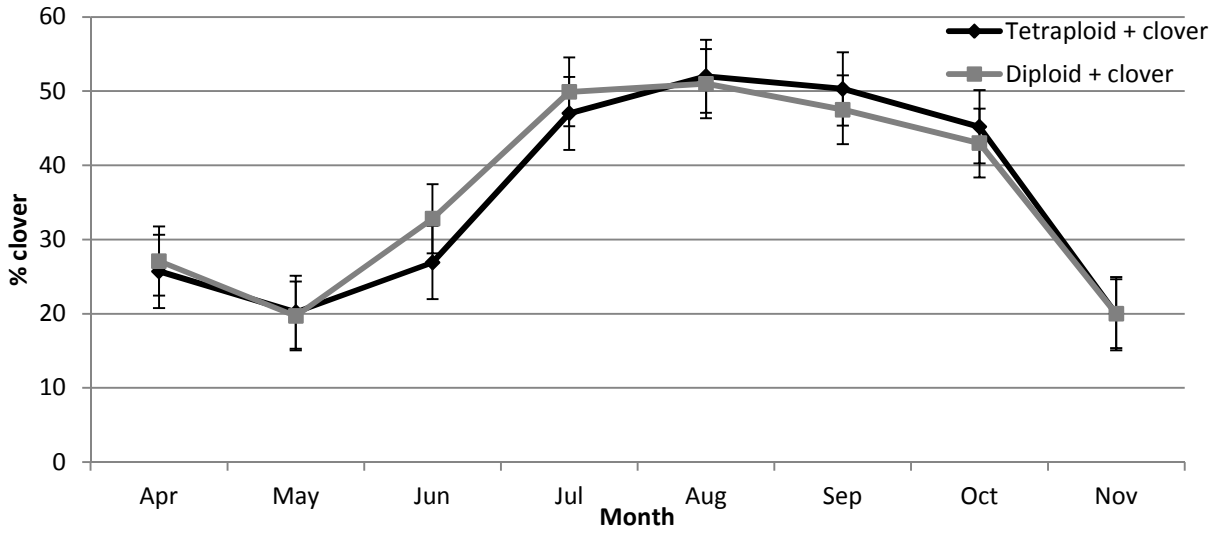

Figure 3 Proportion of clover in the tetraploid + clover and diploid + clover swards for each month.

The effect of treatment on grazing characteristics and herbage DM production is presented in Table 2. There was an interaction between ploidy and clover for DM % as DO had a higher DM % than TO during the year whereas there was no difference in DM % between TC and DC. Ploidy had an effect on pre-grazing yield, post-grazing height and herbage allowance as the diploid treatments (DO and DC) had greater pre-gazing yield (1792 vs. 1701 kg DM/ha), post-grazing height (4.26 vs. 4.08 cm) and herbage allowance (16.3 vs. 15.1 kg DM/cow per day) than the tetraploid (TO and TC) treatments. Clover inclusion had a significant effect on sward DM content as the GC swards had a lower DM content than the GO swards. Clover also had an effect on post-grazing sward height as the GC swards had a lower post-grazing height compared with GO swards (3.96 vs. 4.38 cm). Ploidy had no effect on herbage DM production, herbage utilisation or winter feed production, however, clover had a significant effect. Total herbage DM production was 2.5 t DM/ha greater on the GC swards compared with the GO swards. As a consequence, herbage utilisation (+ 2.2 t DM/ha) and winter feed production (+ 0.44 t DM/cow) was greater on the GC swards in comparison with the GO swards.

Table 2 The effect of treatment on grazing characteristics and herbage DM production and utilisation for the 2014 grazing season.

	Treatment[1]				Significance[2]		
	TO	DO	TC	DC	P	C	P*C
Dry Matter (DM; %)	19.8	21.3	16.7	17.0	***	***	*
Pre-grazing height (cm)	8.85	9.03	9.19	9.13	NS	NS	NS
Pre-grazing yield[3] (kg DM/ha)	1720	1831	1683	1752	*	NS	NS
Post-grazing height (cm)	4.24	4.51	3.92	4.01	**	***	NS
Herbage allowance[3] (kg DM/cow/day)	15.2	16.9	15.1	15.6	+	NS	NS
Herbage disappearance (kg DM/cow/day)	14.4	15.1	15.4	15.7	NS	+	NS
Herbage DM production							
Grazing herbage DM (t DM/ha)	10.4	10.2	11.4	11.2	NS	**	NS
Silage herbage DM (t DM/ha)	4.5	4.6	6.1	6.0	NS	***	NS
Total herbage DM (t DM/ha)	14.9	14.8	17.5	17.2	NS	***	NS
Herbage utilised (t DM/ha)	13.9	14.2	16.2	16.4	NS	***	NS
Winter feed produced (t DM/cow)	1.18	1.27	1.70	1.63			

[1]TO = tetraploid only; DO = diploid only; TC = tetraploid + clover; DC = diploid + clover
[2]Significance; *** = P<0.001; ** = P<0.01; * = P<0.05; + = P<0.1, P = ploidy; C = clover, P*C = interaction between ploidy and clover
[3]Measured above 4 cm

Milk production

The effect of treatment on milk production is presented in Table 3. Although ploidy had no significant effect on any of the milk production variables, the TO treatment produced 11 kg more milk solids per cow than the DO treatment. Clover had a significant effect on all milk production variables with the exception of fat and protein content. Both milk and milk solids yield per cow and per ha were greater for cows on GC treatments compared with the GO treatments. Cows on GC treatments produced 647 kg and 55 kg more milk and milk solids than cows on the GO treatments which resulted in an extra 1781 kg and 151 kg milk and milk solids yield per ha. Daily milk solids production for each treatment by week of lactation is presented in Figure 4. The TC and DC treatments had greater daily milk solids yield than TO and DO from week 10 of lactation onwards. The TO and DO treatments had similar daily

milk solids production for most of the lactation, however, from week 31 onwards TO had a slightly higher daily milk solids production in comparison with DO.

Table 3 The effect of treatment on milk production variables in 2014.

	Treatment[1]				Significance[2]		
	TO	DO	TC	DC	P	C	P*C
Milk yield (kg/cow)	4895	4848	5532	5506	NS	***	NS
Fat (g/kg)	47.4	47.0	46.5	46.8	NS	NS	NS
Protein (g/kg)	37.3	36.5	37.5	37.5	NS	+	NS
Lactose (g/kg)	47.6	47.4	47.9	48.2	NS	**	NS
Milk solids yield (kg/cow)	414	403	464	463	NS	***	NS
Milk yield (kg/ha)	13,473	13,366	15,284	15,118	NS	***	NS
Milk solids yield (kg/ha)	1140	1109	1279	1273	NS	***	NS

[1]TO = tetraploid only; DO = diploid only; TC = tetraploid + clover; DC = diploid + clover
[2]Significance; *** = P<0.001; ** = P<0.01; * = P<0.05; + = P<0.1; NS = not significant; P = ploidy; C = clover

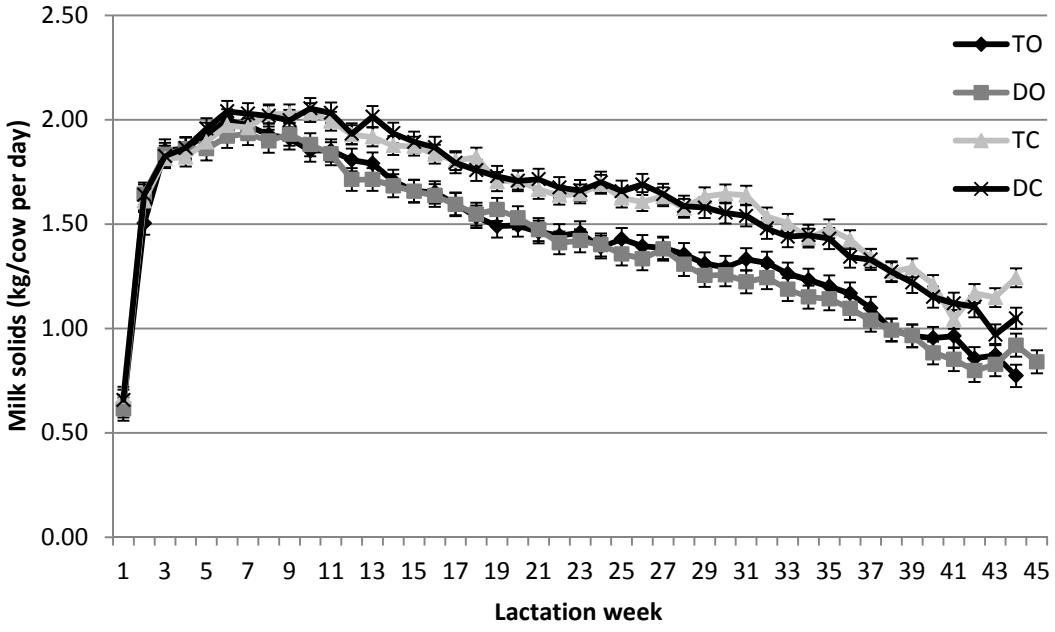

Figure 4 Daily milk solids yield for the 4 treatments by lactation week (TO = tetraploid only; DO = diploid only; TC = tetraploid + clover; DC = diploid + clover).

Moorepark experiment: Influence of nitrogen fertilisation level and white clover incorporation on pasture DM production and animal performance

Introduction

An experiment was established at Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, in January 2013. The experiment will run for 4-5 years. The experiment is a closed systems experiment with three sward treatments:

- Grass only sward receiving 250 kg N/ha (Gr250)
- Grass white clover sward receiving 250 kg N/ha (Cl250)
- Grass white clover sward receiving 150 kg N/ha (Cl150)

Some swards were sown during summer 2012 and 2013, and others are pre-existing swards. The sown grass only swards comprise of a 50:50 mix of Astonenergy (tertaploid) and Tyrella (diploid) sown at 27 kg/ha, and the sown grass clover swards comprise the same grass species and sowing rate plus a 50:50 mixture of Chieftan and Crusader clover cultivars sown at 5 kg/ha. In early February in 2013 and 2014 cows (42 and 57 cows, respectively) were balanced by productive traits and randomly allocated to treatments. There were 14 cows per treatment in 2013 and 19 cows per treatment in 2014. Cows remained in their treatment for the entire year. Treatments were stocked at 2.74 cows/ha and rotationally grazed. Silage for each treatment was harvested from the farmlet. Each farmlet was walked weekly and farm cover was recorded in PastureBaseIreland. The objective of this experiment was to compare the herbage production and milk production from a grass only sward receiving 250 kg N/ha with grass clover swards receiving 150 or 250 kg N/ha. Herbage production is reported from the sown swards as these are comparable in terms of species sown and sowing dates. As this experiment is still on-going, only preliminary statistical analysis has been undertaken. Results from the first two years of this experiment will be presented in this paper.

Results

Herbage production

Herbage production was similar across treatments in 2013 and 2014 (14.2, 14.4 and 14.3 t DM/ha for the Gr250, Cl150 and Cl250, respectively; Figure 5). Herbage production was greater in 2014 (15.5 t DM/ha) than in 2013 (12.8 t DM/ha).

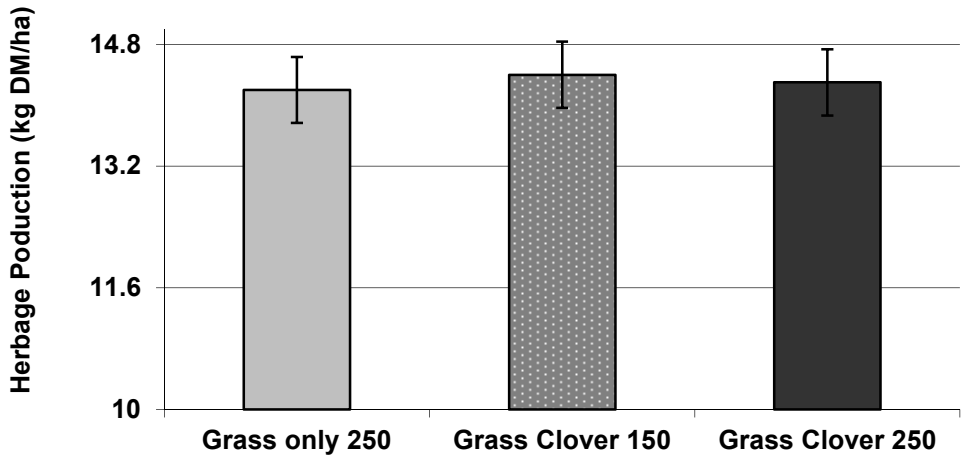

Figure 5 Average herbage production (2013 and 2014) on grass only swards receiving 250 kg N/ha/year and grass clover swards receiving 150 kg N/ha/year and 250 kg N/ha/year.

Average sward clover content for 2013 and 2014 was higher on the Cl150 treatment (average 27.0%) compared with the Cl250 kg N/ha treatment (average 23.6%; Figure 6). Sward clover content was least in the first rotation (average 7% for both treatments) and greatest in the 7th and 8th rotations (42% on the Cl150 treatment and 32.2% on the Cl250 treatment).

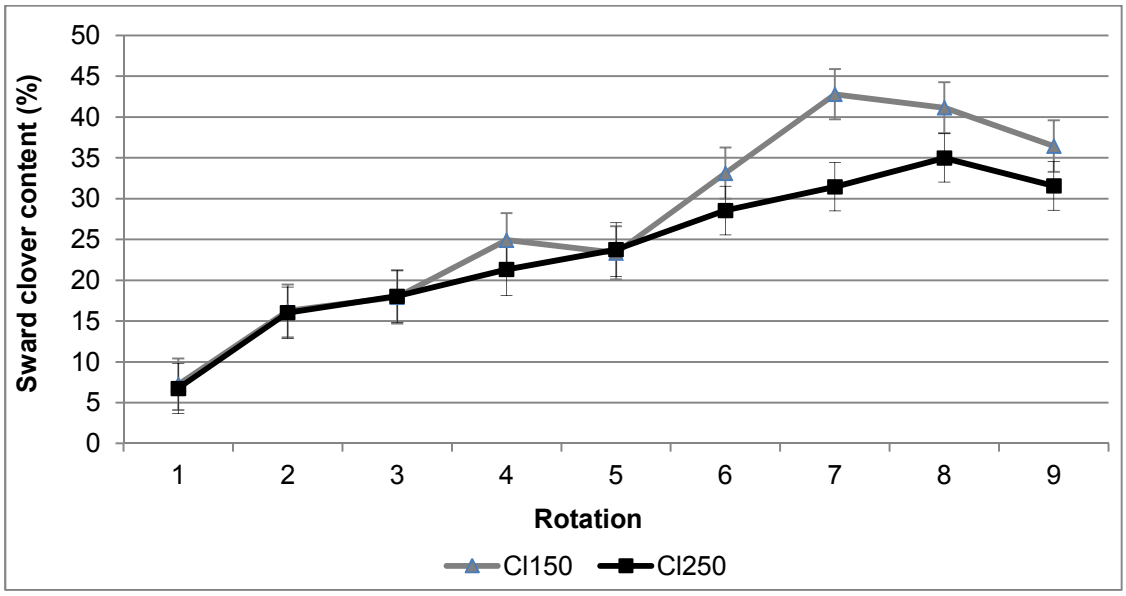

Figure 6 Average sward clover content on the grass clover 150 kg N/ha treatment and the grass clover 250 kg N/ha treatment in rotations 1 to 9 in 2013 and 2014. Bars represent SE.

Milk production

The average milk yield and milk solids production per cow/day, milk composition, and cumulative milk yield and milk solids production per cow for 2013 and 2014 are shown in Table 4. Milk yield and milk solids production per cow per day were lower (P<0.001) on Gr250 treatment than on the CL150 and Cl250 treatments which were similar to each other.

Table 4 Average daily and cumulative milk production on grass only swards receiving 250 kg N/ha (Gr250) and grass clover swards receiving 150 kg N/ha and 250 kg N/ha (Cl150 and Cl250, respectively).

	Cl150	Cl250	Gr250	SE[1]	Significance[2]
Milk yield (kg/cow/d)	21.1	22.1	20.6	0.44	***
Milk solids (kg/cow/d)	1.69	1.70	1.58	0.03	***
Milk fat (g/kg)	4.58	4.47	4.43	0.26	NS
Milk protein (g/kg)	3.61	3.58	3.62	0.05	NS
Cumulative milk solids (kg/cow)	485	489	454	2.85	***

[1]SE = Standard Error

[2]Significance; *** = P<0.001; NS = not significant,

Daily milk solids production was similar for the two clover treatments and lower for the Gr250 treatment for most of the experiment (Figure 7). Daily milk solids production was significantly lower (P<0.05) on the Gr250 treatment compared with the Cl150 and Cl250 treatments from June onwards (Figure 7). On average, milk solids production was greater (P<0.01) in 2014 (476 kg MS/cow) than in 2013 (464 kg MS/cow). The Gr250 cows (454 kg MS/cow; 1244 kg MS/ha) produced significantly (P<0.05) less milk solids per cow than the Cl150 (485 kg MS/cow; 1329 kg MS/ha) or the CL250 (489 kg MS/cow; 1340 kg MS/ha).

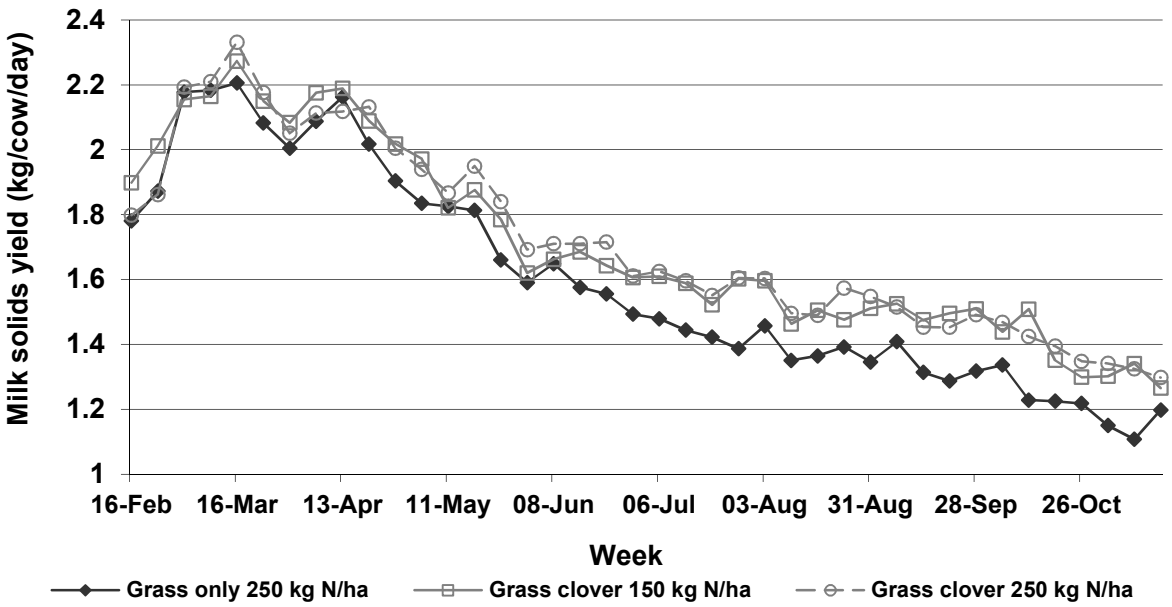

Figure 7 Milk solids yield per cow per day (kg/cow/day) from early February to mid-November (2013 and 2014) on the grass only 250 kg N/ha treatment, the grass clover 150 kg N/ha and the grass clover 250 kg N/ha.

Summary of recent research

Although perennial ryegrass cultivar did not have a significant statistical effect on pasture DM production, there was a large numerical difference (2.8 t DM/ha) between the highest and lowest yielding cultivars. As of yet, it is not possible to ascertain if cultivar has an effect on milk production within this experiment. Ploidy did not affect pasture DM production (average DM production of tetraploid cultivars 16.0 t DM/ha compared with 15.8 t DM/ha for diploid cultivars). Ploidy did not affect milk production in the first year of the Clonakilty experiment. Milk yield and milk solids yield per cow were 1% and 2.7% greater on TO in comparison with DO treatments, which are slightly lower than the results of the meta-analysis presented earlier in this paper.

The contribution of clover to the sward is generally small in spring (<10%), and does not begin to increase until April or May, depending mainly on temperature. Sward clover content peaked between July and September and then declined in the autumn and over winter. The frequent and tight grazing (to 4 cm or less post grazing-sward height) practiced in all of the experiments reported in this paper appears to have benefited sward clover content as clover requires a greater intensity of light at the sward base than perennial ryegrass as light is necessary for stolon production. Year can also have a significant effect on sward clover

content and the two relatively warm and dry summers of 2013 and 2014, have helped achieve relatively high levels of clover in both experiments, although the clover content was higher in the Clonakilty experiment than the Moorepark experiment. Including clover into perennial ryegrass swards increased pasture DM production in the Clonakilty experiment by 2.5 t DM/ha this year, regardless of grass ploidy. Although there was no difference pasture DM production between the three treatments in the Moorepark experiment over the last two years, it is interesting to note that the GC swards receiving 150 kg N/ha produced the same amount of pasture DM as the GO and GC swards receiving 250 kg N/ha. Another experiment in 2012, which is not reported on in this paper, had an average sward clover content of 21.6%, and found that GC swards increased pasture DM production (+ 1.2 t DM/ha) in comparison with GO swards (Hennessy *et al*., 2013). The increased pasture production found on the GC swards in some of the experiments is likely due to the increased availability of N for plant growth as a result of N fixation by clover.

Daily and cumulative milk and milk solids production were greater for cows grazing GC swards compared with GO swards in both the Moorepark and Clonakilty studies. The average increase in milk solids for cows grazing GC swards was 33 kg/cow and 55 kg/cow in the Moorepark and Clonakilty studies, respectively. The variability of the increase in milk solids production in the experiments reported here is likely related to sward clover content. The swards in Clonakilty had a greater average clover content (39.5%; notwithstanding the fact that clover content was not measured in February and March on the Clonakilty experiment, the clover content of the swards was relatively high for the time of year) compared with the Moorepark experiment (25.3%). Milk constituents (fat and protein percentage) were similar for cows grazing GO and GC treatments on both experiments. There was a seasonality effect on milk production observed in the experiments reported in this paper, regardless of the year, with increased milk solids production from the GC swards occurring mainly in the latter part of the grazing season. The increase in milk production is due to a combination of both feed quality and positive intake factors associated with clover (e.g. high digestibility, faster rumen pasture rate compared to perennial ryegrass; Harris *et al*., 1998; Clark and Harris, 1996).

The early results from the experiments presented in this paper involving clover are very promising. However, these experiments are in their infancy and need to be allowed run for the next 5 to 6 years to allow a comprehensive analysis of the impact clover has on grazing systems in Ireland. As stated earlier, the last two summers have been very favorable to clover

and we have not seen any real negative aspects to clover which may be more apparent with less favorable weather conditions. There are a number of questions around GC pastures, including persistency of clover, spring DM production and bloat with GC swards which need to be addressed and answered over the next few years.

Conclusion

Improvements in both pasture DM production and animal performance can be achieved by selecting perennial ryegrass cultivars with the correct mix of structural and chemical composition characteristics. Clover incorporation appears to offer an opportunity to increase pasture DM production and increase animal performance to a greater extent than cultivar selection. However, further research is required as to the long term effectiveness, persistency and sustainability of clover in Irish grazing systems.

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Building your own Grass Budget

Donal Patton

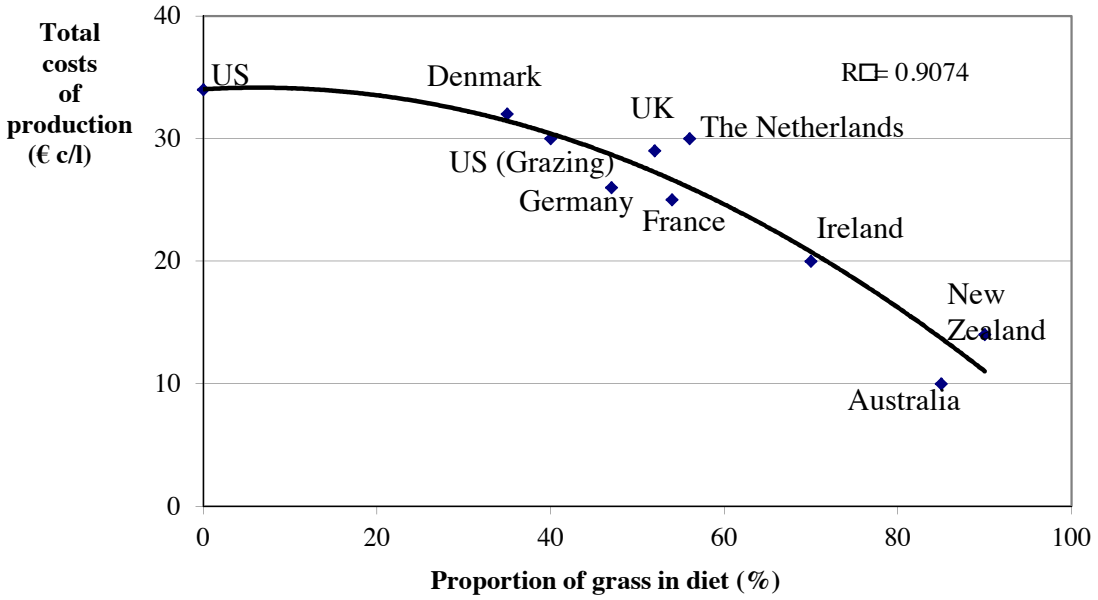
Teagasc Ballyhaise, Co. Cavan

Introduction

The removal of milk quotas in Ireland will create an opportunity for many farmers to increase the overall profitability of their farm business. While the removal of milk quotas signals an exciting time for dairy farmers, I think that there are some positive lessons to take from the era of milk quotas which are worth remembering. Foremost among these lessons was the need to retain low production costs per unit of milk production. The presence of EU milk quota limitations required that total farm profit was maximised by producing milk at least cost and consequently, Irish farmers have focused on increasing the grazed grass proportion of the diet and retaining a high marginal profit (of approximately 40%) per unit of milk produced. The high reliance of Irish farmers on grazing systems of production has resulted in reduced investment in capital infrastructure and therefore lower fixed costs in comparison to other EU countries. Dillon et al. (2005) has previously reported that the average cost of milk production is decreased by over 1 cent/L for a 2.5% increase in grazed grass in the cow diet (Figure 1). The data also show that increasing the proportion of grazed grass in a system that already contains a high proportion of grazed grass (Ireland and New Zealand) and wherein feed costs are proportionally more important, will have a greater benefit in reducing the total cost of milk production than a country that already has a low proportion (Denmark and USA). At both research and farm level, we have realised how valuable our grass is as a feed resource, and the impact of improving grass utilisation on the profitability of milk production systems has been well documented. While there is a diversity of grass-based production systems in Ireland, many studies have indicated that the profitability (€/hectare) of milk production on Irish farms is closely related to the amount of grass dry matter (DM) consumed per ha (Shalloo, 2009; Ramsbottom et al., 2014). Using the agro-economic simulation model for Irish grazing systems, Finneran et al. (2010) estimated the relative costs of grazed grass, conserved grass silage and concentrate feeds to be 1: 2: 5, respectively. It is possible that post quota, this message may be lost with farmers focusing on a drive to increase output from their farm, as has happened in New Zealand in recent years. In general, stocking rates (SR) will increase on Irish dairy farms post quotas and will place added pressure on available feed resources and therefore, productivity improvement within dairy farms is absolutely essential

to avoid production cost inflation and additional environmental stresses associated with production system intensification. On expanding farms post quota, calving dates, closing dates for silage, fertiliser application rates and timing, feed inputs per cow, grazing management practices etc. may need to be adjusted during the expansion process to increase system productivity and realise the potential benefits of higher SR systems. Among the main challenges of high SR systems, the provision of adequate high quality grass to meet the nutritional requirements of the freshly calved herd in spring and to maintain a long grazing season are of paramount importance on dairy farms and necessitate improved feed budgeting at farm level.

A farmer once told me that there was no point in budgeting grass as there was so much variation from year to year; I think that is exactly why we should budget. The fundamental difference between those who budget and those who don't is that people who don't budget are basically accepting that they have little or no control over their feed supply situation. This is as true for budgeting money as budgeting grass and when you think about it, for a dairy farmer, they are one and the same. The benefits of grass budgeting are most evident in poor growing conditions. In early spring when weather is cold and wet, the average farmer will tell you it is far too cold for grass to grow and so his cows are in the shed eating good quality silage. In contrast, the astute grassland farmer will have his cows out grazing because he has been planning for it since the previous August. Grass is a perishable feed source with an irregular supply pattern which is dependent on the weather. On that very basis, I would challenge farms to explain to me how they can possibly manage without budgeting to build reserves for autumn and spring when grass supply is so variable? In my opinion, grass budgeting is a key skill needed for growing the farm business post quota, and on a par with budgeting cash in terms of overall importance. **From experience, I estimate that keeping the farm on target cover during the year reduces feed costs by €100 per cow per year.** The purpose of this paper is to clearly outline the process and benefits of building your own grass budget and how to manage grass supply, quality and utilisation.



Dillon et al. (2005)

Figure 1 Relationship between total costs of production and proportion of grass in cows diet.

What is a grass budget?

A grass budget is like any other budget, it is a plan set out in advance for grass supply and animal nutrition during the autumn to spring period when grass growth is typically lower than demand on dairy farms. Like any other plan, the grass budget based on predicted grass growth and animal requirements, sets targets for grass availability during the most food-expensive months of the year. Working with visiting discussion groups at Ballyhaise, I have often asked farmers if they complete a grass budget and the most frequent answer is 'oh yea I do a wedge most weeks'. In many cases these farmers are doing a good job walking the paddocks and collecting the data week to week, but unfortunately it often stops there. The wedge is a picture of the farm on a given day; the budget on the other hand allows us to predict ahead what is likely to happen in the next week / month. Most of the computer packages used to measure grass have a grass budgeting facility which will import your measured cover each week and allow it to be compared against a pre-determined target cover. In this way, farmers can rapidly react when the actual grass supply deviates from the target to quickly get back on target with minimal cost.

Figure 2 below outlines the target and actual grass supply levels on the Ballyhaise College Dairy unit during autumn 2014. As evidenced from Figure 2, the target for Ballyhaise is to build grass supply from mid-August by extending rotation length to a peak farm cover of

1,100 kg DM/ha on the farm by early October. Thereafter, the reduced autumn growth rates and high demand associated with the high overall farm SR (2.9 LU/ha) result in a decline in grass supply until animals are housed in late November at a closing farm cover of 650 kg DM/ha. A more detailed breakdown of the Ballyhaise grass budget is provided in Appendix 1 at the end of this paper.

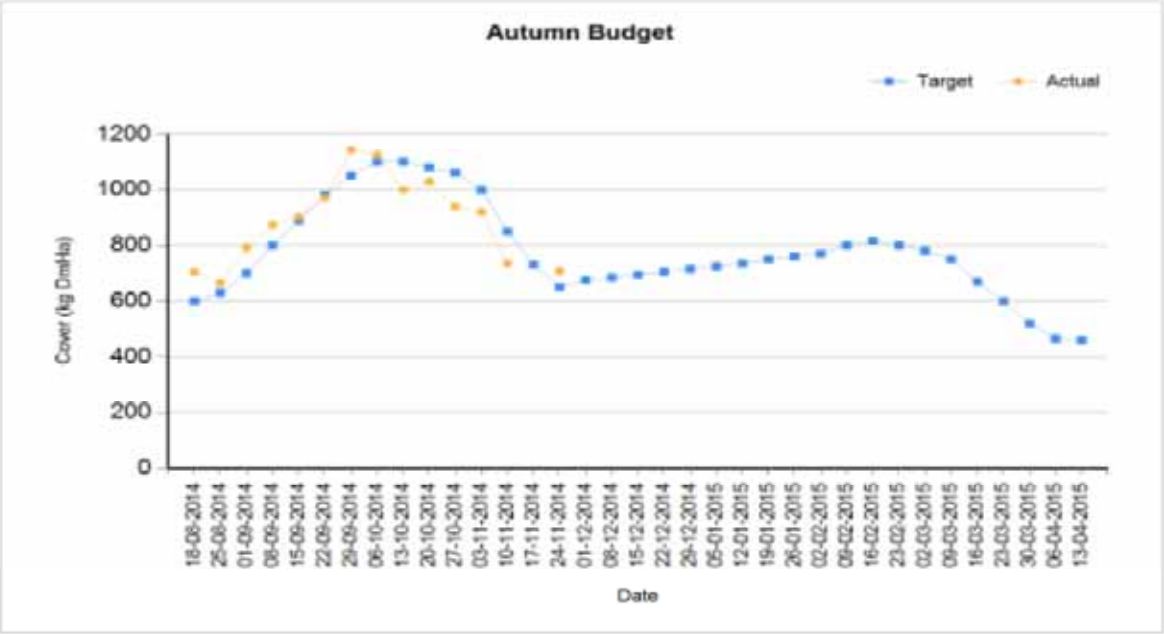


Figure 2 Actual and target autumn grass supply for Ballyhaise College dairy unit.

Why should I build my own Budget?

If we accept the premise that using a grass budget is a sensible strategy for dairy farmers why not just use the same generic set of targets for every farm? The simple explanation is that there is a huge amount of variation from farm to farm in grass growth capability, SR, soil type and fertility, topography, drainage, farm layout, infrastructure etc. In reality the starting point is to take the general cover targets and to adjust them over time to suit your individual farm and farm system based on experience. Similar to cash flow budgets, they are much more effective if the farmer takes control from the beginning and understands the relationship between supply and demand. The difference between farms in grass growth for example can be substantial. Unlike Moorepark, which routinely achieves winter growth rates of 3 to 5 kg DM/ha/day, growth rates at Ballyhaise are much more variable and in 3 of the last 5 years, average grass growth rate during winter was 0 kg DM/ha/day. From my experience, the benefits of grass budgeting to control grass supply on farm will be of even greater

significance in a Ballyhaise type environment where it is essential to plan both the overall level and location of spring grass supplies within a farm with a mixture of wet and dry soils. Over a number of years in Ballyhaise, we have learned that letting peak cover in autumn build above 1150 kg DM/ha is too risky for the college farm as 15% of the overall area is very heavy and prone to flooding. Consequently, we do not build large (in excess of 1300 kg DM/ha) pre-grazing covers on this area at any time during the year as the risk of loss is too great. Instead we graze it at shorter rotations than the rest of the farm which in effect means skipping out of rotation when conditions allow. As a consequence, pre-grazing yields on the drier parts of the farm often builds in excess of 2,400 kg DM /ha even if average farm cover is only 1150 kg DM/ha.

Another advantage of the farm specific budget is to help make tactical decisions quickly and easily. If you deviate from the target line, then you have to take decisive action. This will become even more important as stocking rates, and therefore by association demand, increases. Timely intervention will help to prevent the inevitable tail spin effect if growth rate drops below demand and corrective action is not taken. This can be seen on farms that are operating at high stocking rates without budgeting feed where a sort of continuous boom bust cycle emerges. One particular friend of mine springs to mind, he is stocked at 4 cows per ha, he measures grass weekly but has only recently started budgeting. I have watched him closely for a number of years and have recorded his actions; he tended to perpetually be above or below target. He once described grass management at high stocking rates as 'driving a Ferrari with a brick on the pedal'. The pattern was always the same:

- Delay turnout because there was not enough grass.
- At turnout apply lots of N to drive growth because demand is high.
- Graze high covers (1800 kg DM/ha) in May and June because he has a high stocking rate.
- Covers get far too strong – remove a few paddocks as surplus based on covers of individual paddocks.
- Farm cover drops too low and enters a tail spin – introduce feed to fill gap.
- And so on!!

I have since revised his quote.
Managing grass at a high stocking rate without grass budgeting is like driving a Ferrari with a brick on the pedal and being blindfolded – not very clever.

In addition to the short to medium term benefits of budgeting feed on the farm there are also considerable longer term benefits. It will help you plan ahead more accurately, especially in cases where a farm is in development stage. This can be in terms of provision of supplementary feeds, planning a reseeding programme, planning closing of silage area or the need for additional facilities. A good example of this is a farmer who operated quite successfully at a low stocking rate (2.2 cows / ha) with a poor quality pit silage. He was going to increase stocking rate to 3 cows per ha and realised through creating a feed budget that, at the higher stocking rate, he would have to feed silage to milking cows in early spring to allow for the increase in herd demand. This exercise the year before he increased stocking rate allowed him make provisions:

- He made 1 bale per cow of 76% DMD silage for buffer feeding.
- He rearranged his feed barriers so that bale silage could be introduced easily and efficiently if the budget dictated so.

A couple of hours working out his feed budget meant he was ahead of the curve and was prepared when the inevitable feed shortage occurred. I have talked to a number of farmers who learned this lesson after a number of years of sub-optimal performance at high stocking rates.

How do I construct my budget?
The golden rule is to be realistic when building your budget, there is no point in planning for 15 kg DM/ha in February if you have not done any reseeding in years and your soil pH is 5.5. If the targets set are unrealistic, the entire process becomes irrelevant and the budget devoid of value.

The second rule is to review and readjust regularly and there are two elements to this process. Firstly, as you progress through the season you should look at your actual vs. target cover each week and adjust accordingly. Do not put off making adjustments as the delayed decision is almost always bigger and more expensive. Secondly, it is useful to review the target covers

each year and see if they need to be adjusted. Good records are essential for this process as it is often quite difficult to remember events and conditions throughout the year – when were the cows turned out, what did I feed and when, when did I spread first nitrogen etc. A grazing calendar or diary is essential for this process and recently I have actually started to record a short video at critical times over the year to show grazing conditions and explain how we are managing at that particular time. This will help inform our decision making later in the year when revising the budget targets.

The critical pieces of information you will need are growth rates, demand and cover targets.

Growth Rate

- Take an average of 3 years.
- Input a growth for each week of the year
- Pick a similar farm if you have no data on your own farm

Demand

- Work out number of cows grazing for each week and with accurate calving patterns
- Number of ha available for grazing each week
- Input planned feeding regime

Cover Targets

- Work out magic day for your farm – day when Growth = Demand
- What farm cover will you need at planned start of calving to get to magic day?
- What cover will you have to close the farm at to have the correct opening cover?
- What peak cover can I realistically utilise?
- When will I have to start building to get to this peak?
- So essentially you work backwards with the aim of arriving at magic day with the correct grass cover and minimal feed inputs fed over the autumn and spring.

Having collected the above data, the first step is to input the variables that don't change in the short term – cow numbers, land area, growth rates. Then you set target covers for the 3 critical dates namely: peak cover in autumn, and opening cover and magic day in spring. Then you alter the variables that you have control of in order to meet these targets. As a grass

manager you have several levers available to alter both growth (supply) and animal requirements (demand).

Growth

Short Term

- Fertiliser – N, P and K
- Grazing management – Pre-grazing herbage yield, residual post grazing herbage mass, rotation length, minimise poaching by on/off grazing.

Long Term

- Base soil fertility
- Reseeding
- Drainage
- Grazing infrastructure

Demand

- Changing grass allocation of supplementary feed inputs
- Stocking rate – reduce/increase stock numbers by removing unproductive stock or bringing young stock onto the dairy cow area, changing silage conservation plans
- Moving calving date

Conclusion

I know very few farmers who are using grass budgets on a weekly basis and adjusting them annually. In reality, managing grass supply on dairy farms is an essential skill required to feed animals on a grass diet and maintain low feed costs. Higher SR will place added pressure on available feed resources on farms in future and therefore, increased grassland productivity is absolutely essential to avoid production cost inflation and additional environmental stresses associated with production system intensification. Against the backdrop of increasing overall farm SRs, I contend that the adoption of improved grazing practices on farms and in particular, the development of disciplined feed budgeting, will be among the greatest opportunities for Irish dairy farmers to expand their businesses profitably and in a manner consistent with the highest standards of environmental efficiency.

Appendix 1

Ballyhaise 2014 Autumn and Spring Grass Budget

Week	Grass Cover (kg dm/ha)	Grazing Area (ha)	Growth kg dm/day	No. Milking Cows	Cow diet kg DM Grass		Milking Silage	Predicted cover close (kg dm/ha)
18-Aug	600	30	71.8	120	17	0		627
25-Aug	627	30	70.5	120	17	0		644
01-Sep	644	35	67.8	120	15	2		759
08-Sep	759	40	63.1	120	15	2		885
15-Sep	885	40	58.5	120	15	2		980
22-Sep	980	40	55.0	120	15	2		1050
29-Sep	1050	40	53.7	120	15	2		1111
06-Oct	1111	40	44.2	120	15	2		1105
13-Oct	1105	40	43.0	120	15	2		1091
20-Oct	1091	40	40.7	120	15	2		1061
27-Oct	1061	40	32.8	110	15	2	0	1001
03-Nov	1001	40	15.0	100	15	2	0	844
10-Nov	844	40	12.0	80	14	3	0	732
17-Nov	732	40	5.0	50	13	3	0	**653**
24-Nov	653	40	3.0	50	0	3	12	674
01-Dec	674	40	1.5	0	0	0	10	684
08-Dec	684	40	1.5	0	0	0	10	695
15-Dec	695	40	1.5	0	0	0		705
22-Dec	705	40	1.5	0	0	0		716
29-Dec	716	40	1.5	0	0	0		726
05-Jan	726	40	1.5	0	0	0		737
12-Jan	737	40	1.5	0	0	0		747
19-Jan	747	40	1.5	0	0	0		758
26-Jan	758	40	1.5	0	0	0		768
02-Feb	768	40	4.6	10	0	4	6	**801**
09-Feb	801	40	6.4	35	5	3	2	815
16-Feb	815	40	2.8	40	5	3	3	799
23-Feb	799	40	10.0	55	9	3	0	783
02-Mar	783	40	15.0	80	10	3	0	748
09-Mar	748	40	15.0	95	11	3		670
16-Mar	670	40	20.0	100	12	3		600
23-Mar	600	40	22.5	105	13	3		518
30-Mar	518	40	28.0	110	13	3		464
06-Apr	464	40	36.8	115	13	3		460
13-Apr	460	40	43.0	120	13	3		488

How I maximise the amount of grass I grow on my farm

Michael Doran

Johnstown, Duncormick, Co. Wexford

I am married to Ciara and we have three children, Ella 6, James 2 and Tomás 16 months. In 2014 I started a conversion process on my farm from beef to dairy. First I would like to give some background information of what we were doing on the farm before the conversion. We had grown the suckler herd from 57 cows before I took over the farm to 115 cows with all progeny finished as beef. I previously spoke at an Irish Grassland Beef Conference about my plans at the time to grow my beef enterprise. We switched to finishing all male animals as steers to bulls in 2007 at 22/24 months of age and had reduced age at slaughter over the last number of years to 16/18 months at the same carcass weight. Heifers were slaughtered off grass mainly at 20 to 23 months of age. The sheep flock on the farm peaked at 250 ewes in 2007 and had been reducing since to 50 ewes lambed in 2014 before they were all sold. Overall we were operating at a stocking rate of 2.5 LU/ha on the area of the farm under grass. Forty five hectares of tillage crops were also grown, mostly winter crops as some of the farmed land is heavy.

In June 2013 we applied to the national reserve for milk quota under the new entrants to dairying scheme, this decision was made when I was getting €5/kg carcass for my beef. The decision to convert was not an easy one to make, but with the reduction on my SFP (Single Farm Payment) along with the loss of REPS and SCWS (Suckler Cow Welfare Scheme), the cheque in the post was diminishing. This reduction would reduce my overall profitability, on the beef enterprise. At the same time the message emerging from the beef industry was that they no longer wanted bulls, which was an important part of my system, one which had helped me increase my output and profitability over the previous 7 years. With milk quota being abolished this year the opportunity was now there to convert my farm to dairying. We received confirmation on the 28th of August 2013 that we had been successful in our application for milk quota. Planning permission was applied for in July 2013 in preparation for converting in 2014 or 2015, and was granted in mid-Sept to build a new greenfield milking parlour. We started building in early October 2013. Grant approval was obtained on the 24th of December 2013. We put in 24 units of stall work but only 16 units in the parlour as this maxed out the grant money. A 16,500 litre bulk tank was installed. The first heifer was milked on the 29th of January 2014. In 2014 we milked a total of 78 heifers. We produced a total of 275 kg of milk solids on 120 kg of meal fed. After 11.5 weeks of a breeding season 10% of the cows were empty, which was a little disappointing, however this was the first year we used AI on the farm so hopefully we will have better results in 2015. To date we have spent €200,000 as capital expenditure to convert. We spent €150,000 on a greenfield milking parlour, €20,000 upgrading 900 m of existing roadways and

installing 1200 m of new roadways. And €30,000 was spent on upgrading the 80 existing cubicles & installing 147 new cubicles in an existing shed. The funds generated from the sale of the suckler herd and beef cattle covered the cost of all in-calf dairy heifers (94) and calves (104).

Currently the milking platform is made up of 52 ha (11 ha leased); there is a further 37 ha of out farms in 3 locations under grass. These are between 1 and 5 miles from the milking platform, they will be used for heifer rearing and silage. There is another 40 ha in tillage 15 miles from the milking platform. Fifty beef animals still remain on the farm and will be finished this year, by the end of 2015 there will be no beef animals left on the farm.

Table 1 The 3 year plan to set the farm up as a fully converted dairy operation.

	2014	**2015**	**2016**
Milking cows	78	135	180
In-calf heifers	67	75	60
calves	90	62	60
Beef animals	107	50	10/2
Total	342	322	305
LU/ha	**2.66**	**2.7**	**2.75**

In 2014, 78 heifers (high EBI Jersey ⊏ Holstein Friesian) were milked this will grow to 180 milking cows in 2016. The plan is to generate all the animals required for expansion from within my own herd from now on. When we were operating the farm as a beef farm we had an overall farm stocking rate of 2.5 LU/ha. This will grow to 2.75 LU/ha when we have fully converted to dairying in 2016. To achieve this stocking rate and operate a low cost grass based dairy system, with a target concentrate input of 380 kg, grass measuring is crucial. To maintain this stocking rate the farm needs to grow over 15 t DM/ha. This is especially important on the grazing platform where the stocking rate will be 3.5 LU/ha. The only beef animals on the farm from 2016 on will be 10 male calves which will be kept and vasectomised. These will run with the cows during the breeding season.

How do I maximise grass growth and intakes?

The most important job on my farm every week is grass measuring, I sometimes ask myself why do farmers measure grass, is it for a discussion group meeting, a Teagasc advisor or to tick a box? For me I couldn't manage my farm and operate a low cost grass based system without measuring. Walking my farm weekly and measuring every paddock gives me the ***facts*** that I need to make my management decisions for the week. I use the plate meter to measure grass, the information I collect is

entered onto PastureBase Ireland straight after my farm walk. I find using the plate meter reduces your ability to eyeball as you are not as sharp at estimating the actual covers you are walking. However, I am happy to continue using the plate meter as I am 100% reassured that the covers it gives me are correct and it also forces me to walk every paddock and not just step inside the gate or do a farm cover from the comfort of a tractor seat. The three tools available on PastureBase Ireland or any grass program are the spring rotation planner, the grass wedge and the autumn rotation planner. These help me manage my farm for the year and dictate my plans for the week. The role of a good discussion group focused on grass cannot be underestimated. I am lucky to be in two groups very focused on grass, The Boolaross group in Wexford and a group made up of all new entrants that meet on the Greenfield Dairy Farm in Kilkenny every month. Both groups have a very clear focus on maximising grass growth and intakes and help us to keep our eye on the ball all year round.

The spring rotation planner is used to ration the grass available on the first rotation from turnout post calving in the early days of February until the 5th of April when the second rotation starts and grass growth on my farm is meeting my demand. The other important job of the Spring Rotation Planner is to set targets for the amount of area that should be grazed at specific dates during the first rotation to ensure the paddocks have enough time to re-grow grass and there's a wedge shape to amount of grass in my paddocks, ensuring that grass doesn't run out on the second rotation. The targets for me are those set by Moorepark: 30% grazed by the 1st March, 60% by the 17th of March and 100% by the 4th of April with a farm cover per cow of 180 kg DM/LU maintained in late March and into the second rotation. I always prefer to delay the start of the second rotation by a few days to ensure that there is less risk of running tight on grass as the cows are preparing for breeding which starts on the 22nd of April. It is easy to turn out the cows left to calve at the end of March if there is enough grass to start the second rotation a few days earlier. With paddocks closed since the 7th October we are on target to open at an AFC (Average Farm Cover) of 900 kg DM/ha, which is required to facilitate turnout on the 1st February once calving starts. Eighty percent of my cows are expected to calve in the first six weeks placing a high demand on grass from turnout at calving. Once the second rotation starts the Grass Wedge is the tool used to monitor grass supply and indicates the next paddock which should be grazed. We aim to graze paddocks at 1500 kg DM/ha during the mid-season. Using the wedge allows me to quickly determine if I have a surplus or deficit of grass at that particular moment in time. This then determines the amount of nitrogen that needs to be applied or if a paddock needs to be taken out, grazing covers above 1700 kg DM/ha has a number of negative impacts from my observations in 2014 (1) milk yield drops, (2) milk solids are reduced solids, (3) it is more difficult to graze out paddocks below 4cm and (4) slows re-growths. The opposite is also something to be avoided; that is grazing paddocks with too low a cover, this risks running short on grass unless measures are taken to avoid it such as feeding meal or silage, spreading more fertiliser or watching the forecast to try predict the next weeks grass growth. In 2014 we found that between 150 and 180 kg DM/ha seemed to be the

target covers per cow to keep grass quality right. Measuring grass is not a skill that you can expect to perfect overnight, I have spent the last 7 years measuring grass and still feel that I'm in the beginner's class. Every year throws a different challenge, but also I've been able to improve my skills and learn from the mistakes I've made previously.

The final tool that I use in the grass year is the Autumn Rotation planner, which is similar in ways to the spring rotation planner. Farm covers were built up to 1200 kg DM/ha on the 7th of October. Re-grazing paddocks after closing has to be the biggest cardinal crime that any serious grass farmer can make. We start closing paddocks from the 7th of October and aim for 60% closed on the 1st of November with the remaining grass rationed out until housing in late November or early December. We try to build an AFC of 1200 kg DM/ha on the 1st of October and close at an AFC of 650 kg DM/ha. Grazing out paddocks in autumn 2014 proved somewhat difficult due to the exceptional growth recorded in late September/ early October. This left us grazing covers of 3300 kg DM/ha in mid-November but luckily ground conditions were excellent which allowed us to get most paddocks cleaned out well. Cows were dried off at this stage which also helped to graze out these paddocks as forcing the cows to work harder was not a concern. It was difficult to graze these heavy covers while the cows were milking without effecting milk yield.

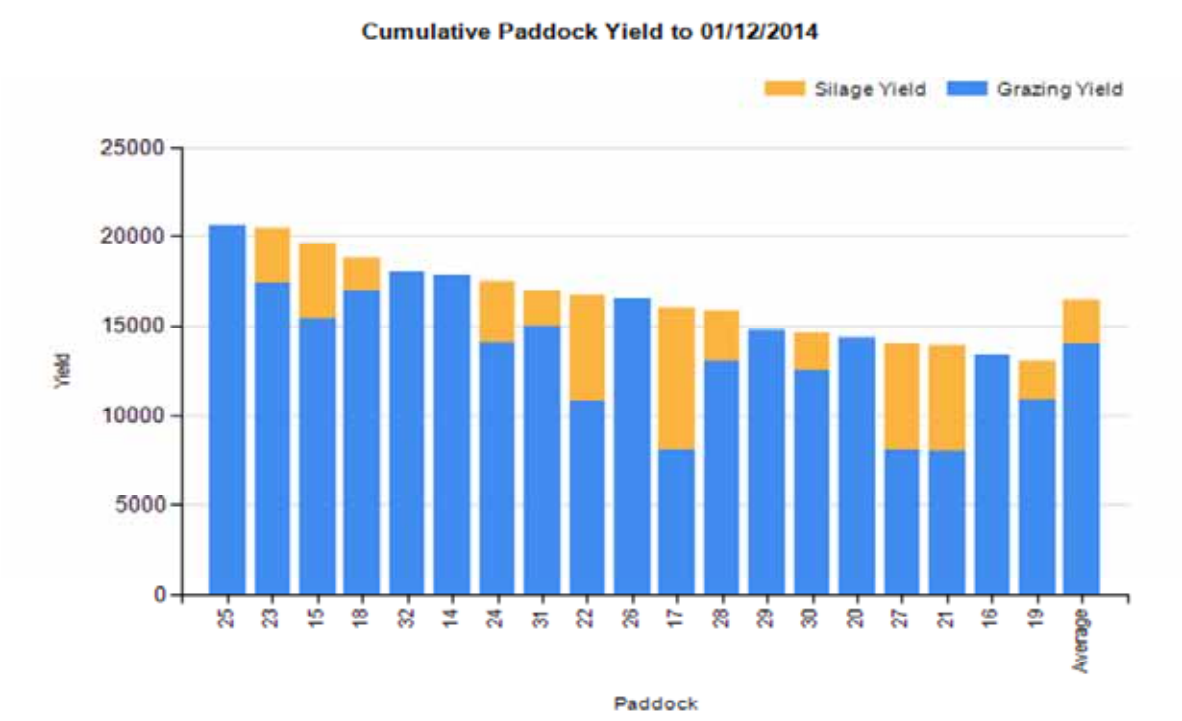


Figure 1 Performance of the paddocks on the grazing platform in 2014.

On average we grew 16.5 t DM/ha across the whole milking platform in 2014. In 2012 we grew 12.2 t DM/ha which was disappointing but the farm suffered from very poor growth rates from the late spring like every farm in the country but also from a very severe drought in late July and again in September. My observations from moving to 36 hr grazing paddocks in 2014 as a dairy farmer versus 4 days in 2013 as a beef farmer is that an extra 15-20% grass can be grown. Re-grazing fresh green shoots has a massive impact on subsequent grass growth. As a beef farmer I had 12 groups of animals grazing separately between spring & autumn cows sub divided with male and female calves and also a number of groups of beef cattle.

Historically the farm was soil tested every 5 years, and had a P & K index of 4, however on entering REPS these index's coupled with the nitrates directive meant that we could not spread any bagged Phosphorus (P) across the grassland especially as we were feeding up to 1.3 T of concentrate per head to bulls. Subsequent soil testing has shown that our P index has slipped to index 2/3 and K (Potash) index has held at index 4. The relaxing of the nitrates rules for the application of P and the reduction in the amount of concentrate fed due to cessation of the beef enterprise means that the application of bagged P will be given priority. We spread 2 rounds of pasture sward (27-2.5-5) for the final 2 rounds in 2014. The question still remains as to whether this coupled with slurry early in the year is enough to try get all paddocks back up to index 3. The slurry applied will also not be as rich in P as previously due to less concentrate being fed. From April 2015 we will apply one full round of ASN to try and get a richer green colour to the grass. This is something tillage farmers are very good at doing, they sit down every year and plan the nutrient requirement of every crop and field to ensure the crop reaches its highest possible yield potential. The farm is also located in an area of high molybdenum. This has meant soil pH was always kept around pH 6; this invariably left some paddocks dropping to below a pH of 5.7. In future we plan on bringing soil pH up to a minimum of pH 6.3 as I feel the lower pH is impacting grass growth and maybe grass vigour. We plan on blood testing a sample of cows annually to monitor mineral levels and if any issues emerge such as low copper levels. We will add the minerals needed to the water supply for the cows. The new motto is to grow the grass and treat for any issues that emerge, as no signs of high molybdenum have been seen in recent years. Two tonnes of lime was spread across two thirds of the grazing platform in August 2014.

Reseeding

Every year 10% of the farm is reseeded. Decisions to reseed are made on paddock performance. The oldest paddocks were reseeded in 1991. In 2013 a paddock reseeded in 1991 had the highest growth of 16 t DM/ha (farm average was 12.2 t DM/ha) In 2013 we reseeded paddocks that were only 5 years old as up to the 15th of August they had only grown 6 t DM/ha. In 2014 these paddocks grew between 17 and 20 t DM/ha. Only 5% was reseeded in 2014 as 1200 m of roadways were installed. A proportion of the farm has been set down to monocultures over the past 2 years as part of the on farm

cultivar evaluation trial being undertaken by Teagasc Moorepark. This will provide some interesting information over the next few years. Drainage needs to be done on the next few paddocks before they are reseeded to improve the utilisation of grass on them.

Mistakes made

I must admit that I have made loads of mistakes over the years in relation to managing grass. But I feel they have helped me to improve my grass managing skills.

- In May 2014 during a very wet period where grass dry matter dropped I was advised to feed some concentrate to the cows. I didn't due to quota concerns and found that the cows dropped from their peak of 20 litres to 16.5 litres in a week, they recovered as grass DM improved but only to 18 litres. In future if I find low DM grass at any stage I will supplement for the few days to ensure I don't suffer such drops in milk yield again, especially around peak yield.
- Leaving surplus paddocks bulk up for too long before taking them out also has led to grass deficits in subsequent rotations if growth rates drop back.
- Surplus paddocks need to be taken out ASAP to ensure that high quality grass is maintained throughout the grazing season. In 2014 I left too many paddocks to cut until first cut silage and found I ended up short of grass in the 3rd week of June and grass quality disimproved as grass started to head. I was unable to take them out for wrapping due to a deficit in my wedge.
- Every day and every year will throw up a different challenge and so we have to be prepared for this and react to ensure we maintain the highest possible grass quality for the cows at all time.

Conclusions

Measuring grass is the most important job that I do on the farm every week. It takes approx. one hour to walk the farm and another twenty minutes to input the information and take any decisions that need to be taken for the week. It is important once the farm is walked that the information is then used to ensure that as much grass as possible can be included in the cows diet, which also helps reduce the cost of feeding the cow. I am part of grass focused discussion groups which help keep the focus on maintaining excellent grass quality all year round. This in turn helps us deal with price volatility by ensuring the cost of producing grass is kept as low as possible. On our farm we have decided to use Jersey cross cows to utilise our grass and maximise the amount of solids that can be produced from grass. As we continue to push grass yields and quality, it will be more important to maintain soil fertility. To ensure we get the best from our soil we will now have to soil test paddocks every second

year. This is a small cost to ensure we maximise the potential of the farm to grow as much grass as possible.

The big question that remains to be answered on my farm is how far we can push the grazing platform. Can the farm grow up to 20 t DM/ha? With the improvement in grass breeding over the years is this possible? How far can we push milk solids per hectare? We are targeting 1450 kg milk solids per hectare from 3.5 cows/ha. Which means we need to average 414 kg of solids per cow milked which includes 1st calvers. Our target is to feed 380 kg meal per milking cow per lactation.

With milk quotas being abolished in 3 months there is a great opportunity for us to make all our future decisions on what is the most profitable for our farm. We have also taken on the role of a monitor farm in the next phase of Glanbia's monitor farm program. The focus of the program is *sustainable and resilient systems,* which fits in well with where we are trying to take the farm now. Hopefully we have the skills to make the most of all the opportunities that are now emerging.

Irish Grassland Association

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Irish Grassland Association

Managing the last three months of the last milk quota year

Matt Ryan
Agri-consultant, Nenagh, Co. Tipperary.

After over 30 years of milk quotas we are gearing up to produce more milk on all our farms, be it through increased performance per cow or extra cows. Unfortunately, the next three months could be frustrating for most dairy farmer who wish to "hit the ground running" from the 1st April and in the meantime try to avoid serious super levy bills.

There seems to be no hope of escaping this penalty this year. The following are the options being considered by farmers to minimise Super Levy bills in a year where profits are likely to be reduced because of low milk prices. But do n0t embark on any action that, in the long term, will cost you money.

Leasing

Leasing quota at this stage is a very unlikely option, but farmers should talk to the Co-op Manager anyway.

Feed less meals

The amount of meal to feed will depend on the type of cow/yield, the availability of grass, the quality of the silage and the quota position. Some farmers with cows at grass will be able to get away with 0 - 2 kg of meal and no silage, but that depends on the quantity of grass available. With low meal feeding levels farmers must be conscious of getting the required levels of minerals to the milking cow. Spring 2014, when more grass was available, convinced farmers that an all grass diet (or with minimum meals) is adequate to meet the cows' demands. Most will have to feed 2 - 4 kg because they will not have enough of grass.

Farmers whose cows are indoors on silage must get 4 – 7 kg of meals as an energy source, otherwise they will lose too much BCS but they also should **not** be fed high protein rations because this will produce more milk and 'burn-off' BCS.

Cows only need 16-16.5% protein in the **total** feed diet, so balance your silage and/or grass protein with the appropriate level of meal protein to give 16% in the total cows' diet.

Generally, with grass, and if feeding less than 4 kg meal/head/day, the protein in the meal need not be higher than 10-11%. Below this level of protein cows will not milk to their potential, so they will put on more weight or loose less weight (at this time).

Moorepark are researching the effects of offering different energy allowances to dairy cows in spring in order to develop optimum nutrition strategies. This work has just commenced and is the beginning of a large programme of work to develop accurate response rates to pasture and concentrate in spring.

Feed a lot more milk to calves

For ease of calf management and improved performance, most farmers are now only feeding 5 - 6 litres per calf per day. But, in quota crisis situations farmers have fed up to 10 - 12 litres per day; however, very good management is required with the quantity being gradually built up over three weeks. Milk must be treated with acid or yogurt to prevent scouring and it must be available to them at all times during the day in a barrel with teats.

Buy in calves to use up milk

Examine all the pros and cons of this option before embarking on it. Farmers who have not enough or good calf houses should not touch it, but calves can be successfully reared outdoors from late February. So, talk to someone who has done it. However, 'bought-in' calves should be kept separate from other calves for a week or so. When buying, buy healthy calves, with no discharges from eyes, nose or navel, with no signs of scour around the anal regions and of course with no signs of pneumonia. When he arrives on farm, he should be given a multi-vitamin injection, salmonella vaccine, and one pint of lukewarm water plus electrolytes. Gradually introduce milk over the next few days.

Contract rear calves for a neighbour

All disease/testing precautions must be observed for this option. One should not embark on this option if adequate labour and housing is not available.

'Give' milk or milking cow to a neighbour to feed his calves

The February calving cow will produce 700 – 1000 litres of milk from calving to 1st April, so, she will cost you an enormous super levy bill, approximately €250/cow, compared with €60/cow for the March calver. Observe disease/testing requirements with this option also.

Sell

Sell off freshly calved February cows, particularly, ones you do not want and more especially if you are over-stocked. With imminent low milk price, this is not the year to be over-stocked. Maybe cows prone to mastitis, lameness, infertility, slow milking, etc. should be moved on.

Feed milk to yearlings

As 5 litres of milk has the same feed value as 2 kg of barley (30 c), feeding it to other stock instead of meal should be considered. Add onto this the super-levy bill on 5 litres of €1.40. This equals a total value of €1.70 or 34 c per litre for milk fed to yearlings. It should be increased gradually over a week or so.

Even feed milk to cows. It has been done. And the value is something similar to the weanling return.

You should do anything to avoid 'throwing money away' in a year in which milk price will be under pressure.

Lease

Lease freshly calved cows to under quota farmers to create a "win-win" situation for both farmers. Adhere to all testing/health requirements and a simple leasing agreement should be drawn up.

What should you pay him for taking your cow?

- Look at Table 1 and you will see he is saving you money by feeding your cows; you are avoiding a super levy bill of €4-5 per cow per day. Therefore, if he is a good operator, has his milking machine in good order and has good grass/silage let him have the cows for free.

Milk cows once per day (OAD)

Many farmers will go for this option as it will reduce milk yield by nearly 30% over the February/March period. Thin cows, good milkers and heifers will put on more weight and so go in-calf easier. After reverting back to milking twice per day milk, the cow will recover to

80% - 90% of her potential yield depending on the type of cow, the age of the cow and the length of time spent on OAD milking. The longer the period the greater the loss.

This option is being considered by many farmers this year, because as Table 1 highlights the financial outcome favours OAD over twice daily milking (TAD):

- Table 1 compares two farmers, selling 15 l/cow/day in spring, with very different fat % and protein % – these are actual farmers and are based on spring 2014 co-op data. The penalty of €4.20/cow/day, the cost of the feed input, all grass except the quantity of silage and meal listed are subtracted from milk sales with a base price for milk of 32 c/l.
- Farmer No. 1, because of his poor milk constituents will lose money on all feed options except when he feeds cows all grass plus 1 kg meal and does it on OAD milking. For example, if, while on TAD milking, he feeds grass plus 20% silage plus 3 kg meal he will be losing €0.48 per cow per day or €24 per day for every 50 cows.
- Farmer No. 2 will lose money if he feeds more than 3 kg meal, plus 20% silage (approx 2.6 kg DM), with the remainder grazed grass no matter whether he does TAD or OAD milking.

Therefore, all dairy farmers who are over quota should go on OAD milking to minimise financial losses, particularly if other factors on the farm suit this option.

Another strong recommendation arising from Table 1 is that providing cows with an 'all-grass' diet is the most economical. Therefore, during the February-March period farmers should make as much grazed grass as possible available to milking cows by having the 1st rotation end on the 31st March in the Spring Rotation Planner.

- The chances are that this will leave grass tight in the 2nd rotation in April but extra supplementation with meal could then be justified if the need arises to slow down the rotation length arises.

Table 1. Financial margin over feed and penalty cost from once-a-day (OAD) compared with twice-a-day (TAD) milking with different feed strategies.

	Yield (L/day)	Protein %	Fat %	Silage % of diet	Meal (kg)	Grazed grass	Margin/cow/day (€)	
							TAD	OAD
Farmer 1 (a)	15	3.15	3.95	20%	3	**	-0.48	-0.26
Farmer 1 (b)	15	3.15	3.95	0%	2	**	-0.25	-0.06
Farmer 1 (c)	15	3.15	3.95	0%	1	**	-0.10	0.09
Farmer 2 (a)	15	3.45	4.59	20%	3	**	-0.12	0.02
Farmer 2 (b)	15	3.45	4.59	0%	2	**	0.13	0.24
Farmer 2 (c)	15	3.45	4.59	0%	1	**	0.27	0.39

**Remainder of Diet = Grazed Grass

Preparations before change to OAD

By being aware of the issues that may arise with OAD and giving some consideration to these aspects you will minimise stress/problems to yourself and cow, milk yield loss, increase in SCC/mastitis and other problems.

- In general, Jersey crosses are better suited to OAD than Holstein Friesians
- Good udder confirmation - strongly attached to the body, evenly-sized quarters, well-placed teats – is especially important as udders will be very full each day prior to milking
- Cows should have a good history in terms of clinical mastitis and lowish SCC
- Because, before each milking, OAD cows will have very tight, full udders, and, during milking, the rate of milk flow will be faster than TAD, these may necessitate the following changes to the milking machine: ensure that liner slip is minimal (can be a problem); that the vacuum level is stable and that you have adequate reserve; that the milk line, milk pump and milk cooling is adequate to meet the faster flow of milk. Therefore, talk to your milking machine technician.
- Farm roadways need to be very good as cows will be travelling slowly, carrying more weight/volume of milk resulting in greater risk of heel ulcers.

Practices after the change to OAD

From day one, milk the cows OAD; withhold the colostrum for four days from cows (five days for heifers) from the bulk tank; and test all teats from every cow with the CMT test to

ensure low levels of SCC. Inspect cows in *twice per day* the field/house for problems such as listlessness, mastitis, milk fever, tetany, lameness, etc. Because after each milking the cows' udder will not be seen for 24 hours, the longer interval may allow mastitis infection to become well established; therefore greater vigilance is required during the cows' time in the parlour. The following "must ensure" practices must be known to all milkers in the parlour.

- *Must* ensure the milking routine is to the highest standard, with the teat cup correctly aligned and that they stay on with no slipping
- *Must* pre-strip all teats pre-milking to identify mastitis. Some farmers pre-strip one teat at each milking – all done in four milkings; doing the same one for all cows, every day.
- *Must* ensure all quarters have been thoroughly milked out before cup removal
- *Must* ensure that every teat is thoroughly disinfected after milking – use 15-20 ml disinfectant/cow/day
- *Must* check milk filter - if it has clots then all cows' teats should be striped at next milking to speedily identify mastitis
- *Must check*: withholding times after antibiotics use needs to be addressed, read the label carefully and seek veterinary advice – it may not be twice as long as TAD milking. Also talk to your vet in relation to the best practice of treating mastitic cows with lactation tubes.

Go for a 16:8 hour milking interval, because the mornings milk would have 2.74 % fat while evening's milk would have 4.96 % fat. Feed all the evenings milk (shortest interval) to calves. This will reduce the butterfat content while at the same time not affecting protein levels or milk yield.

Store

Store your March milk for 28 days using Stor-Milk Plus from your Co-op costing 9 – 10 cents per litre. Use 45 gallon drums to store, writing the date on each drum. Calves will have to be 5 weeks old when feeding it, but it will not flow through teats. Follow the makers' instructions.

Whatever you do, do not let the milk down the drain as it is the worst polluter of all.

Other considerations

Provide enough grazed grass by applying 23 units/acre of N on all the farm as early as allowed, but be early. Apply another 30-40 units/acre 4-6 weeks later. Plan to graze all the silage ground twice on the milking platform and once on outside blocks.

Cost savers in a low milk price year

Low to lowish cost farming is an "attitude" and does not come easy to the Irish psyche. For 2015, a predicted low milk price will result in significant loss of income. For instance a 5c/litre drop in milk price will reduce the value of milk sales by €250 per cow. There are few solutions but plan to reduce costs. Profit is a decision – do not ever lose sight of that.

On the Dairy Profit Monitor there are 28 individual costs listed; if farmers were to take 0.1 cent off each then savings of 2.8 c/l would be made – will be less than half the milk price decrease. This puts the scale of the task in perspective. Therefore the savings in each must be 0.2c/l on all.

A cost control plan, done in January at the projected milk price, will indicate from the very beginning of the year what amount of cost cutting is required. Do this plan taking 0.2 to 0.3 c/litre off all costs, at least. As a result farmers will then know what they can spend every month. Generally, the better dairy farmer the more of the profit is put in place at the beginning of the year. The poorer farm manager will wait to see what is left at the end of the year. Losses manage themselves but profit only comes from a number of key decisions made early in the year.

Fundamentally, it is vital to match stocking rate (SR) per hectare to the amount of grass being grown on the farm. If you go for a very high SR on the milking platform then more meal will have to be fed, more silage drawn or bought from outside or grass zero grazed. We know that for every 10% of home grown grass utilised on the farm, costs in 2013 were reduced by over 3 c/litre. Therefore, based on Moorepark research, farmers should operate at a SR of 2.5 to 3.2 cows/ha on the milking platform for optimum profit opportunity.

The target meal feeding level for a SR of 2.5 cows/ha is 0.07 kg/litre. The year 2014, because it was a good grass year, proved that this level of meal feeding will deliver satisfactory

profits. Just because we have no quotas now is no reason to produce extra milk from meal because the economic response is between 0.5 and 1.1 kg milk per kg of meal.
No savings can be made on fertiliser and lime, unless they are high Index 3.

Breeding costs can be reduced by being 'on your game' before and during the season. Match AI straw requirement to the number of replacements required (5 per replacement), then use lower cost beef AI or rent in stock bulls at €300 – 400 for the 6-8 week 'clean-up' season.

By using contractors judiciously some labour, machinery repairs/running costs can be saved. I have recently come across a farmer whose contractor charged less than €40/ha for eight (8) blanket fertiliser spreading's in 2014. This option might be considered if the fertiliser spreader or tractor needs a serious over-haul in 2015.

Milk recording is an essential tool for monitoring SCC's and individual cow performances, but if these two reasons, for this year, are not an issue (individual cow performance may not be important where cows are not culled on performance, particularly when expanding aand if SCC is ok) then it could be foregone in 2015 – a saving of €7 - 9 per cow.

On the output side we can improve the kg MS/cow sold by increasing the peak yield in April/May by 1-2 litres/cow/day and this will increase overall yield by 220 to 440 litres/cow/year. Managing BCS and the period from calving to April is the key to achieving this improved peak. Culling rate and cow deaths must be minimised, particularly, in cross-bred herds where the difference between cull cow prices and replacement costs are great, see Table 2, so as to limit replacement rate costs.

Table 2 The replacement cost per cow (€) in herd with different replacement rates and varying differences of cull cow price and the cost of replacement.

Difference between cull price and rearing cost (€)	Replacement rate (%)				
	30%	25%	20%	15%	10%
1000	300	250	200	150	100
900	270	225	180	135	90
800	240	200	160	120	80
700	210	175	140	105	70
600	180	150	120	90	60

Do you understand the meaning of the word AVERAGE? Well, if your herd average was 4.0% and 3.6% for fat and protein, respectively, in 2014, then half the cows are producing below these levels. Therefore, if you are not expanding and you can or intend to sell off the lowest 10-20% of cows with low % fat and protein then you will increase both by nearly 0.05% each. This will be worth an extra 0.34 c/litre profit in 2015 to you, approximately €17/cow/year for every cow in the herd!

My approach to the last three months of milk quota

Joseph Leonard
Stamullen, Co. Meath

My name is Joseph Leonard, I am married to Mairéad, we have four children and farm near Stamullen in Co. Meath. We have been milking 300 cows for the last number of seasons, but this year we are expanding into a production partnership with a neighbour which will see us milking 500 cows as milk quotas are finally phased out. We run a grass based spring calving system which last year saw us produce, a quota restricted, 355 kg MS/cow from grass and 65 kg meal/cow. I am a long time member of the Navan Discussion Group and am a 2014 Nuffield Scholar currently studying Stress Management and Mental Health Awareness in Agriculture.

My approach to the last three months of milk quota

Along with my father, brother and one other full time employee up until now we have been running a 300 cow spring calving dairy system. Since the abolition of milk quotas was first announced we have been focused on getting ready for a jump in production. In the last five years we have redeveloped the farm infrastructure to allow us to move from milking 220 cows in 2009 to 500 cows this season (2015). This year we will be farming 228 ha in total with a milking platform of 149 ha, up from 183 ha and 104 ha, respectively. The labour on the farm has enabled us to undertake this redevelopment at a low cost, and entering a joint venture with a neighbour has given us access to the land required to allow us to expand the milking platform to carry the extra cows. With expansion in mind we have concentrated on breeding and rearing as many surplus heifers as we can by using AI for 6-8 weeks breeding. This has helped us to rear 40+ heifers/100 cows for the last number of years. The surplus heifers have been leased out to other farmers with the intention always being to bring back in the numbers to meet our expansion targets. I feel that having spent years breeding the type of cow I want for my system, with a herd average EBI €187, that I do not want to be in the market for other people's unwanted heifers in the run up to 2015.

For me, this last quota season was always going to be about actively managing cow production and quota in the most cost efficient way so as not to compromise my expansion plans. With that in mind, and already milking more cows than were required, last year we

filled our quota almost exclusively from grazed grass (65 kg or €15/cow meal fed in parlour in February and March primarily to get magnesium into the cows. Cows were dried off on 24th October before we needed to introduce any silage or meal. The dry cows were out until 12th November finishing covers (all measured to ground level and assuming 1500 kg DM/ha below 4 cm) that were deemed too high to carry over the winter (3000+ kg DM/ha). The farm was closed with an average cover of 2200 kg DM/ha – deliberately about 100 kg DM higher than our usual target as this grass is better off being fed to milking cows in the spring rather than trying to get extra days at grass for dry cows in the autumn. The Teagasc Grass Calculator figures show we utilised 10 t DM/ha across the whole farm in 2014 whilst also building a surplus of about 600 t silage. This was up from 9.1 t DM/ha in 2013 which lead to a huge saving in bought in feed (roughly 150 t less).

So where are we for this quota year and what are our plans?

As of today we are 32,552 ltrs over quota (butter fat adjusted) and we have 510 cows starting to calve from 5th Feb. To get through the spring we have an average farm cover of 2300 kg DM/ha and 160 high quality bales of silage that were made from surplus paddocks last summer and deliberately kept for feeding this spring. The spring feed budget, using our predicted calving pattern (showing over 90% cows/heifers to calve in February and March) and average growth rates for our farm over the past five years, shows that along with feeding the silage bales we will be able to get through this spring with only having to feed 10 t of meal (20 kg/cow). When all the cows are in milk the milking platform (MP) will be stocked at 3.3 LU/ha, which with our standard growth patterns means we can take out about 40 ha from the MP for two silage crops. The aim will be to graze the whole MP once in the spring and set up the silage ground from mid-April onwards however if needs be we will graze the silage ground on the MP twice and set it up in late April/early May.

Our plan is to get through to 1st April and milk once-a-day (OAD) in February and March so as to maximise milk price. We were in a similar position this time last year where we milked OAD from the beginning of the calving season through until the 5th April. We found this worked very well with very little effect on overall cow performance. The cows were producing 17.5 ltrs (1.5 kg MS) at the end of March on OAD and after we switched back to twice-a-day (TAD) the cows came back up in production to peak at 22.5 ltrs (1.92 kg MS) on a grass only diet (meal feeding was stopped in mid-March). The cows went on to produce 355 kg MS/cow for the lactation despite receiving no meal for the remainder of the lactation

and being dried off a month earlier than average. This experience certainly helps to remove any worries for us that the cow performance from April onwards will be compromised by OAD in February and March. This milk was produced for common costs of 14.54 c/ltr with common profit of 23.68 c/ltr (Teagasc eProfit Monitor 2014). The two elements that I see as driving these low production costs are firstly tons of grass grown/utilised on the farm which are achieved through proper soil fertility and the use of the farms full nitrogen allowance. Getting enough nitrogen onto the land early in the season is a priority of mine and one that I will not compromise on even in a low milk price year. Grow the grass as early in the year as possible and take the surpluses that arise to feed back later. Grazed grass/kg DM is quarter the cost of meal and high quality baled silage/kg DM is only half the cost of meal!! The second driver of low cost production is 6 week in-calf rate/mean calving date so as to have the cows in milk and grazing as the grass starts to grow. Our 2014 season saw a calving interval of 366 days with a 71% 6 week calving rate and a mean calving date of 28th Feb. The aim is to bring our mean calving forward by 3-4 days and also to bring our 6 week calving rate to 85%+; this years predicted rate is about 75%, so still some way to go.

From a milk production point of view by milking OAD I expect milk volume to be reduced by 20-25% but milk solids to only be reduced by 15-17%. The higher protein and butterfat percentages will lift milk price by 3-4 c/ltr above TAD price. My milk price last February and March was 6-7 c/ltr above the creamery base price. This sounds great but this year with the base price at or around 30 c/ltr minus the super levy of 28.5 cltr (which will be the case for a lot of farmers) this only leaves, at best, a milk price 7.5-8.5 c/ltr for February and March milk. It is vitally important to keep milk production as efficient as possible. To further reduce milk sold in this period we are planning to feed 6-7 ltrs/day whole milk to calves and to utilise our newly acquired bulk tank to hold up to 5 days milk from the end of March into April. Obviously once we reach April the aim will be to push up milk production now that quotas have finally been removed, but with the milk price predicted to remain low for the season a certain degree of caution is needed.

For me fertility is key, both soil and cow, so I will not cut cost on either area as this can have far longer term consequences for the farm. Winter feed needs to be grown and as I mentioned earlier grass is by far the cheapest form of feed. I will, however, keep very tight control on other costs such as meal by matching stocking rate to grass growth by removing cull and empty cows early from the system so as not to eat into autumn feed budgets. Discretionary

spending on maintenance and upgrades for machinery or buildings, etc. will be very closely scrutinised as will the number of replacements being carried.

One place we need to be very careful not to cut spending too much is on drawings as this can have a very negative effect on family morale in an already tough year. When things are tough on the farm we as farmers need to be able to get away from that stress and if household budgets are also being unduly constrained then it is very hard to find a place of comfort.

There are other benefits to OAD milking that are less easily quantifiable such as the reduction in the work load in the peak calving season – by not milking in the afternoon there is more time freed up for monitoring cows and calves, vital grassland management and keeping up with all the paper work at this time of year, as well as for taking the odd rest! For us, OAD milking also has the added benefit of helping to maintain cows body condition score (BCS) through the early lactation that has a subsequent positive effect on herd fertility – this is particularly beneficial to the first calved cows. As with most farms the heifers are under the most strain but because they generally calve earlier they have a longer period on OAD which is helpful to their breeding performance – this was the case for us last year as out of the 58 heifers we calved only one didn't go back in calf and 75% are due to calve within 6 weeks. The whole herd had 6% empty cows after 14 weeks breeding. This can be a big cost benefit, in having extra stock for expansion, sale or culling, which is not immediately apparent in February and March.

For us the differences in cow management are small but significant during this period. Milking time in the morning will be increased by 30% - a slow cow on TAD will be extremely slow on OAD. Managing mastitis is harder as the cows are only in the parlour once every 24 hrs and so infections can be slower to cure – you also need to be more vigilant to pick up new infections as you see the cows only half the number of times. You need to visit the cows in the paddock in the afternoon to check for milk fever and tetany, etc. – it is very easy not do this and 24 hrs can be a long time for a fresh calved cow. There is less work in setting up grazing blocks but you need to be more exact on 24 hr breaks so as not to under feed cows. Managing grass tetany for us is done by pasture dusting with cal-mag, though I will always have a few ton of meal in the feed bin in case the weather is very wet. Calf management is also less labour intensive for us as we only feed calves OAD from birth as there is no fresh evening milk. We find calves settle onto this system very quickly – they are

given ad-lib access to fresh water, hay and meal from birth and are given from 4.5 - 6/7 ltrs milk each morning depending on their age. Just like the cows you need to check on the calves in the evening even though they are not being fed to help pick up any signs of illness.

Collaborative Farming Providing Options to Improve the Structures of Irish Farming

Tom Curran

Teagasc, Moorepark, Fermoy, Co. Cork

- **Registered Partnership:**
  - First step to full succession of the family farm.
  - Increased Scale, Improved Labour Efficiency and better Lifestyle
  - Registered Partnerships are open to all enterprises from 2015 onwards.
- **Contract Rearing:**
  - An opportunity for expansion and labour efficiency for the dairy farmer.
  - An alternative to drystock enterprises for retiring farmers, drystock farmers and landowners.
- **Share Farming:**
  - Provides an avenue of entry to dairy farming for young trained people.
  - Option to continue in farming for farmers with no family or no successor
- **Land Leasing:**
  - Strong tax incentives for the landowner
  - Security of tenure, investment return for lessee
- **Restructuring Relief:**
  - Fragmented Farms – Consolidation of holdings, improved viability

Registered Farm Partnerships

A registered farm partnership is essentially a profit sharing arrangement between two or more farmers that is either registered with the Dairy Partnership Registration Office or will be registered on the new Register of Farm Partnerships from 2015 onwards. Milk production partnerships (MPP's) are coming to an end in line with the abolition of milk quota on the 31st of March 2015. However, this does not sound the death knell for the partnership model. The Department of Agriculture, Food and the Marine will operate a new register of farm partnerships from the 1st of January 2015 and this new register will also facilitate all existing milk production partnerships while also being open to new partnership applications.

Therefore, Registered Farm Partnerships will continue to operate in two ways, providing a significant contribution to the structures of Irish farming.

Firstly, in the context of the family farm, they have proven through milk production partnerships, to be an excellent transition arrangement, before full succession.

Secondly, in the context of non-family situations, where two or more farmers wish to combine their respective farming operations into one single operation and they each take a share of the profits. In a situation where a partnership has been set up between at least two active partners, the partnership model also allows for the inclusion of non-active partners who wish to make an equity contribution in the form of land or capital.

Registered Farm Partnerships – Family Situations

Transferring the family farm to the next generation can be a difficult process with many questions and concerns that need to be addressed. It is often complex and therefore needs early and careful planning. A registered family partnership is the first step to consider as part of this planning process. In many cases, parents are not in a position to transfer the farm to a son or daughter that has returned home after completing their agricultural education. There are genuine reasons for this and they are often based around concerns such as: family farm income, security for the parents and other family members who still have to be provided for. These concerns can be alleviated by forming a registered partnership between the parents and the son or daughter as an interim step before considering full succession. There are very strong advantages to forming a partnership for both the parents and the young son or daughter.

Benefits to parents

In a registered partnership, the parents are not giving up control of the farm; they are sharing it with their son or daughter. They retain ownership assets such as land, buildings, quotas and entitlements. These assets are licensed for use by the partnership but only for the duration of the partnership. Assets such as stock and machinery are transferred to the partnership and as a result, they become partnership assets. This structure gives security and reassurance to parents that they are not handing over the farm through a partnership. A partnership gives the parents the opportunity to see how their son or daughter will get on, while working on the farm with shared decision making and management. It also allows the

parents to have a "guiding hand" and share their experience and knowledge with their future successor. A profit sharing ratio is agreed between the parents and the son or daughter. It is entirely up to the family to decide what is equitable and fair in their own situation. At the beginning of the partnership arrangement, the parents generally receive the larger share of the profits to meet with family and financial commitments. As the years go on, this changes by agreement in favour of the son or daughter as they assume more control and take on more responsibility for the farming business.

Benefits to the young farmer

Being a partner in an arrangement where daily duties and management is shared between the parents and a son or daughter is of great benefit to the next generation in the development of their farming career. The key benefit of partnership to the son or daughter is that they have a real input into decision making and the management of the farm. Psychologically, this is very important for the young person in their development as a farmer. The partnership also allows them to put the knowledge and experience that they have gained from their agricultural education into practice on the home farm. It allows them to express themselves and show their ability to their parents. It also increases their confidence and farming ability and gives them experience of running the farm as a business. It helps to make the connection between the outdoor work with the strategic and financial management of the farm. Responsibilities are shared on an agreed basis through the on-farm agreement and a profit share for both the parents and the son or daughter is also agreed as above. This ensures that both parties have a vested interest in the farm business.

Registered Farm Partnership – Non-family

There are a number of key benefits to farmers who farm through partnership. In the context of Food Harvest 2020 and expansion in dairy output, registered farm partnerships can play a significant role.

Partnership with other farmer(s) may offer the opportunity for increased scale but more importantly can offer increased scale in a sustainable way. This involves a number of factors such as: making use of the existing facilities on farm which may reduce the level of capital expenditure; a wider skills mix; greater labour availability and greater labour efficiency.

A key strength of registered partnerships is that it facilitates expansion without having a negative impact on lifestyle. In actual fact, partnership has been shown (through the milk production partnership model) to improve lifestyle on dairy farms even in the absence of expansion through a fair and even distribution of workload between the partners. The real reward for a good work structure is the ability to have a good lifestyle with adequate time for family and other personal interests. A shared and structured workload creates the flexibility to be able to plan your time off for family events such as holidays. There is also the peace of mind of knowing that the person who is running the farm while you are away is doing so as if you were doing the job yourself. They have as much of a vested interest in the efficient running of the business as you do.

When two or more people come together in a partnership, they each bring a set of skills and knowledge base with them. This means that there is often a better and broader range of knowledge and skills available to the partnership business. These can include husbandry skills, financial management skills, computer skills, machinery expertise, farm buildings expertise amongst others. It generates an ability to make better and more informed decisions on a wider range of subject areas. Discussion among partners often generates better decision making as things are teased out and explored better in this process. In a family situation the partnership can provide the platform to blend the experience of the parents with the youthful enthusiasm and modern thinking of the future successor.

Incentives for the formation of registered farm partnerships

There are a number of incentives in place to encourage individual farmers and farm families to consider partnerships going forward as an interim step to full succession. These are related to grant schemes, the basic payment scheme and taxation benefits.

On-Farm Investment Schemes

Under the present on-farm investment schemes, registered partnerships may receive a number of benefits. Registered partnerships may qualify for a doubling of the grant investment ceiling where there are two partners in the partnership. A young trained farmer who is less than five years farming and under forty years of age with the required level 6 in agricultural education may qualify for a 60% grant in the new on-farm investment scheme (TAMS II) on qualifying farm investment. Other registered partnerships that do not involve a young trained

farmer may also qualify for a doubling of the investment ceiling at the 40% grant rate on qualifying farm investment.

Basic Payment Scheme

Under the new basic payment scheme, there is a 25% top-up for young farmers under 40 years of age and who have set-up farming in their own right in the previous 5 years. The payment is made for a maximum of 5 years. Young trained farmers in partnership with their parents may qualify for this top-up on the number of eligible hectares declared each year subject to a maximum of 50 hectares. This 25 % top-up is based on the national average payments and equates to approximately €60 per hectare. This gives a potential of €3,000 per year for 5 years where the maximum of 50 hectares applies.

Taxation Benefits

Stock relief is a pre-tax adjustment to farm profits and can be of great value where stock numbers are increasing on the farm. It is a relief on the uplift in stock values between the opening and closing inventories and is subject to an overall limit of €70,000. The current normal rate for farmers is 25%. Young trained farmers are eligible for 100% stock relief in the first four years after initial set up. A registered partnership allows a young trained farmer to avail of 100 % stock relief for the first four years after the partnership is set up. In addition to this, and enhanced stock relief may be claimed by the other partners in a registered partnership at the rate of 50%. If a son or daughter comes home and works on the home farm as an employee, they cannot avail of stock relief unless they set up on their own.

Where a family goes into a registered partnership, the profit is split between the parents and the son or daughter. This can result in a net tax gain for the family as it maximises the income declared at the lower rate of tax. Both the parents and the son or daughter make separate tax returns and therefore the tax limits apply separately. Due to the profit share with the son or daughter, the parents are not declaring as much profit in the high tax bracket.

Requirements for Successful Partnerships

In order for partnership to work effectively, both parties must clearly understand and be committed to the concept of partnership. The arrangement must be to the benefit of all the parties involved. There cannot be one dominant partner who makes all the decisions. Both parties must have an input into the management of the farm on a daily basis. That is the

essence of a good partnership. To achieve this, a lot of preparation work is required by the potential partners and it is during this period that they get to know one another and trust begins to build as they decide that a partnership is what they want. Trust builds continually even after the partnership begins in the way that each partner conducts themselves. Both parties must be willing to work side by side on a daily and weekly basis.

In preparing to form a partnership or any other collaborative arrangement, the bulk of the discussion will be between the parties involved. However, the process will also require the input of outside help in the form of professionals. The first person to engage with may be your Teagasc advisor or consultant to discuss the issues in relation to your current business, the potential for the partnership and areas such as the impact on scheme payments. Following on from that, each party involved will need to talk with their respective accountants and solicitors. All of these professional people will play a vital role in the bringing together and the formation of the partnership. But, this process must be driven by the farmers themselves and at a pace that they are happy to progress it at.

Forming a farm partnership

There are a number of key requirements when forming a partnership that must be included.

- The partnership agreement. A specimen partnership agreement is available from Teagasc to help with the writing up of the agreement.
- Creation of a partnership bank account in the names of the all partners and through which all the partnership business transactions will take place.
- Legal proof of all lands farmed. This includes folios and filed plans for owned land and a copy of the current lease for any leased land.

Contract Dairy Heifer Rearing

If a dairy farmer wishes to retire from dairy farming, contract rearing of dairy heifers can provide an ideal opportunity to use the skills of rearing replacement dairy heifers in collaboration with another dairy farmer. Contract rearing is an alternative to the traditional beef enterprises such as dry cattle or suckling systems that many retiring dairy farmers fall back into. It may also provide an opportunity for drystock farmers to change to an alternative enterprise with the potential for more profit.

For contract rearing to be successful, it is critical that the rearer gets paid adequately to cover direct costs and make a margin on the enterprise to cover their labour input. The advantages to the rearer are that cash flow is more favourable as payment is generally paid by direct debit on a monthly basis. Another advantage to the rearer is that there is no money tied up in stock, as ownership does not transfer to the rearer. Essentially the rearing period can be broken down into five stages:

- Calf Rearing
- First Grazing Season
- First Winter
- Second Grazing Season
- Second Winter

The various rearing periods need to be borne in mind when calculating and agreeing a rate of payment between the parties. Rearing the calves to twelve weeks of age and keeping the animals over the winter periods are the most expensive rearing stages in terms of cost and they also require a high labour input. The grazing seasons are by far the least expensive and require less labour. In setting up these arrangements the parties need to agree the start date and finish of the term of rearing. If this is to be extended, then the payment rate needs to be increased, especially where this leads further into the second winter when the heifers are approaching eighty per cent of maturity. Each party should draw up a budget to plan their own finances. A recording system to must be used to monitor costs as the year goes on. This can be done very simply by using a written system or through computers using programmes such as the Teagasc Cost Control Planner. Agreement must be reached at the start on which costs are to be incurred by each party. This will determine the rate of payment per head per day.

The priority for the rearer is to cover costs and get adequately paid for his or her labour, but this comes with responsibilities. The heifers must reach their targets weights (see Table 1) at housing after the first grazing season, at mating and approaching calving after the second grazing season.

Table 1 Target weights for pure bred and crossbred replacement heifers at different stages during the 24 month rearing period.

	Month	% Mature liveweight	Holstein Friesian	New Zealand/ British Fr.	Jersey × Holstein Fr.
Birth	February		41	38	34
6 Weeks	March		63	56	56
3 Months	April		90	80	80
6 Months	July	**30%**	**155**	**148**	**138**
8 Months	September		175	170	160
9 Months	October	40%	220	210	196
12 Months	February		280	267	250
15 Months	March	**60%**	**330**	**315**	**295**
19 Months	September		450	425	390
21 Months	November		490	470	437
24 Months (pre-calving)	February	**90%**	**550**	**525**	**490**

Achieving these weight targets along with getting the heifers in calf are the dairy farmers' priority. The rearer also needs to be aware of the age spread and the average starting weight for the group of heifers and have realistic expectations for weight gain during the rearing period. Regular weighing of heifers is a recommended practice to monitor the progress of the group during the agreed rearing period.

Good communication and trust are essential to the success of contract rearing or any other collaborative arrangement. The parties involved should be in regular contact to discuss the progress of the heifers and make key decisions on issues such as breeding and health.

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Share Farming

The key distinguishing feature of share farming from a partnership is that two completely separate farming businesses operate on one area of land. The concept remains the same across all enterprises. In a share farming agreement, the farm produce (grain, beef or milk) is sold and each person gets an agreed proportion of the sale proceeds. In addition to this, each

person in the agreement pays a proportion of the variable costs such as feed, fertiliser, veterinary. Some of the fixed costs may also be divided such as machinery running. For all the people involved, the starting point for this venture is a financial budget to cover potential income and expenditure from the enterprise. The share farmer generally provides all the labour and in some cases, the machinery. The land owner provides the land and the facilities required by the enterprise to be carried out.

The current Irish share farming model was developed to accommodate share farming in tillage and beef enterprises. It is growing in popularity in the tillage sector where it gives security to both the landowner and the share farmer. With the abolition of milk quotas on the 31st of March 2015, a dairy share farming model can now be developed for dairy farming. A specimen agreement is available from Teagasc and a budgeting tool will also be available to help interested farmers to carry out a cash flow budget for the enterprise.

Benefits to Landowners

Share farming provides an opportunity for older farmers who want to continue farming and do not want to retire. They may or may not have family or a successor to the farm. Through share farming, they can enter into an arrangement with a younger person to share the workload, income and costs of production. It is an opportunity for the landowner to get involved in a business arrangement with a young motivated person who will bring attributes that can include new skills, a strong work ethic, modern technology and a desire to develop a profitable enterprise. This comes about as share farming by its nature, means that both parties have a vested interest. Therefore, in this type if arrangement the physical and financial performance of the farm increases rather than winding down.

Benefits to Share Farmers

Share farming opens up the agricultural industry to new talented people who choose to have a career in farming. For the share farmer, this type of arrangement provides a career opportunity or a ladder of entry into farming. It allows a young person to build their own independent business and with the potential to grow their own income from farming. It provides an opportunity to reward ability and efficiency. This in turn provides motivation to the share farmer and will benefit both parties in a successful agreement. When compared to being an employee on a farm, share farming is more tax efficient as the share farmer can

benefit from the various income tax measures, for example stock relief, that apply to sole traders.

The share farmer must be a highly motivated individual, with a clear understanding of what this arrangement can deliver for them. This must be supported by a credible business plan, not for the entire farm but for the share farmer's side of the business. In order them to build a business in a tax efficient way they must prioritise the investment of any surplus profit in stock while also having a reasonable and acceptable standard of living.

Long-term Land Leasing

In recent years, the Ministers for Agriculture and Finance have introduced strong tax incentives to encourage long–term land leasing (at least 5 years) as opposed to short-term the 11 month rental system. These measures were further strengthened in 2015 Budget and Finance Bill as follows:

- Increased tax-free thresholds
- Removal of 1 % stamp duty
- Confirming that both the annual rent and the SPS entitlement value can be rolled into together
- Ltd. Companies can now qualify the lessor for the tax incentives
- Removal of the 40 year age limit

Benefits to Lessor

The key benefit to the lessor is that the income received from a long-term land lease and the value of any single payment entitlements is income tax free subject to the limits set out in

Table 2 Tax incentives for long-term land leasing.

2014		**2015**	
Term of Lease	Max Tax free Income/year	Term of Lease	Max Tax free Income/year
5-7 yrs	€12,000	5-7 yrs	€18,000
7-10yrs	€15,000	7-10yrs	€22,500
>10 yrs	€20,000	10-15 yrs	€30,000
		>15 yrs	€40,000

Another key benefit is that the lessor can qualify for retirement relief on capital gains tax when they do transfer the land to a family member of sell on the open market. Land may be leased for up to 25 years. Capital gains tax is charged at 33%. This is a very valuable relief to farmers and other land owners when transferring land.

By entering into a long-term land leasing arrangement with the lessee, the landowners are providing a better incentive to the lessee to make investments in the land such as reseeding, fencing, and possibly infrastructure.

Benefits to Lessee

The key benefit to the lessee is that the long-term lease provides security of tenure. This allows the lessee to plan the farm business with more certainty. For example, a long-term lease may increase the size of the grazing platform and thereby facilitate expansion of the herd (provided the farmer has a good level of efficiency in the business). To do this on a short-term rental involves a higher level of risk as the use of the land is uncertain.

The extended term of lease allowable under the new provisions mean that the lessee can look at investment in the land in a new light. There can be better financial justification for any investment carried out with long-term lease which can be up to 25 years.

Another benefit to the lessee is the inclusion of farmers operating through limited companies to qualify the lessor for the increased tax incentives. This may have been a disincentive to land owners wishing to lease out land.

Restructuring Relief

Restructuring relief is a capital gains tax relief to encourage farmers with fragmented farms to consolidate their holdings. Farm restructuring relief is the sale and purchase of qualifying lands. It should be seriously considered by farmers in areas of the country where farm fragmentation is an issue. It may involve a collaborative effort by a number of farmers to make it work. Essentially it allows parcels of land to be exchanged between farmers to reduce the number of fragmentations by each farmer and potentially increase the size of the grazing platform, depending on the circumstances.

It operates where a parcel of land is sold by an individual farmer (or joint owners) and where another parcel of land is bought by the same farmer (or joint owners) and both of these transactions occur within 24 months of each other. The initial sale or purchase must have taken place in the period 1 January 2013 and 31 December 2016.

The interaction between the sale and the purchase together must result in the overall reduction in the distance between parcels of land making up the farm, including leased parcels that have been leased for at least 2 years with a minimum of 5 years to run. The entire transaction must lead to a reduction in the fragmentation of the farm and an improvement in the operation and viability of the consolidated farm.

The scheme has been extended in the budget 2015 to include the disposal of an entire farm and its replacement with another farm subject to meeting the original criteria of the scheme in relation to a reduction in the fragmentation of the farm and an improvement in the operation and viability of the consolidated farm.

Post quota: will you make money from milk or milk from money?

Dr. John Roche

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"The farmer is the only man in our economy who buys everything at retail, sells everything at wholesale, and pays the freight both ways" *– John F. Kennedy*

Background

"And I hear sweet and clear, the call of the faraway hills" *– Victor Young*

With the imminent abolition of milk quotas, there is a palpable energy in dairy farming in Ireland that hasn't been seen in more than 30 years. There's a national "call to arms"; the government has decreed that dairy farmers will increase production by 50% in the next five years. Farmers, themselves, have heard the battle cry and there's an individual drive to expand production and provide a better lifestyle and succession opportunity for their families. Not since the late 1970s has such enthusiasm for 'tomorrow' been evident in Irish dairy farming.

What's more, there are examples to follow. The dairy industry in New Zealand has doubled in size in the last 20 years and this from an already considerable base. It has a climate similar to Ireland and a similar focus on exploiting pasture as a cheap, high quality feed. Surely this is proof that Irish farmers can attain the same lofty heights of dairy productivity and personal wealth. Having witnessed the changes in NZ first hand, I believe it can serve as an example of what can be achieved in Ireland in the coming decades; however, more recent changes should serve as a warning of what must not be done when quotas are retired.

They say that youth is wasted on the young because they have not yet had the experience to be wise! As I progress into my 40s and reflect on my 'education from the school of life', I now understand the truth in that cliché. As the regulatory spancil of quotas is removed, it is important that we learn from the mistakes of others; we don't need to make all of the mistakes ourselves. I've been very fortunate to work with farmers in Ireland and the UK, Australia and New Zealand, North and South America, and South Africa, start-up businesses

that were pioneering a new system of farming in virgin territory and well-established successful businesses that have stood the test of time, and to be a part of a period of significant expansion and farm development in New Zealand. I'm not claiming to have all the answers. However, having reflected on my mistakes and successes and the mistakes and successes of others, I believe I have wisdom to share. For what it's worth, this is my opinion!

Farming in Ireland pre-quota

"Those who don't know history are doomed to repeat it" *– Edmund Burke*

I was born in 1972 and my memories of pre-quota Ireland are few and vague. With the innocence of youth, it appeared that the sun shone every day of summer and that there was nothing but good in the world. I have only the fondest of memories.

I grew up on a farm that I can say, with the benefit of hindsight, was progressive, profitable, and would have matched any farm in New Zealand for operational efficiency and profitability at that time. My father removed ditches, drained wet land, ploughed, harrowed, and re-seeded; we picked stones every summer. This expansion drive was fuelled by self-thought business acumen, the energy of youth, the promise that we had an unlimited market for our milk, and that we would be paid a true value for the most wholesome food on the planet.

My father recognised that pasture produced and utilised underpinned profitable farming in Ireland. Every piece of equipment on the farm was there to provide pasture. From the plough to the rotavator to the land leveller, equipment only served one purpose: to provide more acres of grazing land. He bred to top genetics, under the mantra that "*an ounce of breeding was worth a tonne of feeding*", and this without the benefit of an EBI system. Bulls whose mothers were high yielding and, yet, produced a calf each year were used. In retrospect, I understand his logic. Milk production per cow was not his driver; milk production from grazed pasture was the cow he wanted. Despite turbulent economic times, high inflation and even higher bank interest rates, the farm provided for the upbringing and education of five kids and a lifestyle that, although not extravagant, was more than pleasant.

Although a personal recount of pre-quota times, my parents were not alone. Ireland's dairy industry was progressive. Had our fathers and mothers not been spancilled by the short-sightedness of politicians, where would the Irish dairy industry be now. We'll never know for

definite; but, I believe, we would have equalled the might of the kiwis in on-farm ingenuity and productivity. The opportunity is upon us again. We should grasp it with both hands, but with the wisdom of hindsight to guide our steps.

The removal of quotas – the need to change

"The only person that likes change is a wet baby" *– Unknown*

"If you don't like change, you'll like irrelevance even less" *– Eric Shinseki*

With the countdown to April 1st well advanced, you must make sure that you aren't the proverbial April fool! Quota removal will allow you to produce more milk; however, will you make more money or will you pay for the privilege of producing it.

Will you milk more cows or just feed the cows you've got more? Interestingly, farmers in New Zealand have done both – increased stocking rate and purchased more feed/cow. After all, the argument that more milk from the same land will dilute fixed costs and increase overall profit is common sense, isn't it?

In my experience, common sense is not that common; so, let us see!

Lessons learned from New Zealand

"Learn from the mistakes of others. You can't live long enough to make them all yourself" *- Unknown*

There is little doubt that New Zealand dairy farmers created a successful business model between 1985 and 2005, with strong capital growth, a lack of capital gains tax, and a banking fraternity happy to forego principle repayments and to re-finance capital appreciation. Because of the intervention and product sale policies of Europe and North America, global milk price was kept artificially low, but stable, and relatively predictable. This meant that New Zealand farmers could not afford supplementary feed inputs, cost of production was low, and farmers provided for their future through capital appreciation. Pasture growth and utilisation drove farming profit, and this was accepted as fact; in fact, so much so, that land was sold on how much milksolids were produced/ha (i.e., how much pasture it could grow).

Since 2006, however, we have witnessed a 'sea change' in farming practices in New Zealand. With the change in dairy product inventories globally, milk price has become higher, on average, but much more volatile. The initial increase in milk price relative to the price of supplementary feeds led to a huge increase in the use of supplementary feeds/cow. On average, feed expenses have increased from approximately €0.04/kg milk to €0.07/kg milk (Figure 1) and land price is no longer tied to its ability to produce milk from pasture.

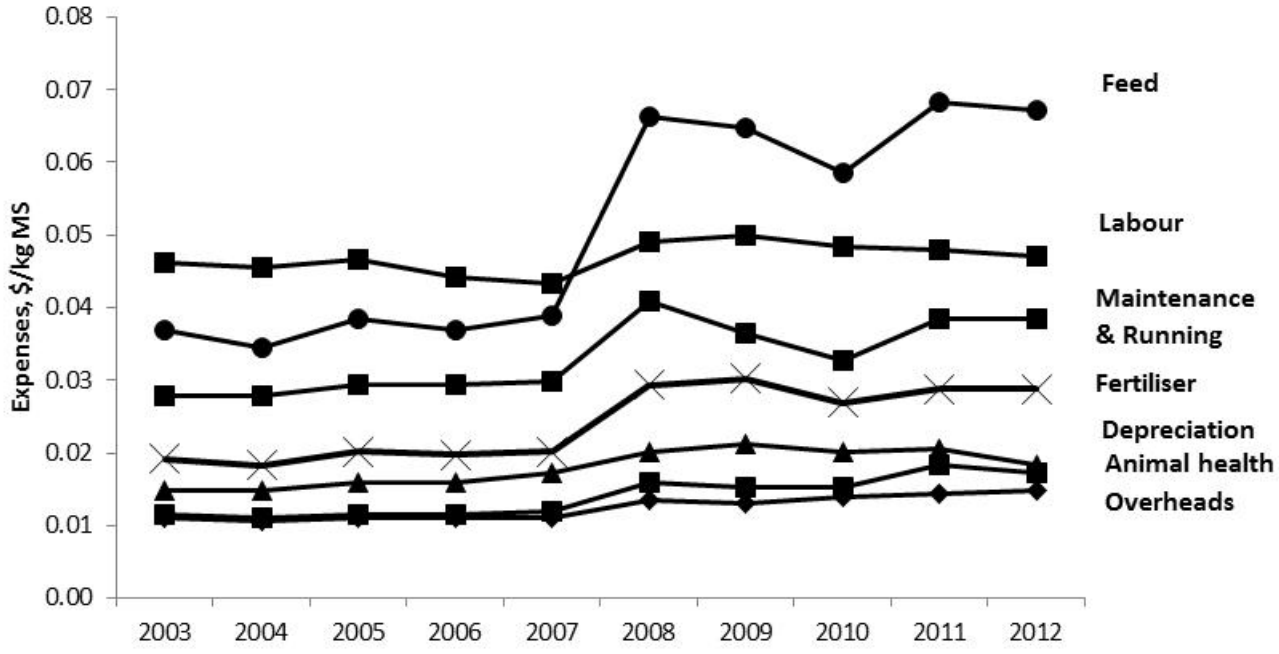

Figure 1 Changes to expenditure on New Zealand dairy farms over the last decade.

It is argued by many, particularly those with a vested interest in having farmers purchase their inputs, that this increased use of purchased supplements makes smart business sense. Resilient systems are not only able to adapt to downturns in milk price, they should also be able to take advantage of upswings. In fact, one prominent academic and industry leader claimed that a system designed to incorporate supplementary feed is best for New Zealand, as it allows farmers the flexibility of increasing the use of feed when milk price is favourable and removing it when the price is low. This is lunacy! Because our system is driven by stocking rate and, therefore, cow demand relative to feed supply, it isn't possible to put in feed and take it out on an annual basis and manage a grazing system effectively. If you don't believe me, the New Zealand national dairy farming statistics make for sobering reading.

In the following calculations, I've compared a rolling average of three years at the start of the decade (2002-2005) and at the end of the decade (2009-2012). I've done this to make sure that particularly bad or good years do not influence the result unduly. In using these years, I've also avoided the economic catastrophe between 2007 and 2009. In the intervening decade,

- average farm size increased from 112 to 138 ha
- herd size increased from 301 to 385 cows
- stocking rate increased by 0.1 cows/ha
- milksolids production/cow increased from 315 kg to 340 kg
- total milksolids production increased from 95,000 kg to 131,000 kg (38%)
- milk revenue increased from €250,000 to €560,000
- operating profit from the farm increased from €51,000 to €120,000 (profit/cow increased from €162 to €311)

This sounds like a successful fairy tale; they all lived happily ever after!

However, remember, during this decade, milk price also increased from €2.50 to €4.15/kg milksolids (€0.20 to €0.33/L). If you factor in this change and examine the statistics more carefully, you can determine what would have happened if the same farmer had done nothing new, but just accepted the increased milk price and the inflationary increase in expenses.

Total milksolids production would have remained at 90,000 kg, but operating profit from the farm would have increased from €41,000 to €131,000 (profit/cow would have increased from €136 to €435, just on the back of milk price). In other words, these statistics indicate that expansion and intensification during the last decade has not returned any value to New Zealand dairy farmers. In fact, they are working harder (i.e., milking 80 more cows) and receiving no additional financial reward.

Who's going to be the April fool? ***Just because you can produce more milk, doesn't mean you should***. This is where theory meets reality. In theory, you can dilute fixed costs and increase profitability by strategically incorporating supplements into systems to increase stocking rate. This is what occurred in New Zealand between 2002 and 2006 when milk price was stable (Figure 2); supplements purchased/cow remained stable and total supplements purchased increased with cow numbers. However, when milk price rose in 2008, so did use

of supplements, without a similar increase in cow numbers (Figure 2). This was not a strategic decision to improve farm profitability. This was spending money because they had money to spend.

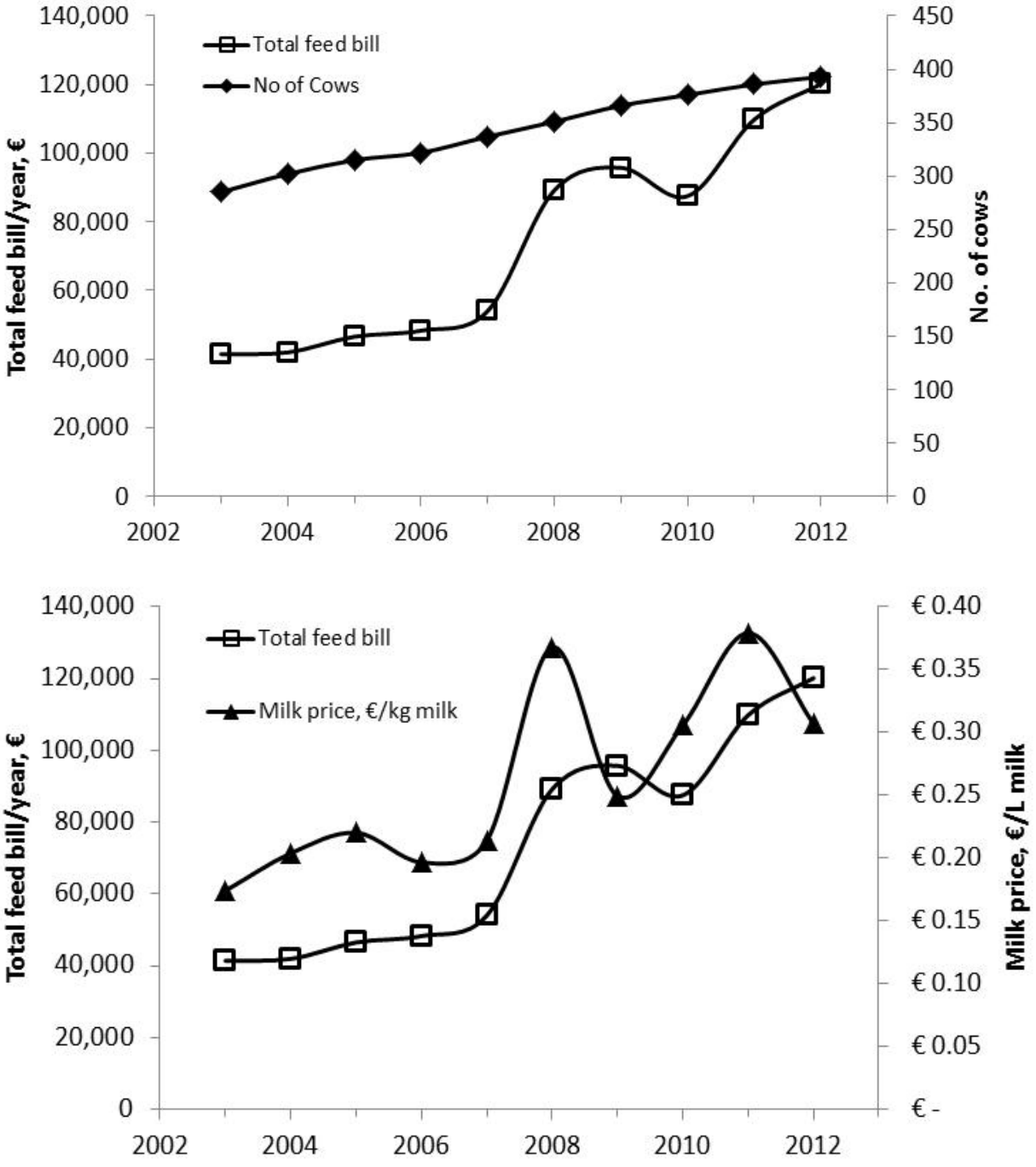

Figure 2 The relationship between the number of cows farmed and the milk price (€/L) and total feed purchased (€).

A final point must be considered, and that is the resilience of the business to a milk price downturn. Money is not the sole driver of people's decision making. Many people milk more cows or feed supplements for reasons other than profit. However, whatever the reason, the farm business must be able to buffer a downturn in milk price. I was at a discussion group recently where the primary topic of discussion was around convincing the owner that he should be feeding more supplements. His milksolids production/ha was average for the district and approximately 400 kg milksolids/ha less than the top 10% of farmers in the district. He was told that ***"he was leaving milk on the table"***. The discussion was lively and most people agreed that he should increase his use of supplementary feeds. This was despite the fact that the farmer had shared his financial performance, which clearly showed that he was in the top 15% of farmers in operating profit/ha; his operating profit was 30-50% greater than the district average, despite his 'average performance' in the milk tank. What was particularly noteworthy, though, was that his feed costs were €0.02/kg milk, while the top 10% average was €0.06/kg milk. Whose business is more resilient to a significant downturn in milk price?

In summary, New Zealand farmers have grown production by 38% over the last decade and are making considerably more money than they were. However, their national statistics indicate that this increase in profit is exclusively due to an increase in milk price and that farmers are financially no better off for the system change. In fact, cost of milk production has increased through the increased use of feed to such an extent that the viability of many farms in a milk price downturn is questionable.

Lessons learned from closer to home

"The only time you should ever look back is to see how far you've come" *- Unknown*

Although important to learn from other people's successes and failures, we don't have to go to New Zealand to understand the likely effect of expansion through purchasing more feed. Based on current statistics and ignoring the single farm payment and debt repayment, the average Irish dairy farmer needs to milk 135 cows to earn the average national wage (approximately, €45,000). This is more than double the average farm size. However, this **does not mean** that people should double cow numbers to ensure that they have a reasonable standard of living. The top 20% of farmers only have to milk 55 cows to earn the same wage, a much more manageable number for most. This also doesn't mean that these farmers should

remain milking 55 cows. However, the statistics highlight the need to improve operating efficiency before considering expansion – ***there must be skill before scale***.

Farm data from the UK is even more sobering. The average pasture-based, seasonal calving herd currently needs 135 cows to earn the average national wage (approx. £26,500). Like Ireland, the top 20% only requires 50-55 cows. However, in the high feed input-high milk production per cow system, the average farmer needs to milk 400 cows to earn the same wage – three times the number of cows as his neighbour running a simple system. The reason for the low margin/cow is unclear, but probably reflects a failure to account for non-feed costs in assessing the value proposition of more milk. Margin over feed is a common metric used by nutritionists as a supposed measure of the profitability of using feed. Unfortunately, however, it doesn't account for additional cost increases when supplementary feed is purchased. UK, Irish, and New Zealand all highlight an increase in costs approximately 50% greater than the cost of feed when supplementary feed is purchased. As feed inputs increase and the response to additional feed diminishes, the non-feed costs could become greater than the feed costs. In short, beware of marginal analyses like Margin Over Feed, Margin Over All Feed or Margin Over Feed and Fertiliser; basing purchase decisions on these analyses is fraught with error and is likely to lose you money.

The Irish and UK statistics highlight two things:

1. a large gap in operating efficiency between the best farmers and the average farmers in lower input systems, meaning that there is considerable room for improvement for most people
2. a far greater gap in operating efficiency between the best and average farmers in more complex systems, where the importance of decision making and, in particular, the timeliness of decision making is much greater.

One further point worth considering is a recent analysis of the Irish Profit Monitor dataset. In it, we compared 1,500 farmers from across the country to determine what factors most influenced profit. Two facts were very clear:

1. there was a linear increase in farm profit with increased utilisation of pasture: for every extra tonne pasture DM utilised/ha, operating profit increased €268/ha.
2. there was a linear decline in operating profit with increasing use of purchased feed (i.e., silage and meal). Each extra tonne of feed purchased/ha resulted in a reduction

in farm profit of approximately €80/ha. For a typical 40 ha farm, this is a reduction in farm profit of €3,200 for every additional 500 kg meal purchased/cow.

The statistics presented highlight that you are more likely to be profitable in the long run if you maintain a low cost pasture-based system with minimal requirement for purchased feed. I want to be clear; I am not saying that systems utilising large amounts of purchased supplementary feed and driving for high milk production per cow cannot be profitable. I am saying that the majority farmers cannot make a success of them. Please do not take that as a challenge to prove me wrong!

Failing to plan is planning to fail

"Be sure you positively identify your target before you pull the trigger" *- Tom Flynn*

With the imminent abolition of quotas, you must have a plan – a target to aim for. If you fire blind, someone's likely to get hurt, and that someone is most likely yourself and your family. What should you consider?

When I was younger and knew everything, I got involved in farm development and got caught up in the egotism of scale. While deriving plans for owning several thousand cows, my father said to me: ***"you've only one family to feed. How many cows do you need to milk?"*** It is hard to fathom the wisdom of such a simple statement. But this should be the basis of your expansion plan. Each one of you must define what success looks like for you.

- What are your personal and professional goals?
- What income do you need to realise those goals?
- What is your likely cost of milk production?
- How many kg milksolids must you produce?
- How many cows do you need to milk?

To use a sailing cliché, *"trade a little speed for direction"*. Take your time when setting this plan, there is always trade-offs to consider. More time at work means less leisure time and less time with family. Do your goals line up with your wife's/husband's/partner's goals. If not, your success will be very lonely. Seek out mentors, those people that will challenge your assumptions and provide positive guidance. Above all, be patient. Quotas will be gone in 2016 and 2017 as well. You don't have to achieve the end game in 2015.

Achieving the plan – making money from milk

"The only mistake in life, is the lesson not learned" *– Albert Einstein*

Despite my earlier warnings, your plan must involve increasing milk production from your farm; it would be foolish not to. However, the devil in the detail is the method by which you expand production. If you cast your mind back to my pre-quota stories, Irish dairy farming expanded by improving soil fertility, draining wet land, improving pasture species, and breeding appropriate cows. You are now facing into the same opportunities that our parents did 40 years ago. It is the same factors that drive profit today. You must strive to grow and utilise more pasture from your farm and feed it to a cow suitable for a grazing system. It is estimated that average pasture production in Ireland is 10 t DM, while average pasture utilisation is less than 7 t DM. Real farm data indicate that it is possible to push average pasture production to between 12 and 14 t DM with current technologies and varieties. Conservatively, Irish farmers are leaving 5 t DM pasture unutilised/ha. This is equivalent to over €1,000/ha in profit that is not being captured in any given year; to put this in perspective, it is the equivalent of being paid an extra €0.10 for your milk!

The successful expansion of Irish farming is dependent on reclaiming this lost resource and not in purchasing feed to milk more cows.

Summary

"Chance favours the prepared mind" *– Louis Pasteur*

The removal of quotas is an exciting prospect and a huge opportunity for Irish dairy farmers. Of all farmers in Europe, you have the greatest ability to produce milk cheaply and sustainably. Grazed pasture is your competitive and comparative advantage – it distinguishes you from your competitors and it is the foundation of profitable systems. To capitalise on quota removal, therefore, you have to set your goals and an appropriate plan to achieve them. Part of this plan must be to grow more pasture/ha and increase cow numbers to eat the increased production. Be careful of increasing cow numbers through purchased feed. Although a sound concept in theory, in practice it has not borne the financial fruit promised for many.

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