Improving Profit and Sustainability on Winter Milk Farms

Key Management Practices

teagasc
Agriculture and Food Development Authority

Introduction

Winter milk producers constitute a vital sub-sector within a highly seasonal Irish dairy industry. Year-on-year these farms meet demand for a consistent daily supply of quality fresh milk to the domestic market, as well as providing winter volumes for manufacture of specific products. In 2018, there were approximately 1800 registered liquid milk producers in the state. They supplied just over 14% of national production (1.1bn litres), of which 45% (490m litres or 6% of total national production) was used for domestic consumption. It is estimated that a further 600 - 800 farms nationally produce winter milk under various non-registered price incentive schemes.

There are significant challenges to the future viability of winter milk production, within and beyond the farm gate. Abolition of EU milk quotas has prompted some to re-assess the optimal production system for their farms. Potential changes to international market conditions increases risk of price volatility. Securing quality labour is also a major issue. Nonetheless, Teagasc benchmarking data show that the more technically proficient winter milk producers continue to operate profitable and sustainable farms. The challenge for research and extension is to develop best practice and promote greater uptake of key technologies among winter milk producers in general.

Many aspects of herd management are common to winter and manufacturing milk farms alike (e.g. soil fertility, animal health, cost control). The key defining feature of winter milk herds however is a requirement for at least a proportion of autumn calving to guarantee sufficient milk production across the winter period. This brings specific questions in terms of forage quality and herd nutrition, calving pattern and fertility, and young stock management. The Teagasc Johnstown Castle Winter Milk project was established over 10 years ago to help address some of these issues.

A high EBI Holstein herd of 150 cows pus followers is operated on the campus dairy farm of approximately 70ha. This has provided a strong resource to conduct research, training and demonstration work. A project steering group was formed in 2008, comprising leading winter milk farmers plus Teagasc Dairy Research and Advisory staff. This group, chaired initially by Teddy Cashman, Co. Cork and more recently by Donal Murphy, Co. Wexford, has provided valuable direction and constructive input in the intervening years.

This booklet, published to mark the Teagasc Winter Milk Event 2019 at Johnstown Castle, summarises the principal findings from the Teagasc Winter Milk project to date. Outcomes are presented as a practical guide plus discussion of some key technical issues for farms that incorporate autumn calving as part of their system.

Joe Patton,
Teagasc Winter Milk Specialist

Aidan Lawless,
Teagasc Johnstown Dairy Herd Manager

Table of Contents

Current Performance Benchmarks for Winter Milk Herds

Milk production and fertility metrics:

Winter milk herds in Ireland are commonly characterized as '*high-input, high-output*' relative to the standard spring calving model, however it is instructive to examine herd-level data to gauge actual performance and challenges for the sector. Table 1 shows 2018 average herd performance metrics (ICBF) across four milk processors (± 80% of total winter milk suppliers) in comparison to their spring calving counterparts and top 10% within each group. Although average milk solids supply was 37kg greater than for spring calving, output per cow was modest overall at 427kg milk solids. This is largely explained by more days in milk/year round milking; the milk solids difference between top 10% spring and winter was also approximately 40kg. The top 10% of herds exceeded the average by over 100kg milk solids per year in both sectors. Milk protein for winter herds was 3.42% on average - while rising steadily from 3.29% in 2010 there remains significant scope for further improvement through genetics and nutrition.

The 2018 data indicate a persistent issue of sub-optimal fertility in winter milk herds. A calving intervals of 413 days, while improved from 430 days in 2010, remains too high to maximize milk output and feed efficiency. The main challenge for many herds in this regard will be to remove reliance on recycling cows from one breeding season to the next as a means of coping with poor fertility outcomes. There is much potential to increase rate of heifers calving as 2-year olds, and to improve herd EBI, as means of making fertility gains. The EBI profile of AI sires used in 2018 suggests reasonable uptake of this technology. However, using better AI bull teams and eliminating use of low EBI stock bulls could accelerate gains in milk solids and fertility.

	Avg Spring	Top 10% Spring	Avg Winter	Winter Top 10%
Milk Solids Kg/Cow	390	494	427	537
Milk Kg/Cow	4,950	6,214	5,591	6,987
Milk Protein %	3.50%	3.65%	3.42%	3.57%
Calving Interval Days	386	363	413	377
2 Yr Old Calving %	68	100	42	100
Herd EBI €	€98	€133	€67	€116
EBI AI Sires €	€223	€281	€215	€278

Table 1. Performance metrics (2015-2018) for spring and winter calving herds

Year-round milking explained most of the difference in yield per cow between spring and winter systems in 2018

Costs and profit metrics:

Table 2 outlines characteristics of average and high profit winter milk herds (owner-operator labour cost included) based on Teagasc profit monitor data. These farms are generally more profitable than the national average, therefore relative not absolute comparisons are most valid. High profit herds had greater output per ha driven by 10% more milk solids per cow with higher stocking rate. Critically, the extra productivity is derived from more forage utilised rather than extra concentrate fed per cow. Grass gown per ha, days at grass, and winter forage quality all contribute to this effect. From a fixed cost perspective, high profit farms were more efficient in total labour cost per cow, had lower machinery running costs, leases and depreciation. These were achieved through a combination of more days at grass and better control of spending on fixed assets. The trends outlined here remain consistent across multiple years analysis of winter milk herd data.

	Per Cow		Per Litre		Per Ha	
	Avg	Top 25%	Avg	Top 25%	Avg	Top 25%
Gross Output	2,346	2,637	37.90	38.90	5,325	5,325
Feed Cost	382	389	6.20	5.70	867	991
Total Variable Costs	799	783	12.90	11.50	1,813	1,996
Labour Cost	473	418	7.60	6.10	1,073	1,065
Total Fixed Costs	970	861	15.70	12.80	2,201	2,195
Net Margin	576	993	9.30	14.50	1,307	2,532
Milk Solids Kg	476	525	Stocking Rate		2.27	2.55
Milk Yield	6,186	6,772	Grass Utilised tDM		8.60	10.40

Table 2. Profit metrics for average and top winter milk herds ranked on margin per ha

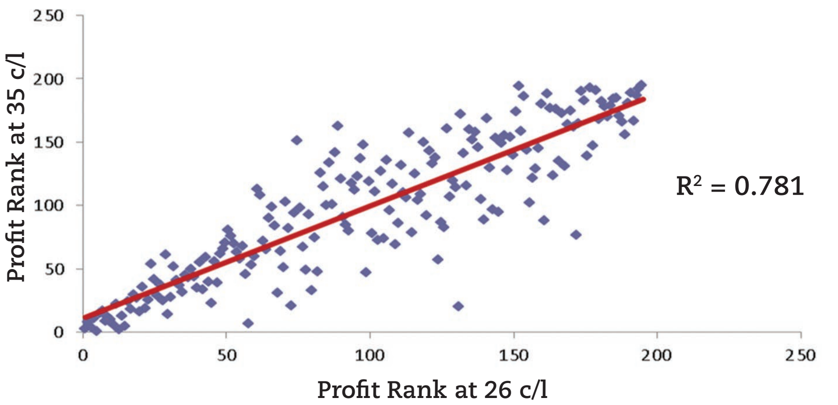
The most profitable farm system – does it depend on milk price?

Teagasc surveys indicate a strong perception among dairy farmers that profit ranking of systems changes with milk price, particularly that '*high input farms do best at high milk prices*'. This can influence decisions on uptake of profit-driving technologies.

Effect of milk price on profit-ranking of was tested using eProfit Monitor data from 220 winter milk herds. Two annual base milk prices, €0.26c/l and €0.35c/l, were imposed using an A+B-C plus winter bonus structure. Profit per ha was calculated and farms ranked in order of profit at both price (see Fig 1).

Results showed that higher profit farms had greater milk solids, higher stocking rate but lower feed costs, and better control of overheads. The most profitable farms largely remained so regardless of milk price; there was no significant re-ranking. This indicates that the key practices for profit should be consistently implemented despite potential price volatility.

Fig 1. Comparing profit ranking at 25 and 36 c/l milk price



Grazing Management for Winter Milk Herds

While much industry focus is rightly placed on winter diets and concentrate feeding for autumn calving systems, the single most consistent driver of winter milk farm profit is increased pasture utilised per ha (Teagasc ePM analysis). It remains the most effective means of improving milk sales from the farm while controlling the largest single input cost i.e. purchased feed. Approximately 45% of the variation in whole farm profit between winter milk farms can be explained by this metric alone; by comparison milk yield per cow explains around 5% of the difference.

The importance of good grazing management is further underlined when milk supply patterns for different calving patterns are examined – a typical 65% Spring / 35% Autumn split calving system in Ireland will potentially produce over 80% of its annual milk volume during the grazing season (Feb to Nov); for block autumn calving systems this will be up to 60% of annual milk produced. Clearly, grazed pasture forms a significant part of the annual milking diet. Winter milk herds therefore require an annual grazing plan that increases grazing days and pasture quality, is flexible to implement, and is tailored to the particular demands of autumn calving herds.

A principal aim for the winter milk project in Johnstown Castle has been to develop such grazing guidelines for winter milk herds. The spring rotation planner, summer grass wedge, and autumn grass budget provide an appropriate framework for pasture management, subject to some adjustments of specific targets.

Within this framework, the key challenges to be met for winter milk herds are:

1. Meeting high spring feed demand
2. Maintaining pasture quality in mid-season
3. Achieving the correct peak farm grass cover in autumn
4. Concentrate feeding strategies for split-calving herds at grass

Grazing Management for winter milk herds

Managing high spring feed demand

Autumn calving herds carry a heavy feed demand per ha in early spring.

The objective remains to graze the entire area in an extended first rotation from early-mid February to early-mid April. This helps to ensure adequate grass recovery for the second rotation, improves sward quality through the year, and reduces daily feed cost.

Some important targets for spring grazing are:

- An opening cover of at least 900kg DM per ha (see page 10) helps to balance high spring feed demand.
- At least 1/3 of area grazed by end of February and 2/3 area by mid-March (or 1 week later on heavier soils). This is readily achievable for winter milk herds provided grazing commences by mid-February where possible.
- The minimum allowance per grazing in early spring should be 5kg DM per cow. This can be achieved in a 3-4 hours grazing after morning milking until noon. As grass allowance increases, add a second grazing bout after pm milking. Where very high grass demand exists in early spring, cows can be grazed for 4-5 days per week to meet weekly targets for area grazed.
- Daily silage allocation should be gradually reduced to balance increasing grass allowances – aim to have silage finished before morning milking to encourage grazing post-milking. Total daily feed intake should be maintained however.
- Graze tightly i.e. 3.5 to 4cm residuals. Graze some lighter covers (<800kg DM per ha) at first turnout to settle cows into grazing correctly.
- Concentrate allocation can be held steady until grass allocation is >10kg DM per day. This stabilises intake and milk yield. A temporary milk dip of 1 to 1.5 litres is normal post-turnout, however daily yields should recover after 7-10 days.
- Maintain average farm cover at 500-550kg DM per by end of 1st rotation. Having a simple spring feed budget (Table 3) helps to monitor progress and allow adjustments to be made.
(Available at www.pasturebase.teagasc.ie)

Table 3. Simplified spring feed budget[1] for block autumn calving herd stocked at 2.9 cows per ha

Week Ending	Feb 7	Feb 14	Feb 21	Feb 28 1/3 area grazed	Mar 7	Mar 14	Mar 21 2/3 area grazed	Mar 28	Apr 4	Apr 11
Grass	5	5	5	10	10	10	12	14	14	14
Conc.	7	7	7	5	5	5	4	4	4	4
Silage	8	8	8	5	5	5	5	4	0	0
Farm cover kg per ha	900 (opening)	861	822	818	726	662	626	578	517	511 (2nd Rotation)

[1] *Budget targets will vary depending on proportion of autumn calving, stocking rate and growth pattern. Consult your Teagasc Dairy Advisor*

Maintaining pasture quality in mid-season

Autumn calving cows have capacity to produce relatively high milk solids yield from grazing diets and low supplement feeding levels across mid to late lactation. For example, block-autumn calving groups within the Johnstown Castle herd have typically averaged 82 - 88% of daily milk volume or >90% of daily milk solids yield, (1.85 to 1.95kg per cow) compared to spring calving counterparts in the April to July period. This is sometimes described as a 'second peak' effect. To capitalise on this high margin milk, it is important that grass is managed for maximum quality (digestibility) through the peak growth period.

- Average farm cover (AFC) should be 500 to 500kg DM per ha when commencing the second rotation (early to mid-April). A useful guide is there should be at least 1100kg DM per ha on the first paddocks to be grazed.
- Maintain pre-grazing yield (PGY) of 1400kg DM per ha (1300-1500 range) in mid-season. This corresponds to the 3-leaf growing stage of the plant and gives the optimum balance between digestibility, intake, growth and grazing utilisation. Optimum pre-grazing yield therefore does not vary with stocking rate, cow type, calving spread etc.
- The principal pasture cover metrics interact as per the following simple equation:

Equation PGY	**=**	**Stocking Rate (SR)**	**x**	**Grass Intake**	**x**	**Rotation length**	**+**	**Residual**
Example 1400	**=**	**4.2**	**x**	**17**	**x**	**19**	**+**	**50**

- These factors should be managed in combination to hold PGY at the optimum. For example, if pasture growth declines then pasture intake must be reduced (supplements fed) and rotation length increased (restricted grazing area allowance). On the other hand if growth increases then rotation length can be shortened (surpluses baled out), SR increased (area closed for main crop silage) and grass intakes increased (supplements reduced in the diet). Use a weekly farm cover and grass wedge (www.pasturebase.teagasc.ie) to simplify farm cover management.
- Target cover per cow is approx 160-170kg DM at a summer SR of 4.0 to 4.5, and 140-150kg DM at SR 4.6 to 5.0 (supplements are routinely fed to balance grass demand).
- Introduce supplements when growth rate falls below demand and pasture covers begin to decline below target. Rotation length must be extended (daily grazing area restricted) in this situation for the supplements to be effective. Adjust feed rates as growth rates recover.
- Where grass growth pushes AFC / PGY above target, remove surpluses within 3-4 days of planned grazing. This will mean mowing light covers, however grass quality is maintained and excellent buffer forage results. It is preferable to pre-mowing or topping after grazing.

Remove surplus grass covers within rotation to maintain sward quality

Achieving the correct peak farm grass cover in autumn

For autumn calving herds, grass management during the autumn period must account for declining feed value of grass while controlling grass supply relative to demand.

Some observations from the Johnstown project and other Teagasc studies are:

- Although leaf proportion is high, energy (UFL) content of autumn grass is 10-15% lower than its spring/summer equivalent. This is due to shorter day length and reduced digestibility of the NDF fibre fraction. As a rule of thumb, every 5kg DM of autumn grass fed requires an extra 0.75kg concentrate to balance nutrient intake relative to spring grazing.
- While crude protein of autumn grass is relatively high (>20%), much of the additional protein is non-protein N (NPN). This is adequate for lower yielding cows, however fresh calved cows may benefit from supplementation with quality protein.
- Freshly calved cows have low feed intake potential and will not effectively utilise heavy covers of autumn grass. Offering buffer silage along with ad-lib autumn grass significantly depresses herbage intake and impairs grazing efficiency.
- Autumn calving systems in Johnstown have adjusted for these factors by implementing the following:
  a. Limiting pre-grazing yields to <1800kg DM through grass budgeting and aggressive removal of surpluses (See Fig 2)
  b. Offering 5-6kg of high energy concentrate with a quality protein source included to freshly calved cows at grass
  c. Feeding no silage (grass plus meal) to freshly calved cows until mid to late October, unless conditions are very poor.

Fig 2. Farm grass cover targets for spring & autumn calving herds

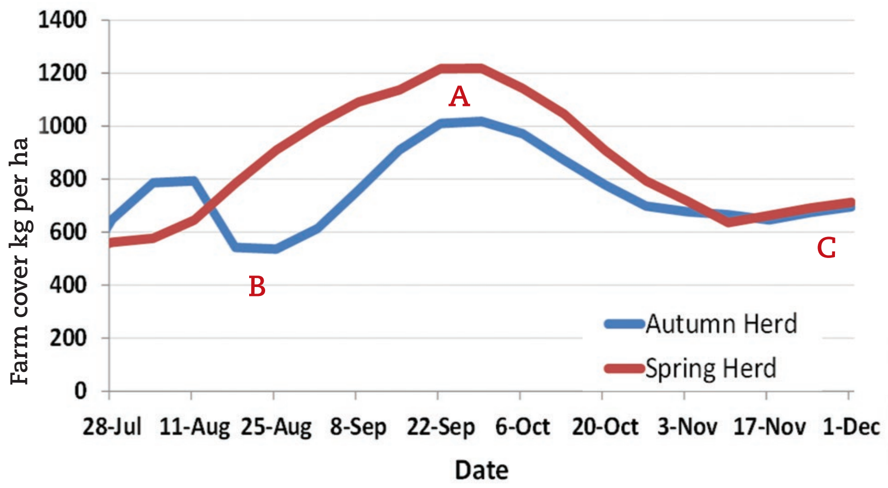


Figure 2 illustrates grass budget targets for a herd with >50% autumn calving relative to a standard budget for spring calving herds. The key adjustment is to **limit peak farm cover to 950-1000kg DM** per ha (**A**) in late September.

To achieve this in a normal growing season, average farm cover is controlled until mid-late August by removing surplus grass (**B**) according to budget. This will likely involve cutting out paddocks on a small-and-often basis (2-3 occasions) during August to create a wedge effect. If this is not carried out, high growth rate coupled with lower feed demand due to dry cows results in excess cover later in autumn.

Controlling peak cover in this way improves autumn grass utilisation by maintaining pre-grazing yields at <1800kg DM per ha. It also helps to ensure final grazing can finish at **target cover of 700kg DM** per ha (**C**).

Autumn Dry Cow Management

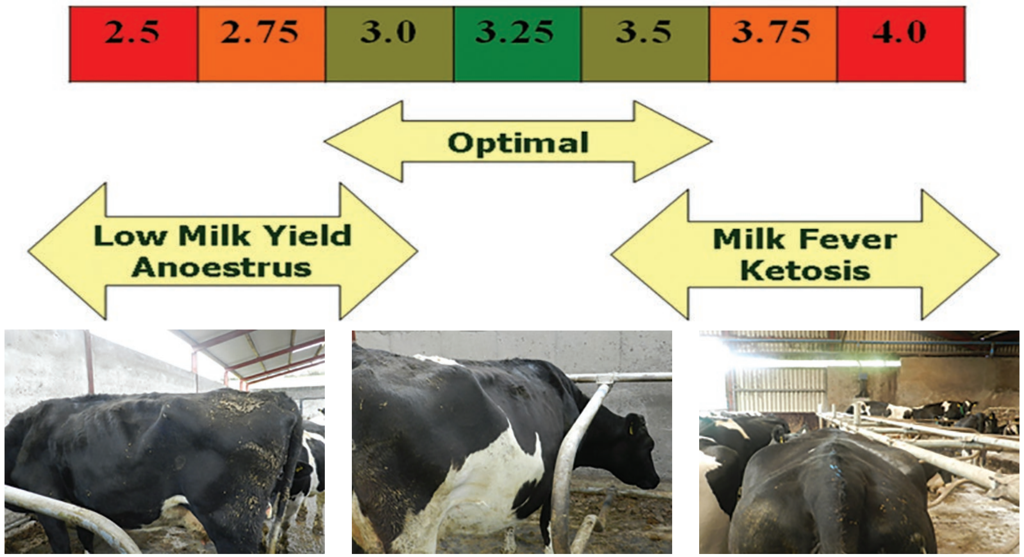
Dry cow feeding guidelines

The main objective of any dry cow feeding programme is to set up the cow for a trouble-free calving and a smooth transition to a productive lactation, with a healthy calf produced. The dry period diet plays a fundamental role by ensuring 3 principal factors are correct at point of calving:

- Macro mineral status (in particular calcium)
- Body condition score (BCS)
- Trace mineral and vitamin status

These factors have complex interactions, however it is useful to set targets for each individual factor when assessing dry cow programmes.

Optimal body condition score at calving



Macro mineral status

Maintaining target blood calcium (2mmol/L) controls milk fever risk. Cows mobilize bone Ca reserves to meet demand at calving. Limiting Ca in the dry cow diet (0.45% of DM) aids this process. Higher Ca diets (0.6-0.7%) should be fed post calving. Mg promotes release and absorption of Ca. Target **0.4% Mg** in the total dry cow diet, or at least 25g supplement Mg per day. This is essential. High K forages (>2.4%) disrupt Mg function. **Ideal forage K content is <2.0%**. This reduces diet Cation Anion Balance (CAB) value [(Na +K) - (Cl + S)] which benefits milk fever control. Dry cow diet P should be approx 0.3% - avoid overfeeding P).

Body condition score

Optimal BCS is **3.25** at calving; too high BCS increases milk fever, ketosis, retained placenta etc. To achieve this target requires BCS 2.75 to 3.0 at drying off, and limiting energy intake to 8.25 UFL/day for dry cows.

Dry cows fed ad-lib grass are at risk of excess BCS gain; feed intake must be controlled in the first 6 weeks dry. From 2-3 weeks pre-calving gut fill and diet mineral content are important. Provide at least 660g per day diet PDI protein to dry cows, particularly in the close-up period.

Trace mineral status

Trace minerals (Se, I, Zn, Co, Cu, Mn) and vitamins (A,D,E) can be provided as feed/licks or boluses, or as injectables for acute problems. Most herds are adequately covered by meeting recommended daily intakes. Some farms will require tailored feeding based on blood/tissue and forage analysis.

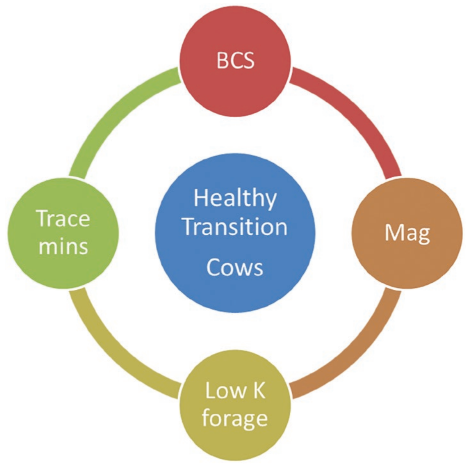
Common trace mineral/vitamin issues for dry cows are:

- Iodine– slow calving, weak calves
- Selenium- retained placenta, mastitis
- Vit D—clinical milk fever
- Vit E– retained placenta, mastitis

Johnstown Castle herd - dry cow management

Autumn calving cows are generally given 55-60 days dry. Extra days dry are generally not required because a) thin cow at drying off are rare, and b) any dry cows <2.75 BCS at dry off can be offered extra grass intake for 3-4 weeks to correct low BCS.

- For the first 6 weeks after drying off approximately, cows are grazed in rotation after the milking group, which will have grazed paddocks to around 5.0 - 5.5cm residual. The dry group grazes the paddock tightly to 3.5cm residual and moves on within 1 to 2 days. A longer duration would result in re-growths being eaten which slows growth and increased BCS gain.
- This leader/follower grazing has the effect of limiting feed intake in the early dry period to ensure that excess BCS gain does not occur. Gut fill is not an issue during this period so supplementary hay/straw is not used. Any thinner cows can be grazed on full grass allocation for a few weeks to correct BCS.
- At 16-20 days before expected calving date, cows are drafted to a calving paddock on which has a standing hay crop established. This sward will have been closed 50 days previous and received no K fertilize since spring. A pre-grazing cover of around 3,000kg DM per ha is expected. Approximately 1 ha per 30 cows is required for the total dry period.
- Cows are strip–grazed through this crop, offered 5-6kg DM once per day along a long axis. The balance of forage intake is also provided as moderate DMD, low potassium (<1.8% DM) haylage in ring feeders. Cows consume approximately 5 to 6kg DM of this material, so 1.5 to 2 bales per cow will be adequate for the dry period. It is important to conduct a mineral analysis of bales; some haylage can be higher than expected in K content and should not be fed to close-up dry cows.
- Re-growth pasture is 100% leaf and can have high energy and K content; therefore it is not suitable for dry cows (grazing dry cows on a large bare paddock carries similar risk). Cows are back-fenced off the re-growth area as they move through the paddock to prevent this and minimize sward damage.
- Dry cows are offered bucket-lick minerals during the far-off (leader-follower grazing) period. These are adequate to build up trace mineral reserves but will not provide adequate Mg to close-up cows.
- When cows enter the calving paddock mineral licks are provided, but in addition 100g of high Mg (25%) powder mineral per cow is supplemented daily. This is mixed with 1kg barley as a carrier and fed out in troughs once per day. This also provides an opportunity to inspect cows for signs of calving.
- Under this system the majority of Autumn cows calve trouble-free outdoors during September and early October, thereafter conditions may necessitate drafting of remaining cows indoors on point of calving. This can be simplified by placing temporary fence around meal troughs to draft cows at feeding each day.



Winter Feeding of the Milking Herd

Winter diet guidelines

Measure	Guideline value*	Comment
DMI (kg) Dry Matter Intake	20-22kg	Required to meet nutrient (particularly energy) demand. Quality forage essential; target at least 60% of DMI as forage (13 to 14kg per day). Balance of DMI as concentrate
Energy UFL per kg	0.92-0.96 per kg DM	First limiting nutrient for milk, diet UFL per kg is constrained by need for fibre in diet. Meet target UFL per kg with high quality silage and hi-energy concentrates
Fibre NDF % Total NDF from Forage	 30-36% 24-28%	Meet NDF (and NDF from forage) targets to maintain rumen health and avoid acidosis. However excess NDF (>40%) reduces DMI and milk yield. High standard of feed management required at lower thresholds. Silage DMD and intake achieved dictate overall diet NDF. Use quality digestible fibre sources if forage intake/quality are limited
Starch + Sugar %	Max 20-24% of DM	To limit risk of acidosis. Use lower threshold value if silage DMD <70% , and 100% of concentrate is fed in-parlour. Use digestible fibre (pulps) to boost energy in such cases
Oil %	Total 3-5% of DM	Energy-dense but not fermentable in the rumen. May reduce fibre digestion. Limit inclusion of added fats, use rumen-protected sources if required
Crude Protein %	15 -16% of DM	A measure of N content. More appropriate to use PDI values to balance protein in diets
Protein PDI PDIN per kg PDIE per kg	 94-100g 94-100g	Measures total diet protein (rumen-derived plus bypass). PDIN = protein from available N; PDIE = protein from available energy. Provide enough total PDI for target production. Balance PDIN:PDIE ratio to approximately 100-103% to maximize efficiency.
PDIE to UFL Ratio	100-104g PDIE per UFL	To maximize efficiency of energy and protein utilisation for milk production. For example A diet with 0.92UFL per kg should have 92-95g PDIE per kg (also balance for PDIN)
Conc. per kg milk	0.24—0.28	To control feed costs during winter. Only possible with high quality silage

***Guidelines are for freshly calved Hol-Fr cows on silage diets with a group average milk yield of 30-36kg**

Summary UFL and PDI requirements

Energy (UFL)	
Per kg milk	0.44 UFL (depending on fat %)
Maintenance per day	5.5 to 6.0 UFL (depending on weight)
To gain 0.5 BCS	115 UFL (surplus over a period of time)
Pregnancy	Add 1.5 to 2.5 UFL for 8th & 9th month
Protein (PDI)	
Per kg milk	50g (depending on protein %)
Maintenance per day	420 to 450g (depending on weight)
Pregnancy	Add 140 to 200g for 8th and 9th month

Table 4. Energy and protein for different milk yield levels

	Total per day			Per kg DM	
Milk kg	UFL	PDI	DMI	UFL	PDI
24	16.06	1630	17.5	0.92	93
28	17.82	1830	19	0.94	96
32	19.58	2030	21	0.93	97
36	21.34	2230	22	0.96*	101
40	23.1	2430	23.5	0.96	103
44	24.86	2630	23.5	0.98	112

**Some loss of bodyweight expected in early lactation (max 0.5kg/day)*

Johnstown winter milk diet – fresh cows

Dry Matter %	34	**Ingredients kg DM**
DMI	21	**Grass silage 9.5kg**
		Maize silage 4.5kg
UFL	0.94	
Crude Protein	15.5	**24% Blend 2.0kg DM**
PDIN/PDIE	95/96	*(Beet pulp, soya, maize meal)*
NDF %	36	
Starch + Sugar	19	**Hi-Energy nut 5.2kg DM**
Conc. as % DM	34	*(Fed in parlour, incl. mins)*
Milk kg supported	32.0	

The standard winter milk diet for the Johnstown herd comprises a grass/maize silage forage mix, a hi-protein blend fed in the forage, with hi-energy concentrate fed in parlour. Target silage DMD is 75%. Maize silage is included at 4.5kg DM or 500kg DM per cow annually. This also offsets the annual forage shortfall due to milking platform stocking rate of 2.9 cows per ha. In recent years, total crude protein content has been reduced from 17.5% to 15.5% with no loss of milk yield or solids content, by balancing the diet for UFL and PDI ratios.

Typical feed values per kg DM for common milking diet ingredients

Feed	UFL	PDIN/PDIE
Energy feeds		
Barley	1.16	74/104
Maize	1.22	83/120
Beet Pulp	1.14	64/110
Citrus Pulp	1.13	46/90
Molasses	1.00	32/68
High crude protein feeds		
Soybean meal	1.18	396/269
Maize Distillers	1.16	200/135
Rapeseed meal	1.05	255/105
Maize gluten	1.04	158/105
Field beans	1.16	166/102
Sunflower meal	0.66	180/100

Feed	UFL	PDIN/PDIE
By product feeds		
Palm Kernel	0.96	130/140
Pollard/wheatfeed	0.87	115/90
Soya Hulls	1.04	77/104
Brewers grains 20% DM	0.90	183/185
Forages*		
Quality grazed grass	1.0	130/105
Grass silage 75 DMD	0.85	71/75
Grass silage 68 DMD	0.76	71/66
Maize silage 30% starch	0.82	50/68
Quality Whole crop wheat	0.80	55/75
Fodder Beet	1.12	53/88
Barley Straw	0.42	20/42

The overall composition of rations (UFL/PDI/fibre) is more important than inclusion of any specific ingredient
Cash value of feeds can be estimated using Teagasc Feeds Calculator (http://interactive.teagasc.ie/Open/FeedStuffs)
See '***Teagasc Maize Guide***' and '***Teagasc Quality Silage Guide***' for detailed descriptions of quality forage production

Winter milk diets - FAQ's

Should I pay more for high protein rations?

High crude protein rations are not necessarily better quality; high energy content is needed too. Excess protein is wasted if energy is lacking, but too low protein can reduce feed intake also. Choose high energy (0.94+ UFL per kg as fed) rations, then pick the level of protein to suit the forage. Use PDI and UFL to balance the diet fractions.

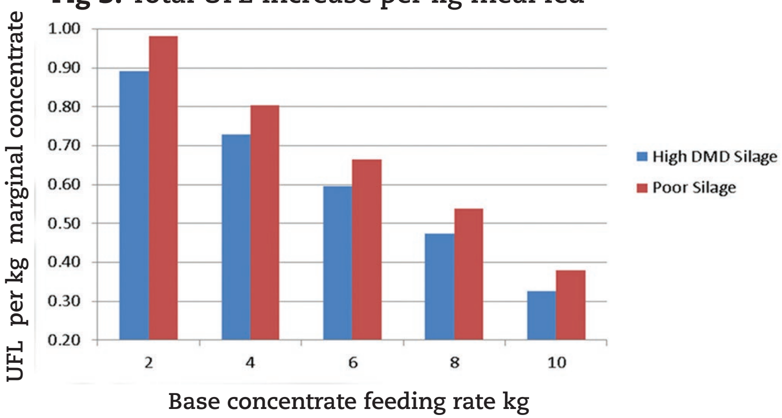
What is the best feed energy source?

Quality forage (e.g. >74% DMD grass silage) is the first step to a high energy diet. For concentrates, blending ingredients between rapid (barley), intermediate (maize) and slowly (beet pulp) fermentable energy sources promotes good rumen function. Value feeds on dry matter basis using cost per unit UFL and PDI; allow for handling costs also.

It pays to feed extra concentrate in a high milk price year, right?

It depends! While 1kg concentrate has enough UFL for ≈2kg milk on paper, this response to marginal feed is never seen in practice. Why? Extra concentrate reduces forage intake (substitution) and lowers whole diet digestibility (associative effect), so total UFL increase is less than the extra concentrate UFL fed (Fig 3). The scale of this effect depends on cow type, days in milk etc.

Fig 3. Total UFL increase per kg meal fed



Feed responses appear better with low DMD silage, due to lower initial DMI, but total feed cost per litre will be higher. For a given herd situation, break-even concentrate feeding rate will not change too significantly due to a ±4cpl base milk price swing; milk response rate determines the economics to a greater extent.

Should I feed concentrate in the parlour or as a total mixed ration (TMR)?

Feeding a TMR allows for a greater rate of feeding (up to 8kg concentrate can be fed in-parlour) but does not improve the efficiency of response (milk per kg concentrate). The decision is farm-specific and should factor in the capital and labour implications as well as feed costs.

Do I need to feed straw with silage?

Straw has very low feed value and at >80% NDF reduces nutrient intake. There should be no need to feed straw with ad-lib silage even if high DMD. Check total diet NDF% as a guide.

But will short precision chop silage cause acidosis?

Silage retains its 'cudding' effect unless chopped <10mm. Milking diet silage should be 30-50mm with no more than 10% of particles >70mm. Adding long straw increases sorting with no benefit to rumen health. Most silages in Ireland are chopped too long for optimum yield milk.

Ear tag 70mm. Milking cow silage should be chopped to 1/2 this width. No more than 10% particles longer than tag.

Comparing concentrate feeding strategies for split-calving herds at Johnstown Castle

Concentrate feed is the largest variable cost for winter milk farms. While average cost is around 6.0 to 6.5cpl (cent per litre), there is considerable variation around the average (4.5 to >12cpl). Forage utilised, stocking rate, calving pattern, yield per cow, and concentrate feeding strategy all contribute to this variation.

Split–calving pattern herds by definition have a greater range in lactation stage and milk yield for a given calendar day (see example Fig 4). This adds potential complexity to feeding plans. A study undertaken at Johnstown Castle compared two concentrate feeding systems; Flat Rate which offered a fixed daily feed rate to the herd, or Feed to Yield which determined individual daily feed rates based on 7-day rolling average milk yields. Both systems were 60 Autumn : 40 spring calving.

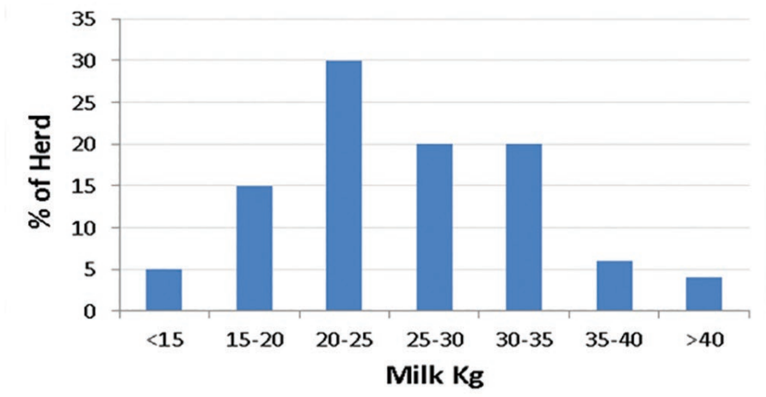


Fig 4. Distribution of milk yield at January recording for a 7500kg split calving herd. At a 25kg daily average, typically 10% will exceed 36kg yield, with 20% of the herd <20kg per day.

Fig 4. Decision rules for Flat Rate and Feed to Yield systems compared

Period	Forage Plan (Both herds)	Concentrate Plan	
		Flat Rate Herd	Feed to Yield Herd
Spring	Spring Rotation Plan	3-6kg	**2kg + 0.5kg/litre above 23**
Summer	Pasture Wedge 1400kg DM covers	1kg plus budget	**0.5kg + 0.5kg/litre above 25.5**
Autumn	Peak cover 950kg DM per ha	2kg plus budget	**2kg + 0.5kg/litre above 22**
Winter indoor	High quality grass/ maize silage	7-8kg	**3.0kg + 0.5kg/litre above 21**

Systems compared: Both systems implemented forage budgeting tools across lactation. Pasture growth, utilisation and quality were similar between systems.

Flat Rate: Concentrate rate based on group average milk yield relative to forage UFL and PDI intake. Concentrate minimized to all cows during pasture surplus. Spring and autumn cows fed as 2 groups during indoor period.

Feed to Yield: Concentrate rate based on individual milk yield relative to deviation from base diet set for the group. Base diet dictated by forage supply and quality, and included a low level of concentrate fed flat rate. Maximum total daily concentrate thresholds per cow were at 10kg at grazing cows, 12kg per cow on indoor diets.

Comparing concentrate feeding strategies for split-calving herds - summary findings

Within the spring calving sections in each treatment, FTY increased milk yield and concentrate consumed. Marginal response ratio was 1.59kg milk per 1kg concentrate, below the system parameter of 2:1. System effects were driven by greater milk yield and concentrate intake at peak lactation (>80% of profile differences occurred Apr-Jun). Lactation profiles converged from mid lactation. In contrast, there was little difference in milk yield profile between FR and FTY systems for autumn calving cows. However, autumn calving FTY cows consumed moderately less concentrate (140kg approx) to achieve similar milk yield. Overall, FTY delivered 4% more milk solids than FR for 4.5% extra concentrate fed; forage budgets were similar.

FTY operated off a maintenance-plus-base yield calculation with a max daily concentrate threshold. For spring calvers, forage (grazed grass) supported a higher base yield in early lactation than for autumn calvers (silage); thus a greater proportion of daily concentrate was available to drive a milk response. It should be noted that the FTY 'response' in spring calvers was limited to that extra feed targeted to cows with high potential response; lower rates of response (0.8 to 1.1) would be expected if concentrate feeding was increased across the entire group. There was little concentrate-sparing effect in the spring calving section as cows were not offered a high rate of concentrate at pasture. To ensure this, it was essential that *maintenance-plus-base yield* at grass was maximised.

The principal effect in autumn calvers was a modest saving on concentrate, equating to ±1kg per day for the winter period. This was primarily due to reduction in concentrate offered to lower yielding cows within the group, compared to the FR system. To achieve a feed-sparing effect, it was important that base maintenance-plus-base yield level was set below group average. The economics of FTY versus FR vary with milk to feed price ratio plus cost of equipment.

At base milk price 31cpl and concentrate at €260/tonne, annual margin over feed cost per cow diff would be approx €72/cow higher for FTY. However, capital and maintenance costs should be accounted for before final margin is realised. At farm level, differences in pasture growth and utilised are likely to have much greater effect on farm margins than difference between two well-managed concentrate feeding systems.

Feed System	Flat Rate (FR)		Feed to Yield (FTY)	
	Autumn Cows	Spring Cows	Autumn Cows	Spring cows
Milk kg	7,192	6,706	7,304	7,274
Fat %	4.06	3.91	4.03	3.89
Pro %	3.58	3.59	3.59	3.58
Milk Solids kg	549	503	557	543
Total Conc. kg	1,456	806	1,311	1,162
	Flat Rate Herd		Flat Rate Herd	
Milk Yield	6,998		7,292	
Milk Solids kg	531		551	
Concentrate kg	1,196		1,251	
Conc. per kg milk	0.17		0.17	

Breeding and Fertility

EBI effects on winter milk herd performance

The Economic Breeding Index (**EBI**) ranks cows and herd sires based on potential for high milk solids output and good fertility (low calving interval, longevity). A common question has been '***does the index work for higher input or non-seasonal calving herds?***'. This was explored by a number of on-farm studies of commercial (winter milk) herd data.

Study 1:

Milk Production: Data were analysed from ≈900 mature cows across 8 high output (>500kg MS) herds in the north region. Lifetime milk yield per day in the herd was calculated, accounting for herd/parity effects. Results (Table 5) showed that top EBI cows had the highest daily milk value, due to similar volume but higher solids than the EBI lower groups. Peak yield (not shown) was higher for the lower EBI groups, reflecting higher PD (genetic merit) for milk volume; however due to longer calving intervals the annual volume sold from 'milkier' cows was not higher than for the highest EBI group.

Table 5. Effect of EBI on milk performance in high output herds

	High EBI	Average	Low EBI
EBI	€137	€42	-€75
Milk Index €	€43	23	€1
Fert Index €	€56	-3	-€81
Milk kg PD	65	97	145
Milk Pro % PD	0.06	0	-0.06
Annual Solids kg	586	551	528
Milk yield kg/day	20.8	20.9	20.9
Milk Fat %	4.25	3.93	3.71
Milk Protein %	3.53	3.36	3.23
Milk value €/day	€6.66	€6.31	€6.06
€ per 100 cows/year	Base	-€12,775	-€21,900

Study 2:

Herd Fertility: Data from 3,360 cow records in 22 liquid milk herds were used to determine relationships between EBI fertility sub-index, and survival plus interval to 4th calving. 64% of high index (>€50) cows reached 4th lactation compared to 29% of low index (<€10) herd-mates. High index cows reached 4th lactation earlier than low index herd-mates, taking almost 296 days less for 50% to calve for a 4th time (Fig 5). High milk volume genetics, but not EBI milk sub-index, negatively impacted fertility.

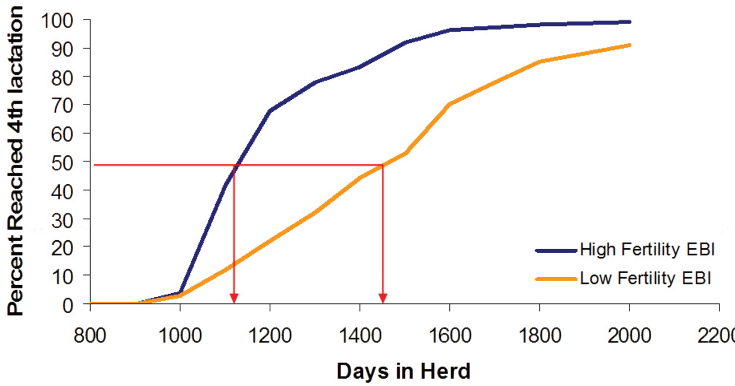


Fig 5. Effect of fertility sub-index on interval to 4th lactation

Johnstown Castle herd - breeding targets

Breeding goals for the Johnstown Castle herd are centred on improving milk solids output while gaining on calving interval and 6wk calving rate; feed efficiency plus functional health and longevity are also important goals. EBI balances these objectives; herd profile is detailed in Table 6. The HerdPlus (www.ICBF.com) package provides an excellent facility to simplify management of breeding decisions.

The key breeding plan steps are:

- Identify cow-side deviations using records and mark cows for culling or beef breeding- low solids, temperament, fertility, SCC, lame etc.
- Select a panel of 7-9 high EBI (>€260) bulls from Active lists. These have generally been a mix of genomic and some daughter proven bulls. No distinction is made between genetic targets for spring or autumn calving cows.
- All bulls used must have high positive on fertility (>€100 index).
- Target combined milk solids kg of 25kg plus in the bulls. The aim is to hold milk volume proof at +80-100kg. The bull team varies around this average figure to complement variation in the cow herd.
- 2-3 bulls with calving ease proofs are included for use on replacements
- Bulls with high maintenance index figures (>€20) are used on heaviest cows
- Sires with very negative udder score (<-1.5) are not used on particular cows
- An inbreeding check is completed using HerdPlus to complete the plan

Animal Group	Num of Cows	Milk Kg Fat Prot	% %	Surv% CI Days	Milk % Cont	Fertility % Cont	Calv % Cont	Beef % Cont	Maint % Cont	Mgmt % Cont	Health % Cont	EBI €
Cows with EBI	143	84			€ 51	€ 63	€ 38	€ -6	€ 1	€ 3	€ 2	€ 153
Missing EBI*	1	8.8	0.09	1.9	31.1%	38.2%	23.1%	-3.7%	0.8%	1.7%	1.4%	
Total Cows	144	6.9	0.07	-3.1								

Table 6. Johnstown Castle herd EBI profile - June 2019

How does fertility affect milk yield?

Analysis of within-herd data (between-herd analysis is confounded by feed system) shows high EBI cows tend to have better annual solids yield, often while having lower genetic merit for milk kg. How is this explained? First, yield should be defined as milk sold per cow per year. This is simply total annual sales divided by cows milked as it best reflects economic value per cow. Milk recorded herd averages are quoted as a 305-day equivalent yield to standardise across herds. Though yield is very accurately measured at each recording, the 305-d figure can be substantially lower than annual milk yield if herd average lactation length deviates significantly from 305 days. In winter milk herds, longer calving intervals mean more stale/recycled cows and more days dry, reducing herd annual yield relative to potential (Fig 6); good fertility is therefore key to unlocking herd milk yield potential.

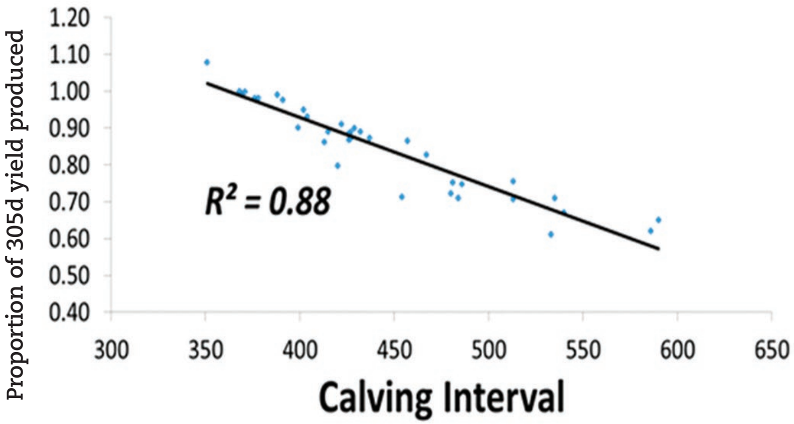


Fig 6. Calving Interval effect on annual milk yield

Fertility targets for winter milk herds

Measure	Target	Comment
Calving Interval	Less than 375 days <375 | 390 | >405	Days between successive calvings per cow. Longer calving intervals mean fewer days at peak milk, reducing annual milk yield per cow. Recycling cows from one calving season to the next is the primary cause of extended calving intervals.
6 week calving rate	More than 80% >80 | 70 | <65	Compactness of calving relative to optimal start date(s). Measured twice per year in split calving systems. High 6 week calving rates drive better margins over feed and reduce risk of culling as empty or recycling between breeding seasons.
Not in Calf Rate %	Less than 10% <10 | 13 | >16	The % of eligible cows not in calf after 12 weeks breeding. Extending the season may reduce empty rate but distorts calving pattern. Low empty rate occurs by combining high submission rate with good conception rate across the season.
Recycling %	Less than 5% <5 | 8 | >14	The % of cows that move from one calving season to the next. Recycling increases calving interval and distorts calving pattern. Usually a short-term response to high empty rate. Aim to eliminate spring-to-autumn recycling, and curtail autumn-to-spring recycling to <5% of whole herd annually.
Lactation per cow at culling	4.5+ lactations >4.5 | 3.8 | <3.5	A measure of herd maturity and long-term fertility performance. More mature cows in the herd increases annual milk yield and reduces replacement costs. However, retaining older cows through recycling is counterproductive.
% calving May to Aug	Less than 5% <5 | 7 | >10	Late spring calvers have poor lactation persistency, high annual feed cost, and low milk yield during winter contract periods. August calving is the least profitable
% First Calving at 24 months	More than 90% >90 | 85 | <80	Higher ager at 1st calving adds an to already large overhead cost for dairy herds. Older heifers have poorer fertility and lower lifetime milk production.

Achieving a high 6 week calving rate

High submission rate in tandem with high conception rate is required to achieve target 6wk calving rate. Cows with delayed onset of first ovulation and may not be ready for start of breeding.

The main risk factors are:

- **Negative Energy Balance**. Low BCS compounds the problem
- **Uterine Infection** (endometritis) also reduces conception rate

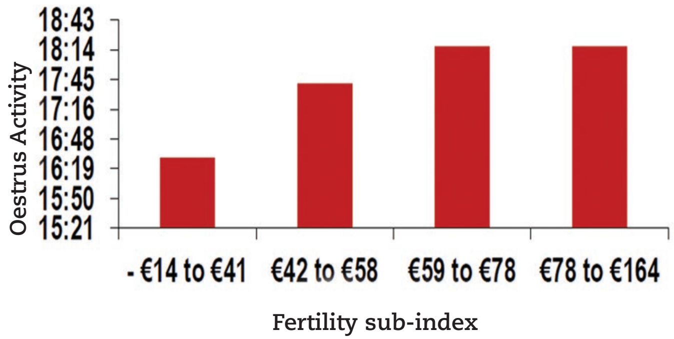
Problems may resolve eventually without intervention but time is limited where high submission rate is targeted. Herd management should focus on having maximum number of cows clean and cycling at mating start date (MSD).

- Record events that increase infection risk– difficult calving, milk fever, retained placenta. Check cows (e.g. Metricheck) 2-3 weeks pre-breeding
- Treat problems (PGF-2α or antimicrobial) promptly to aid recovery time
- Tail paint all cows once-off 28-30 days before MSD; non-cyclers can be identified without having to pre-breed scan the entire herd.
- On day 10 before breeding, examine all cows calved >30 days and not seen in heat. Anoestrus cows can be treated (e.g. CIDR protocol) to induce cyclicity.
- Where calving pattern is lax, clean late-calving cows could be put on a synchrony/ fixed time AI protocol from day 35 after calving. Seek vet advice before treating cows.
- Assess BCS of the herd 3 weeks pre-MSD. If >25% of the herd are below BCS of 2.75, adjust UFL intake and PDI balance (page 10 and 12-13).
- Oestrous activity is constrained in winter by overcrowding, slippery surfaces, slatted floors. Providing a spacious non-slip solid floor area separate to feeding area can significantly improve heat detection.
- Lighting- regulate to approx 200 lux light for 16hrs/day and 8hrs nightlight.
- Breed high EBI cows - less uterine infection risk, earlier return to cyclicity, stronger heats, higher conception rates and lower embryo mortality.

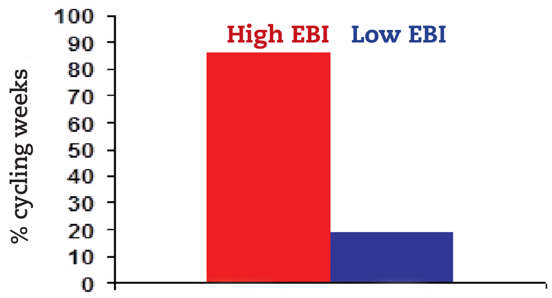
Target 90% submission and >50% conception rate

6 week in calf rate	Conception Rate (Avg.)		
Submission Rate	40	50	60
90%	62	75	82
75 - 90%	55	65	75
<75%	46	56	65

High EBI cows show heat for longer



High EBI = more cows cycling by week 6 post calving



Optimising Calving Pattern

Calving pattern guidelines - liquid milk herds

Table 7. Feed cost by month, relative to Feb calving

Calving month	Relative Feed Cost
Jan	4%
Feb	-
Mar	3%
Apr	11%
May	18%
Jun	24%
Jul	25%
Aug	30%
Sep	25%
Oct	18%
Nov	15%
Dec	9%

Calving date dictates annual feed cost for a given milk yield by changing proportions of grazed grass, silage and concentrate in the diet. For a typical 7000 litre cow milked for a 300 day lactation. February is the lowest cost calving month and August the most expensive (Table 7). Cows calving in May-July have a long indoor milking period and poorer utilisation of grass, adding cost. At farm level, cost per month of calving varies depending on grass growth, stocking rate etc. However, the figures presented give a good estimate for the majority of liquid milk herds operating at <3.8 cows per grazing ha.

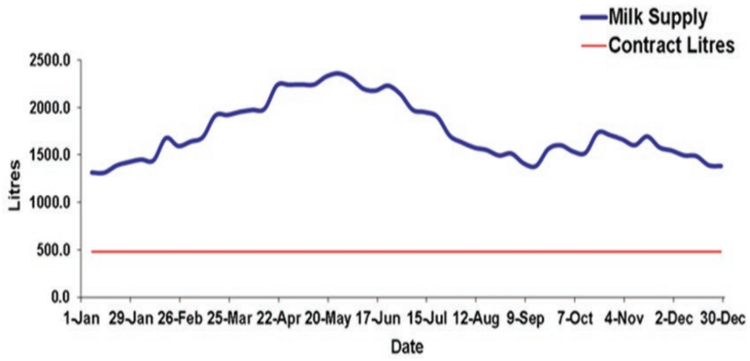


Fig 7a. Lax calving pattern with non-contract winter surplus

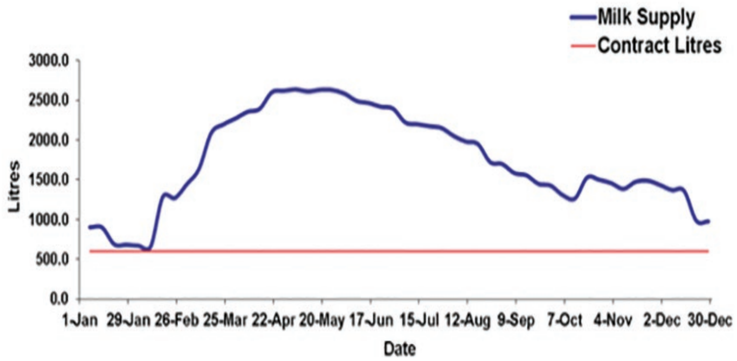


Fig 7b. Tight calving pattern with controlled winter supply

A tighter calving pattern will significantly reduce surplus-to-contract milk (Fig 7). More non-contracted milk is produced during March-October when it can be more cost-effective to do so. This pattern has 2 calving blocks, centred on early February and early October, with 75% of cows calving in the first 6 weeks of each block, and less than 5% cows recycled between seasons.

How does liquid contract affect % autumn calving?

Two 10-12 week blocks of calving, commencing in early February and early October, is an appropriate structure to match winter supply and contracts for most liquid milk farms. However, the relative proportion of the herd calving in each block depends on level of liquid contract.

Table 8 estimates these numbers for a 100-cow herd.

At liquid milk contract levels of <25%, calving 15-16 cows in autumn is sufficient. However, this raises issues in terms of cost viability, and practicality of managing small groups, particularly for with herds of <100 cows.

Calving 30-33% cows in late autumn will meet a 50% liquid contract. Calving commences in early October depending to suit labour and facilities on farm (some farms prefer to start in September for outdoor calving). Note the compact spring calving, meaning that the contribution of 'stale spring' or April-May calving cows to December-January supply is negligible. This is efficient practice. For ≥70% liquid contract, it becomes more difficult to calve compactly at the optimal times while still meeting daily supply requirements. Autumn calving moves to 55 cows and should start in mid-September, with late spring calving kept to a minimum as before.

With this pattern, August/early September milk supply may fall below daily targets on the individual farm, but it is argued that the benefits of block calving to the farm should be recognised in such circumstances.

Table 8. Monthly calving % for different liquid contract levels

Calving month	Liquid Contract Level		
	25%	50%	70%
Jan	-	-	-
Feb	54	45	28
Mar	22	16	12
Apr	8	7	5
May	-	-	-
Jun	-	-	-
Jul	-	-	-
Aug	-	-	-
Sep	-	-	30
Oct	8	16	20
Nov	5	12	5
Dec	3	4	-

Contract conditions vary by processor. Here, contract level is defined as daily volume contract multiplied by 365 e.g. a farm has 1000 litres per day.

Annual liquid volume = 365*1000 = 365,000 litres

The farm sells approx 850,000 total milk litres annually

Liquid contract = 44% approx. Calving 30-32% in autumn would be optimal.

To meet winter contracts additional to liquid litres:

An extra 7-8 late Sep-Oct calving cows are needed for every 5000 litres per month of winter contract volumes (Oct to Mar inclusive), based on herds at 7000-7500 litre annual average production.

Comparing calving pattern systems at Johnstown Castle

The vast majority of winter milk herds employ a 'split calving' pattern, where a proportion of cows (typically 20-50%) calve in autumn and the remainder in spring. This model developed over time to fit the prevailing payment structures of fixed upper limits to winter contract volumes. Compared to single block systems, split calving herds face additional challenges around herd feed costs, control of fertility, youngstock rearing and labour input. As the Irish dairy sector expands and evolves, many liquid/winter milk producers have expanded the spring-calving component of the herd and now face the question of whether retaining a smaller proportion of autumn calving is optimal.

From a milk processing perspective, the issue of how best to structure winter schemes to secure viable milk supply, and how pricing structures may alter annual supply profiles, require examination.

With this in mind, a study was conducted at Johnstown Castle to compare herd performance, milk supply profiles, and feed input costs for 3 different calving pattern systems:

Block Spring	**(SPR)**	- 100% calved in Feb to Apr
Spring : Autumn	**(SPLIT)**	- 50% of herd calved spring, 50% autumn
Block Autumn	**(AUT)**	-100% calved Sep to Nov

Breeding plan for 3 calving pattern systems in Johnstown Castle study

	SPR 100	SPLIT 50:50		AUT 100
Start of breeding season	27th April	27th April	12th Dec	12th Dec
End of AI use	8th June	8th June	25th Jan	25th Jan
End of breeding	20th July	20th July	27th Feb	3rd March
Season duration weeks	12	12 + 11		12
Start of calving	1st Feb	1st Feb	17th Sept	17th Sept
End of calving	25th April	25th April	3rd Dec	10th Dec

Carryover cows policy (SPLIT only)

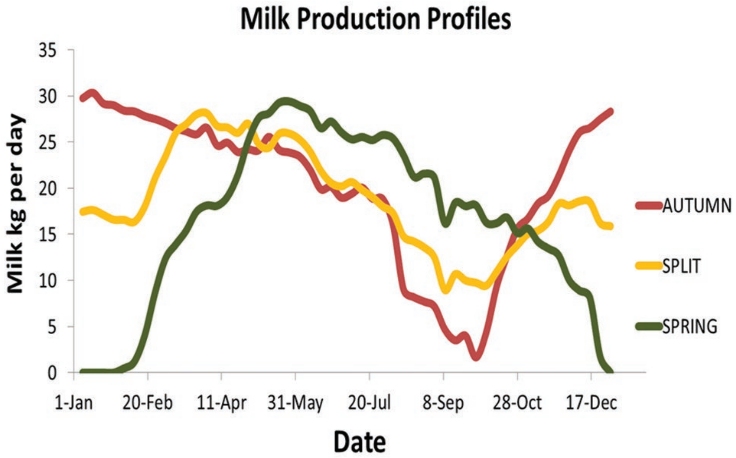
Cows not pregnant by end of breeding period were retained for subsequent breeding only if:

i. 3rd parity or less and high EBI
ii. ultrasound showed normal ovarian activity, no uterine infection
iii. cow not previously changed calving season

Empty cows not meeting these criteria were culled as infertile

Maximum recycling rate was limited to 5% per year

Comparing calving pattern systems at Johnstown Castle - milk profiles



Milk Profiles	SPR	SPLIT	AUT
Milk kg	6192	6723	7261
Fat %	4.30	4.17	4.19
Pro %	3.56	3.52	3.54
Milk Solids kg	488	517	561
Profile analysis			
Summer peak[1] milk kg	27.1	24.6	23.1
% total milk Nov-Feb	<10.0	29.4	43.2
Winter Days dry	38	0	0
Peak : trough month ratio	∞	1.5	4.7

[1] *Summer Peak = Avg kg per cow per day, late Apr to Jun*

Feed Management

The 3 herds were managed as separate farmlets at a grazing stocking rate of 2.90 cows per ha; the objective within each was to maximize pasture in the diet. Grazing commenced in early February with first rotation completed by 6-10th April for all groups.

SPLIT and AUT groups received additional supplement during the spring period to offset higher feed demand of autumn calvers. Stocking rates were increased to >4.1 cows per ha after closing for 1st cut silage area. Mid-season pasture was managed to target 1400kg DM/ha pre-grazing cover.

Autumn grass was managed according to budget targets (page 9). Final rotation was completed by early Nov for the AUT herd and 10-12 days later for SPR and SPLIT herds. The SPLIT and AUT herds incorporated maize silage as 33% of winter forage.

Milk Profiles

AUT produced higher milk solids than SPR, with SPLIT intermediate. This was volume-drive as milk composition was quite similar across herds. However, SPR cows milked for 37 days less on average.

Relative to SPR, summer peak (volume) was reduced by 8% by SPLIT (50% calving in autumn) and by 14% for AUT, a relative modest effect given scale of change in calving pattern. Notably, AUT and SPLIT reduced volumes by 76% and 31% respectively during the Aug-Sep period. The primary effect of Sep-Dec calving was therefore to shift milk supply primarily from early autumn into winter, to a greater extent than from summer peak.

There were no treatment effects on fertility performance, with 6 week calving rates, calving intervals and empty culling rates meeting target values each year of the study.

Comparing calving pattern systems at Johnstown Castle - feed input and margin results

	Spring	Split	Autumn
Grazing stocking rate	2.90	2.90	2.90
Concentrate kg/cow	536	1050	1380
Concentrate kg/kg milk	0.09	0.16	0.19
Forage deficit tDM/cow	0.26	0.39	0.70
Winter Days dry	38	0	0
Feed cost per litre	3.35	5.68	7.55
	Margin over purchased feed €/cow		
Base Milk Price	***€250 concentrate price***		
26cpl	1,560	1,518	1,521
30cpl	1,834	1,814	1,842
34cpl	2,088	2,087	2,139
	€270 concentrate price		
26cpl	1,546	1,492	1,486
30cpl	1,821	1,788	1,807
34cpl	2,075	2,061	2,104

The SPR system had lowest feed cost per cow and per litre with SPLIT intermediate and AUT highest. The systems with autumn calving as expected had increased concentrate cost due to milking on silage diets. Volume and cost of external forage also increased with autumn calving. This was due to a combination of higher cost per tDM (lactating cow forage), greater total forage intake per cow, and interestingly, a reduction in annual pasture growth (0.4 to 0.7tDM per ha depending on autumn calving ratio). This may be a consequence of adjusting autumn grass management to account for reduced grass demand in the system.

Milk margins over feed cost, before winter premiums, were calculated for each system. System margins difference across this range of scenarios were €60 per cow at most. There was relatively little difference at 30cpl base milk price and €250/t equivalent concentrate price. The SPR system had a relatively higher margin where feed cost increased or milk price declined, whereas AUT had better outcomes at high milk price/lower concentrate price. The SPLIT system margin did not exceed SPRING any scenario tested.

Collectively, the outcomes indicate that the higher milk revenue of autumn calving systems is essentially offset by higher feed costs at a common stocking rate. To exceed SPR margins therefore, autumn calving systems require a price premium that at least meets any differences in overhead costs per system.

Key point: Milk revenue advantage of autumn calving systems offset by feed costs differentials.

Comparing calving pattern systems at Johnstown Castle - fixed cost effects

Margin over feed (MOF) results showed no advantage to SPLIT or AUT systems despite higher milk revenue before premium payments, relative to SPRING. It is recognized that MOF is limited as a metric to assess between farm profitability. However, in this study stocking rate, grazing sward management, animal health etc. were all standardized between groups so that MOF represents a reasonable approximation of gross margin differences.

The key questions then become:

i. What effect does calving pattern have on overhead cost?
ii. Does available winter milk payment scheme offsets this cost?

The main fixed cost effects of calving pattern are likely to manifest as labour, machinery and depreciation costs. Using data from commercial farms, it has been estimated that split calving systems require up to 4 hours extra labour input per cow annually compared to spring calving (Fig 8).

Direct calving pattern effects on machinery and infrastructure costs are difficult to quantify given the range of on-farm variables involved. Teagasc eProfit Monitor data estimates €15-20 per cow in additional machinery running costs for winter milk herds, largely due to operating more complex winter feeding equipment and systems.

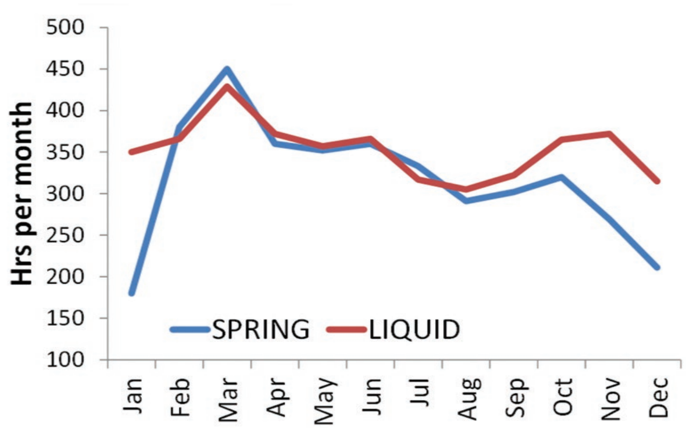


Fig 8. Effect of calving pattern on monthly labour (100 cows)

How does split calving affect labour input?

Based on labour survey data, the total additional labour input for split versus spring calving herds was 4 hours per LU per year approximately, or 450-500 hours per year for a standard sized herd. Importantly, the data also showed very little labour saving at spring peak (20 mins per day), contradicting the common assumption that split calving 'spreads the work'. On the contrary, the principal effect was to significantly increase total labour input in the second half of the season. Labour data on block autumn systems is limited, but it would be expected that hours per cow may be intermediate between spring and split systems.

Comparing calving pattern systems at Johnstown Castle - pricing structure effects on milk payments

Table 9. Effect of calving pattern and milk payment scheme on annual winter premium per cow

	Spring	Split	Autumn
	Milk Premium € per cow		
Winter Scheme			
Nov - Feb @ 7.5cpl	-	€146	€234
Nov - Feb @ 5cpl	-	€98	€156
Liquid Scheme (7.5cpl)			
50% 6 months		€133	€137
50% 4 months		€82	€89

Winter Scheme: Defined as payment on all litres on condition that a minimum volume (25% of annual) be supplied Nov-Feb.

Liquid Scheme: Defined here as a premium payment (7.5cpl) for a fixed minimum volume of litres per day during a 4 month (Nov-Feb) or 6-month (Oct-Mar) period. Percentage schemes calculated by liquid milk as % of total annual supply.

Schemes and rates are for illustrative purposes only, and do not constitute a recommendation on commercial payment structures

Results from the Johnstown study showed that split/autumn calving requires milk price incentives to at least offset additional overhead costs. Various example winter pricing structures were imposed on the AUT and SPLIT milk supply profiles of the study to calculate likely annualised milk premium values (see Table 9).

For winter schemes (payments on ***all*** winter litres based on meeting minimum supply criteria), AUT calving had a clear advantage over SPLIT, due to its capacity to supply higher volume in the Nov-Feb period. For example, AUT would receive 2.2cpl annualised bonus at the 5cpl rate, compared to 1.4cpl for SPLIT.

For liquid scheme structures (payment on a fixed winter volume with the remainder paid a manufacturing price), the premium differentials between systems were less – both AUT and SPLIT met minimum volumes however AUT delivered a greater non-contracted winter surplus. Duration of winter payment has a significant effect– annualised liquid premium was 1.8cpl for a 6-month scheme but 1.2cpl if paid over 4 months.

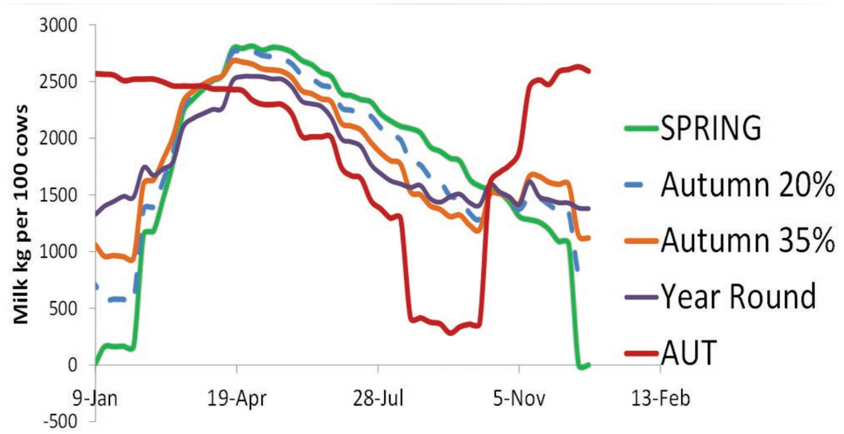
The key point is that ***structure*** (eligible volume) as well as ***rate*** (price) of payment determines overall value of a given scheme. Farm businesses should compare total potential annual milk bonuses against the labour, overheads, feed and risk implications of altering calving pattern to achieve such payments. The corollary is that winter milk payment structures should factor in the requirement for individual farms to achieve a critical mass in realised winter milk bonuses, in order to offset additional total costs.

Comparing calving patterns - implications for winter milk processing profiles

In the current Irish industry context, deviation from a block calving model adds cost and risk to the individual farm. That said, milk pricing is a highly tangible motivator of management decisions. Price incentives usually elicit a production response across a milk supplier pool, the value of which may often not be subject to full financial analysis at farm level. It is important to clarify the objectives for any milk pricing system that encourages change in calving pattern.

Based on lactation curve analysis, a further series of calving pattern options were modelled in addition to the Johnstown calving pattern study profiles, to examine effects on milk supply. This showed that <20% autumn calving had a negligible effect on milk output at summer peak but as expected secured some additional winter volume. Calving all year round (AYR) produced a milk supply profile quite similar to 35% autumn calving (a standard level for autumn calving herds) at peak and during Nov-Feb, but would create significantly higher annual labour demand and feed cost on-farm. These trends are verified by commercial farm data.

In conclusion, winter milk pricing schemes to encourage small shifts to autumn calving per farm are unlikely to have a significant effect on summer peak volumes. A more likely outcome in this scenario would be moderate additional winter volume secured for an increase in average production costs across the supplier base. Winter milk supply and summer peak management should be treated as related but separate issues at processor level. Rationalising winter milk payment schemes to target more specialized herds with a higher proportion of autumn (not AYR) calving is an appropriate strategy. This would achieve 'critical mass' on individual farms to offset cost; milk assembly and quality during winter months may benefit also.



Calving Pattern	AUT 20	AUT 35	Year Round	AUT
Peak as % Spring	-3.0	-7.1	-9.6	-14.8
Nov-Feb as % total	16	22	24	40

Notes

Notes

Contact Details:

Teagasc,
Head Office,
Oak Park,
Carlow.

Tel: 059 9170200

Email: info@teagasc.ie

www.teagasc.ie

Teagasc

Agriculture and Food Development Authority