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Moorepark Dairy Levy Research Update

Moorepark Dairy Production Research Centre
Balldague Open Day

Tuesday 23rd March, 2010
Series 13

Breeding and Management Technologies to Increase Farm Profit

FBD Trust

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Table of Contents

Introduction

The Irish dairy industry is facing new and challenging times with the impending removal of milk quotas and large volatility in milk price. There will be significant opportunities for Irish dairy farmers to profitably grow their farm businesses in the coming years. Compared to 2007, Ireland can increase milk production by 9.3% by 2013 (2% increase in 2008; 1% increase in each year between 2009 and 2013; 2% increase in 2009 due to butterfat adjustment). This will require an increase in the national dairy cow herd. There is an increasing awareness among dairy farmers that key to future success is the utilisation of the best genetics available together with the implementation of sound science-based management technologies. Maximising the use of high EBI genetics is the corner stone to ensuring profit maximisation regardless of future milk price. This important and timely event will provide Irish dairy farmers with up to-date research information as they prepare for the start of the breeding season.

The objective of this event will be to provide comprehensive direction to dairy farmers in breeding strategy for the coming breeding season. Compact calving, generating additional high EBI replacements, increase AI usage and increasing overall profitability of the dairy herd will be the focus of the day. The event will also offer dairy farmers an opportunity to meet with ICBF, NCBC and the main AI organisations. The various alternative breeds and crossbreeds currently being evaluated at the Ballydague Research Farm will also exhibited on the day.

At present there is a shortage of high quality dairy replacement stock being generated on Irish dairy herds. For dairy farmers that are not considering increasing cow numbers, there is the potential to increase farm profitability significantly through selling surplus AI bred high EBI breeding stock. While fertility levels have improved, current performance continues to be substantially below optimum, negatively impacting upon heifer supply and more immediately dairy farm profits. Maiden heifers are a key component of the dairy enterprise and must be managed accordingly to achieve optimum performance. Synchronisation programmes can help achieve early compact heifer calving as well as facilitating an improved supply of high quality replacements.

The Open Day will be an ideal opportunity to see at first hand the results of the comprehensive research programme at Moorepark and to meet research and advisory personnel from Teagasc. Additionally, attending this event will fulfil one of the eight meetings that dairy farmers are required to attend to qualify for the Dairy Efficiency Programme 2010. This event has been generously sponsored by FBD. The financial support for the research programme from state grants and dairy levy research funds is gratefully acknowledged.

Pat Dillon,
Head, Moorepark Dairy Production Research Centre
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Key Factors for Dairy Farm Efficiency

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Summary

- Milk price volatility will force Irish dairy farmers to place greater emphasis on business planning, incorporating risk and key performance indicators.
- Key characteristics of a successful dairy farm business in the future will be low cost grass-based systems driven by high grass utilisation, low levels of supplementation using productive and highly fertile grass-based genetics.
- Grass utilisation per hectare is the best predictor of profit per hectare
- Farm management skills such as business planning/monitoring, grass measurement/budgeting, fertility management, breeding management and the adoption of low cost labour efficient practices are required.

Introduction

Future milk price in both Ireland and the wider EU will be increasingly exposed to substantial fluctuation over the next number of years as the supports available from CAP recede. These supports regulated EU milk price by placing product into intervention when prices were low and selling product out of intervention when prices were high, thus keeping milk price in the EU stable, to a large extent. This practice however, also had a stabilising effect on the world market price as it removed EU product from the market at times when the market was weak and reintroduced when the price rose.

In contrast to New Zealand and Australia, milk price volatility is a new phenomenon for Irish and EU producers. There is a requirement at farm level to refocus the dairy farm business in a way that will insulate the business in an increasingly volatile environment. Every dairy farmer who remains committed to dairying for the longer term should develop a business plan that can be used to drive the farm business forward. The development and application of a business plan is the first stepping stone in the development of a thriving and successful business. In order for any business to survive and prosper long term they must constantly innovate to reduce costs and increase output. This model has been successful (e.g. Ryanair, Kerry Group, CRH, Dell etc.). A dairy business is no different. In the business plan a review is required of resources and from this a plan for the future can be prepared. The business model that dairy farmers select for the future must be based around surviving price and weather shocks and be about setting up the business to capitalise when the price increases. This ultimately means producing milk at the lowest cost possible, while reducing the investment requirement by expansion through the use of low cost housing technologies.

Key components to ensure future profitability

The key components of the successful dairy farm of the future will centre around producing milk at low cost in a simple system that is sustainable for the animal and the personnel working in the system, with a cow suited to the system in an environmentally sustainable manner. The maximum gain's will be achieved where grass harvested is maximised through increased grass growth and utilisation with a cow that calves compactly, at the right time of year, while maximising grass utilisation and minimising supplementary feeding. The key technologies centre around grass utilisation and having the right cow for the system.

1. ***Grass utilised per hectare***
2. ***Grazing season length***
3. ***Fertility performance***
4. ***Milk solids concentration***

1. Grass utilised per hectare

Grass utilised per hectare is a feature of grass grown per hectare, stocking rate, grassland management and the level of supplementary feeding that is carried out on the farm. Nationally dairy farmers operate at a stocking rate of 1.78LU/ha (O' Donnell et al., 2008) on the grazing platform. It is estimated that nationally there is approximately 7.1t DM/ha being utilised on the average specialist dairy farm. Figure 2 shows the relationship between grass utilised per hectare and net profit for 200 farms selected from the Profit Monitor System for 2008. Grass utilised is calculated based on the farm stocking rate, milk yield per cow, cow live weight and the level of concentrate feeding. Figure 2 shows that approximately 44% of the difference in net profit per hectare between farms can be explained by overall grass utilised per hectare. Carrying out the analysis over a number of years showed that the relationship was extremely robust ranging from 45% to 34% over a 5 year period. The key drivers effecting grass utilised per hectare are grass growth, stocking rate and supplementation level.

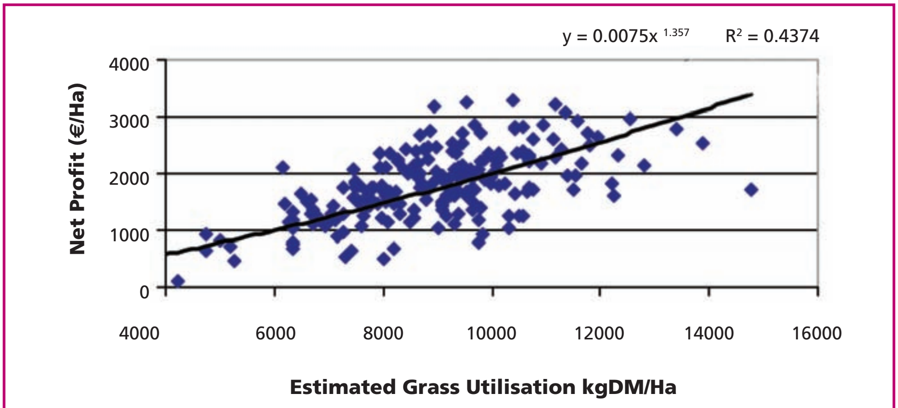

Figure 2. The relationship between estimated grass utilised per hectare and net profit per hectare

2. Grazing season length

Results from the NFS suggest that the national grazing season length is under 200 days annually. A number of studies have been carried out looking at the effect of the grazing season length on overall farm profitability. The studies have shown that milk yield and milk solids concentration are increased through earlier turnout of cows as well as sward quality and therefore intake in subsequent rotations. The feed costs are substantially reduced as there is a reduced requirement for grass silage and concentrate which are between two and three times more expensive than grazed grass. Animals outdoor has less mastitis and feet problems, require less labour and have less slurry spreading costs. Increasing the length of the grazing season has been estimated to increase profitability by over €3/cow/day. Therefore, on a 60 cow herd a 10 day increase in grazing season length is worth €1,800. As is discussed on the grassland boards grazing season length can be extended using tools such as the rotation planner and having the correct grass varieties.

3. Fertility performance

There are significant costs associated with infertility in the national dairy herd. Data from ICBF indicates that even in the top 10% of spring calving herds based on EBI, replacement rate (incl. recycled cows) is in excess of 30% annually with a mean calving interval of 380 days. The optimum replacement rate (balance between requirement for new genetics and cost) is estimated to be 17% in a spring calving herd. Sub optimal fertility adds significant cost to the dairy business. Sub optimal fertility effects herd in a number of ways:

(i) Replacement rate

The cost associated with the requirement for increased replacements is a topical one. It has been estimated that it costs approximately €1,500 to rear a replacement heifer when the value of the calf and labour, land and housing costs are included, as well as the direct costs. The value of a not in-calf cull cow at the end of lactation will vary from €200 to €400 depending on year. Therefore, the cost associated with having to replace an additional 10 cows is €11,000 or €275/ha on a 40ha farm with 100 cows.

(ii) Calving date and spread

Sub optimal herd fertility will result in a spread-out calving pattern with an average calving date slip to later and later each year. More often than not this will result in the farmer starting to calve earlier in an effort to stop the slippage and subsequent increase in the breeding and calving seasons. This has a significant feed budget effect as some cows are then calving too early to match the supply of grass with the demand and others are calving too late to capitalise on early grass. There will be an effect on milk solids concentration as more milk is produced from grass silage. There may also be a significant milk yield effect with some cows in the herd having a significantly shorter lactation length. The national calving date has slipped by 8 days over the past 6 years (CMMS, 2009). Nationally the mean calving date is close to mid March with a target of mid to late February. This is costing approximately €300/ha/year.

(iii) Milk yield per cow

Higher replacement rates in the dairy herd result in reduced herd milk yields. This is caused because 1st, 2nd and 3rd lactation animals are only capable of producing 75%, 92% and 97% of that of a mature cow. Therefore, a higher proportion of 1st and 2nd lactation animals in a herd will result in the herd not reaching its milk production potential. A replacement rate 10% above the target of 17% will reduce a herd that has a mature cows milk production potential of 6,200l from 5,871 to 5,669l. This will reduce the potential profitability of the herd by up to €100/ha/year at a milk price of 30c/l.

(iv) Infertility treatment

It is much more difficult to quantify the costs associated with infertility treatment, with huge variation between herds. However, in herds with poor fertility, there are a greater number of straws used per calf born, increased veterinarian intervention with hormone treatments and higher levels of scanning. Good fertility versus poor fertility could account for 0.6 less straws used per cow in calf with a conception rate to service of 60% versus 40%. This will result in €12 difference between cows @ €20/straw. When coupled with additional scanning and treatments the total could amount to €30/ha.

(v). Labour

A herd with higher levels of infertility will result in the amount of dairy cows that an operator can handle being significantly reduced. Increased breeding, calving, and herd intervention reduce the number of cows that can be handled.

All of these costs result in reduced profitability and add significant pressure to the system being operated. Other costs that are more difficult to quantify are reduced potential for expansion, reduced genetic gain, inability to maintain a closed herd, drudgery factor associated with breeding and calving for a 20 week breeding season as well as the lost opportunity for the second most potentially profitable enterprise on the farm. The EBI and in particular the fertility sub index within the EBI as well as cross breeding urgently need to be explored and exploited if the costs associated with infertility are to be reduced on farm.

4. Milk solids concentration

The rate of milk composition (fat and protein) increase in Ireland is slow. Milk fat and protein concentrations have increased from 3.56% and 3.21% in 1992 to 3.83% and 3.33% in 2009 (www.cso.ie) or by 0.016% and 0.008% per year, respectively. Increasing milk solids concentration through the combination of both management and genetic selection has a significant effect on farm profitability. The recent introduction of the A+B-C system of milk payment in many Co-Ops and its proposed introduction in others will increase the emphasis on milk solids concentration at farm level. An increase in milk solids concentration increases the efficiency of protein and fat production within the cow due a reduction in lactose output for every additional unit of protein and fat. Increasing milk solids concentration has a significant effect on dairy farm output and inevitably farm profitability. Table 4 shows the effect of increasing milk solids concentration in incremental steps of 0.04% protein and 0.08% fat in a non EU milk quota scenario. The results show that increasing milk solids concentration will substantially increase profitability with a higher increase observed at higher milk prices. Increasing milk protein and fat concentration from 3.33% and 3.83% to 3.54% and 4.22% increased profitability by €11,600, €9,081 and €13,669 at milk prices of 27c/l, 20c/l and 33c/l respectively, on a 40ha farm. While it is accepted that these types of increases will not happen overnight the benefits are there to be seen. These benefits can be captured by focusing on increasing grassland management, grazing season length and grass quality as well as on the permanent effects of increasing the genetics for increased milk solids concentration.

Table 4. The effect of increasing milk solids concentration on farm profitability

Milk protein %	3.33	3.38	3.42	3.46	3.50	3.54
Milk Fat %	3.83	3.90	3.98	4.06	4.14	4.22
DM Utilised (t DM/ha)	8,832	8,911	8,989	9,065	9,146	9,223
Total hectares (ha)	40	40	40	40	40	40
Milk sales (kg)	452,586	452,586	452,586	452,586	452,586	452,586
Cows calving (no.)	85	85	85	85	85	85
Stocking rate (LU/ha)	2.09	2.09	2.09	2.09	2.09	2.09
Milk solids sales (kg)	32,426	32,978	33,514	34,048	34,614	35,149
Fat sales (kg)	17,274	17,643	18,012	18,364	18,733	19,085
Protein sales (kg)	15,153	15,335	15,502	15,684	15,881	16,064
Labour costs (€)	25,732	25,732	25,732	25,732	25,732	25,732
Milk Price 27 c/litre						
Milk returns (€)	127,766	130,142	132,360	134,640	137,076	139,357
Margin per cow (€)	258	286	312	339	367	394
Margin/kg milk (c)	4.74	5.25	5.73	6.22	6.75	7.25
Total profit/farm (€)	21,908	24,286	26,505	28,788	31,226	33,508
Milk Price 20 c/litre						
Milk returns (€)	94,531	96,363	98,109	99,904	101,822	103,618
Margin per cow (€)	-136	-114	-94	-72	-50	-29
Margin/kg milk (c)	-2.49	-2.10	-1.72	-1.33	-0.92	-0.53
Total profit/farm (€)	-11,535	-9,704	-7,960	-6/165	-4,249	-2,454
Milk Price 33 c/litre						
Milk returns (€)	156,351	159,102	161,725	164,421	167,301	169,997
Margin per cow (€)	596	629	659	691	725	757
Margin/kg milk (c)	10.96	11.55	12.12	12.70	13.33	13.91
Total profit/farm (€)	50,672	53,427	56,053	58,754	61,639	64,341

Conclusion

Price volatility will be a key feature in milk production systems of the future. There is a positive future for dairy farming if a clear business focus is adopted. The objective or the goals of the business should be set down and should drive the business forward. Focus should be placed on maximising grass utilisation while minimising supplementary feeding, increasing the length of the grazing season and improving the genetic status of the herd. There have been significant financial investments made in facilities on farm over the past number of years. There is now a requirement for farmers to invest in their own skill set (business planning, grass budgeting) and to invest in the genetics that will be required for the future. These investments will result in substantial increases in productivity and will ensure survival of the business into the future.

References

O'Donnell S., Shalloo L., Butler A.M. and Horan B. 2008. Opportunities, challenges and limitations on Irish Dairy farms. *International Journal of Farm Management.* Vol 13 (6) 419-434.

Shadbolt N. 2009. How risky your business? In Proceedings of South African Large herds conference. 23rd-25th February 2009, Champagne Sports Resort, Drakensberg. Page 155-167.

Bull Selection 2010

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Summary

- The EBI is a tool to compare animals with regard to the expected profitability of their progeny based on additive genetic differences.
- Evidence from Moorepark suggests that high EBI North American Holstein genetics can survive in our system.
- Oman (OJI) is still ranked no. 1 on the ICBF Active Bull list®. On average in Ireland his daughters have 19 days shorter calving interval and 1% greater survival compared to their herdmates.
- A review of 2009 daughter performances for the first crop of GS (Genomically Selected) sires is providing confidence that genomic selection is a more accurate predictor of genetic merit than previously used methodology.
- Research is on-going between Teagasc Moorepark and the ICBF to ensure a continuous supply of high EBI sires into the future. Among the challenges being addressed is the identification of elite Irish bull dams of future high EBI AI sires.
- Crossbreeding trials at Moorepark have demonstrated substantial improvements in cow performance and consequent profitability from crossbreeding. Moorepark studies suggest hybrid vigour is worth in excess of €100 per lactation in addition to EBI.
- Analysis by the ICBF using performance data from the national data base has confirmed these findings.
- The true benefit (add profit generation) from crossbreeding will only be realised where the best available genetics (high EBI alternative breed sires) are use, thereby availing of high EBI, breed complimentarity and hybrid vigour.

Introduction

The ideal cow for Ireland, irrespective of breed, is a cow that will efficiently deliver high milk solids from grazed grass with little fuss, and continue to go back in calf year on year. Robust reliable cows will ensure profit generation regardless of the ups and downs that the future will present. The ongoing research at Moorepark, as well as close collaborations with industry partners such as the Irish Cattle Breeding Federation (ICBF); experimental results, and tools such as the EBI, the Active Bull list®, Genomic Selection etc., present Irish dairy farmers with the where with all to identify the most profitable genetics for the Irish grass-based environment. Now, more than ever, there is a large choice of bulls of high genetic merit from different breeds. Irish farmers must maximise the use of superior genetics to ensure highest profit potential within their future herd.

Genetic improvement – the Economic Breeding Index

Genetic improvement for Irish dairy farmers should constitute increases in herd productivity through genetic improvement in solids output potential, and reduced costs by genetically improving reproductive efficiency/survival as well as animal health (udder health, lameness etc.). It also should be noted that improvements to calving interval and survival (fertility sub-index) will improve productivity via potentially longer lactation lengths as well as increasing the proportion of cows reaching maturity and the consequential increased production capacity that ensues. Moreover, it must be appreciated that genetic change, be it improvement or otherwise, is cumulative and permanent. The economic breeding index (EBI) has been available to Irish dairy farmers as a tool to identify the most profitable animals under average production systems. The availability of sub-indexes within the EBI allows farmers to "fine-tune" the selection of bulls to address particular issues in their herd.

EBI – Ongoing developments

The economic breeding index is continuously updated to reflect expected changes in economic, social and environmental policy as well as the availability of data to estimate genetic merit. With land now the limiting factor on Irish dairy farms (imminent removal of quota) the ability to maximise milk solids output per unit land area, or per tonne grass grown is key to maximising profitability. To reflect this the weighting on cow live-weight has become more negative and to make this more transparent within the EBI, a new sub-index, the 'maintenance' sub-index, is now included. This in effect means that the EBI is selecting for cows with high milk solids and good fertility, that require less feed to do so. Upcoming changes to the EBI in the latter half of 2010 will include changes to the methodology by which fertility (calving interval) is evaluated with more emphasis being placed on insemination data. Mastitis and lameness will enter the EBI as traits themselves, replacing the current methodology whereby both traits are predicted by somatic cell count and locomotion score, respectively. Also, six week old calf price (based on mart data) will replace carcass traits in the beef sub-index.

Genomic selection – What is it?

Genomic selection is a new tool that facilitates the more accurate identification of high EBI animals, based on analysis of the DNA of the animal. As a technology it is being heralded as the most promising application of science in animal breeding since the introduction of AI. The basis of the technology is similar to that used by forensic scientists to solve crime or identify bodies. Both are based on the knowledge that everyone has a unique signature of genes or DNA. Also, DNA is passed on from parents to offspring. Furthermore, DNA can be measured in an individual from birth and does not change over the lifetime of the individual. It is the DNA, or genes, interacting with the management on the farm, that determine whether an animal will yield more milk solids and will go back in calf easily.

Therefore, if we can determine what DNA is associated with the different performance traits, and we can measure the DNA of an animal at birth, then we can predict the genetic merit of the animal. This is the basis behind genomic selection. Genomic selection was launched in Ireland for Holstein-Friesian cattle in Spring 2009. Ireland was the second country, after the US, to release official national proofs based on genomic selection. The implication of genomic selection is an increase in EBI reliability for younger animals, especially young bulls and cows. It has no impact on the reliability or EBI of proven bulls. Genomic selection is currently only available in Holstein-Friesians but research is underway to expand to other breeds. The accuracy of the approach will be firstly tested in beef where a multiple of sires from different breeds are proven in Ireland.

Genetic evaluations incorporating genomic information

In Ireland, the genetic merit predicted from the DNA is blended together with the old system of genetic evaluations, which for calves is just its parental average. Bulls with DNA information included in their genetic proofs are said to be "genomically selected". In Ireland there are four categories of bull available through AI; a) bulls with daughters milking in Ireland (DP-IRL), b) bulls with no milking daughters in Ireland but with daughters milking in other counties, thereby proven in other countries (DP-INT), c) bulls selected based on their DNA, but also with at least 50% reliability for calving difficulty in some country, meaning that they must have progeny calves somewhere in the world and are therefore known not to carry any major genetic defects observable in calves and have reliable calving difficulty information (GS), and finally d) bull calves which are genomically selected but have no or very few calves born anywhere in the world.

Impact on genomics on accuracy of identifying elite bulls

The reliability achievable for bulls evaluated based on their DNA is now approximately 54%, though this will vary depending on the information available from their pedigree. This is an increase of approximately 22% compared to if genomic selection was not used. However, 54% reliability is still considerably less than the maximum of 99% achievable in proven (older) bulls. Nonetheless, the genetic merit (e.g., EBI) of the best genomically selected bulls is on average superior to the genetic merit of most proven bulls, available at a reasonable price. The lower reliability of genomically selected bulls can be overcome by using teams of these bulls; a recommendation is to use at least five genomically selected bulls in a team. **Use of less than five genomically selected bulls in a herd is not recommended and should never be undertaken.** The reliability of the average EBI of a team of five genomically selected bulls, each with an individual reliability of 54%, is equivalent to the reliability of the EBI of using one sire with a reliability of 91%. One option is to select a team of bulls that include proven bulls, genomically selected bulls proven for calving difficulty, and G€N€ IR€LAND young bulls.

Are we confident that Genomic Selection stacks up?

Although genomic selection is a relatively new technology and has not been thoroughly proven, 35 layoff bulls that were genomically selected last year now have daughters milking. Comparing their now daughter milk production proofs (these bulls have no daughters with fertility information yet) with predicted milk proofs using genomic selection and the old traditional system of genetic evaluation, it is clear that genomic selection was the better predictor. Some bulls did change relative to their predictions but this is expected and is reflected in the range of EBI provided on the Active Bull List®.

Can high EBI North American Holstein Genetics be successful in Ireland?

Based on past experience it is difficult to accept that Holstein-Friesian genetics (specifically those of North American origin) will really survive in our grass-based production environment. Recent research at Moorepark, however, provides evidence that the EBI and its sub-indexes do predict animal performance. Cows of contrasting fertility sub-index but similar production sub-index were assembled. The cows in the study have either a high fertility sub-index (€51) or a low fertility sub-index (€-30), but have similar percentage of Holstein-Friesian genetics (93%) and similar values for the milk production sub-index (€40). The sires of cows with a high fertility sub-index include RUU, LBO, LLO and OJI, while the sires represented in the low fertility sub-index group include BIJ, VET, SYG and GUF. In 2008, the 36 cows were managed as one herd in accordance with the Moorepark blueprint for pasture-based milk production. The production and fertility performance of each group during Year 1 of the study (2008) is summarised in Table 1.

Table 1. First lactation milk production and reproductive performance

	High Fertility sub-index	Low Fertility sub-index	Fertility Targets
Milk Production (kg)	5069	5098	-
Milk solids (kg)	360	363	-
Average BCS	2.81	2.65	-
21 day submission rate (%)	83	72	90
First service pregnancy rate (%)	56	28	55-60
Six week in-calf rate (%)	72	41	>75
Empty rate (%)	11	28	<10
2008 mean calving date	15 Feb 2008	09 Feb 2008	-
2009 mean calving date	17 Feb 2009	11 Mar 2009	-

There was no difference in milk production during their first lactation. The high fertility group maintained a better body condition score throughout lactation. This is particularly interesting, as all cows were fed and managed in a similar manner. The high fertility group had slightly better submission rates, superior conception rates, less pregnancy loss (embryo mortality) and a lower overall empty rate than the low fertility group. The differences in fertility performance resulted in the mean calving date in 2009 staying the same in the high fertility group, but slipping by 28 days in the low fertility group. This means the high fertility group had a more compact calving pattern, resulting in longer lactations at pasture, and hence a more profitable cow.

"The Oman effect"

Similarly, there is a lot of talk on how the high yielding North American bull, Oman (OJI), can have such good fertility. Unfortunately we don't know and if we did we'd make more of them! However, OJI, or his sons, are topping the active bull lists of most countries around the world. OJI is currently positioned around 50th highest on Breeding Worth (BW) in New Zealand based on many New Zealand daughters. He loses many BW points from his heavier liveweight compared to the average herd (which includes Jersey cows) in New Zealand. His milk production sub-index in Ireland is based on 418 daughters milking in 111 Irish herds (including Moorepark). His fertility performance is still based on INTERBULL genetic evaluations but is also influenced by his 426 daughters in 112 Irish herds. On average, these daughters have 19 days shorter calving interval than their herdmates and 1% more survive to the next lactation.

The National Breeding Program

Having a world-class breeding index, such as the EBI, is futile without having a constant supply of high EBI sires from different families, coming through the system year on year. This is the basis of G€N€ IR€LAND®. A breeding program, first implemented by the NCBC in collaboration with Moorepark and the ICBF in 2009 is now being expanded to include other breeding organisations. The objective is to ensure that a sufficient stream of new sire and dam lines routinely come to the top of the Active Bull List®.

Selection of sires of young test sires is not very difficult, made possible by large progeny group sizes and international genetic evaluations. Identification of elite Irish dams is, however, more challenging because of the lower EBI reliability associated with cows. The approach is to identify genetically elite Irish cows that have proven themselves under Irish grazing systems. Research at Moorepark is underway since 2007 to develop computer programs that will screen the entire national dairy herd of milk recorded cows to identify high EBI cows that have proven themselves on the ground through high milk solids and consistently going back in calf. Genomic selection tools will be used to more accurately select within these cows. These cows will be mated to sires, of which a proportion will be of different sire lines, some with lower EBI values compared to the current high flying bulls. The hope, however, with careful selection, is that a proportion of progeny from lower EBI sires will themselves have higher EBI and be able to compete with bulls at the top of the Active Bull List®.

Crossbreeding

There is now also an increasing realisation that crossbreeding with high genetic merit (high EBI) alternative breed sires can offer substantial animal performance benefits with consequent improvements in profit. Much of this view is being fuelled by the findings emanating from the research at Moorepark - Jersey crossbreeding research at Ballydague and the Norwegian Red On-Farm study. Since 2006 the Ballydague research farm has been devoted primarily to evaluating the merit of crossbreeding with Jersey under Irish conditions. After four years of evaluation the results are consistent and very much in favour of the Jersey crossbred cows when compared to either of the two parent pure breeds. Similar findings were observed on the on-farm study with Norwegian Red×Holstein-Friesian cows.

While the Jersey×Holstein-Frieisan cows produced less milk volume compared to the Holstein-Friesian, they had improved milk composition and consequently increased milk solids yield and milk value. Production characteristics of the Norwegian crossbreds was similar to that of the Holstein-Friesian cows. As a consequence, we can in fact expect an increase in herd productivity, particularly where we use top genetics. This is due to more days in milk/more mature lactations because of improved fertility/survival. Both Jersey×Holstein-Frieisan and Norwegian Red×Holstein-Friesian cows on both studies display many other favourable practical traits that will benefit Irish dairy farmers, such as an ability to maintain better body condition, a moderate body size, and a substantial improvement in reproductive efficiency. Udder health was improved with the Norwegian Red crossbreds compared to the Holstein-Friesians.

As presented at the Teagasc National Dairy Conference last November, economic analysis conducted using the biological data generated at Ballydague showed a substantial profit benefit per lactation with the Jersey×Holstein-Friesian cows compared to pure Holstein-Friesian cows. The difference in performance equated to +€18,000 annually on a 40ha farm. This is over €180/cow/year more profit with the Jersey×Holstein-Friesian cows compared to pure Holstein-Friesian cows at Ballydague. In the same analysis, similar improvements were estimated for the Norwegian Red crossbreed (+ €130/cow annually). This economic analysis was very detailed, taking into account differences in production characteristics, body weight differences, replacement rates/survival, cull cow and male calf values etc. The improved profitability is primarily attributable to improvements in milk value and the large differences in reproductive efficiency/longevity observed at Ballydague.

Whilst these results are highly significant, it should be noted that they were based on animals from an experimental research farm and that some of the difference in economic performance could be explained by EBI differences between the crossbred and Holstein-Friesian cows. These findings prompt the question as to whether similar findings would be apparent based on national data, where the number of animals are much larger.

Latest Results from EBI evaluations

Recent research undertaken by ICBF has indicated a potential benefit from cross-breeding to other dairy breeds, of some €100/lactation in the first cross (Table 2). These results are based on an analysis of 28 commercial dairy herds (some 6,000 lactation records) that have a mixture of dairy breeds including Holstein-Friesian and Jersey.

Table 2. Breed and hybrid vigour effects for three dairy breeds under commercial farm conditions

	Milk (kg)	Fat (kg)	Protein (kg)	Calving interval	Cow profit (€)
Holstein-Friesian	5,549	233	200	371	€1,176
Jersey*	-1172	7.3	-19.6	-3.8	€25
Hybrid vigour effects**. Holstein-Friesian×Jersey	93 (1.7%)	5.7 (2.4%)	5.3 (2.7%)	-3.2 (-0.9%)	€74 (6.3%)

**** Breed effect of Jersey is relative to the Holstein-Friesian.***
***** Values within brackets are percentages hybrid vigour of the phenotypic mean.***

The results indicate that, relative to the Holstein-Friesian, pure-bred Jerseys, produce less milk volume (4,377 kg), more fat (240 kg), less protein (180 kg) and have shorter calving intervals (367 days), with a difference in overall profit of +€25 (in EBI terms).

Looking next at the effects of hybrid vigour, indicates that first cross animals (F1) from the Holstein-Friesian and Jersey breeds, would have additional milk, fat, protein and calving interval benefits, above the average of the two parent breeds, resulting in an increase in cow profit/lactation of €74 (or 6.3% of the phenotypic mean). ***Similar hybrid vigour benefits were apparent for other breed crosses.***

It should also be noted, that the results presented only take into account the effects of milk production and calving interval and do not account for other traits within the EBI, most notably cow survival. Given the biological similarity between this trait and calving interval, ICBF are confident that inclusion of data on this trait (and other traits within the EBI index), would increase the effect of hybrid vigour to ~€100 for breed crosses, such as the Jersey×Holstein-Friesian.

These results are significant and timely. They also support the findings from the Ballydague research, with both studies indicating substantial benefits from cross-breeding. ***A figure of €100 in the first cross is now accepted within the industry.*** You should keep this figure in mind when making your breeding decisions this Spring.

Sire selection for cross breeding this spring

The first and most important thing to remember is that you continue to use high genetic merit (high EBI) sires. However, many of these 'alternative breed' sires still have very low reliability so it is important to 1) use a team of bulls and 2) take cognisance of proof in country of origin which will likely be of higher reliability. Based on the findings outlined above, using a Jersey or Norwegian AI sire with an EBI of €200 will result in progeny with an increased profit per lactation of €300 (i.e., €200 from the direct genetic effect, plus another €100 from the "mixing" of the genes). Similarly, using a Jersey sire with an EBI of €100 will only return an additional profit of €200, which is less than the majority of Holstein Frisian sires on the ICBF Active Bull List. You should keep this in mind when making your breeding decisions – otherwise the benefits of cross-breeding will be totally wiped out by using inferior sires from other breeds. You should remember also that the heterosis effect (€100/lactation) does not get 'passed on' to the next generation, but may be reduced after generation one. The extent to which hybrid vigour is maintained/reduced depends on the breeding strategy of choice after the first cross.

Where to after the first cross?

Three options exist with regard to the breeding strategy that can be employed when it comes to breeding the crossbred (F_1) cow. These are as follows:

1) Two-way crossbreeding. This entails mating the F_1 cow to a sire of one of the parent breeds used initially. In the short term HV will be reduced but over time settles down at 66.6%.
2) Three way crossing. Simply use a high EBI sire of a third breed. When the F_1 cow is mated to a sire of a third breed HV is maintained at close to 100%. However, with the reintroduction of sires from the same three breeds again in subsequent generations the HV levels out at 85.7%.
3) Synthetic crossing. This involves the use of F_1 or crossbred bulls. In the long term a new (synthetic) breed is produced. HV in this strategy is reduced to 50% initially and is reduced gradually with time.

At Ballydague, for the past two breeding seasons the Jersey×Holstein-Friesian cows have been mated to high genetic merit Norwegian Red sires (LEV, NZT, SJU, AKM) to determine the benefit of a three-way crossbreeding strategy. In conjunction with this a follow-on study to the on-farm Norwegian Red crossbreeding study has engaged a further 20 commercial farms to generate and subsequently evaluate three-way crossbred cows (both Jersey×Norwegian Red×Holstein-Friesian and Norwegian Red×Jersey×Holstein-Friesian) on a larger scale. This year, 20 three-way crossbred heifers at Ballydague (50% Norwegian Red, 25% Jersey, 25% Holstein-Friesian) will be mated to the highest EBI GS Holstein-Friesian sires available from the ICBF Active sire list. Emphasis will be placed on solids yield mostly, while obviously not neglecting the fertility sub index. In essence, therefore, maximising the benefits of EBI, breed complimentarily and hybrid vigour. The resulting calves will be 62.5% Holstein-Friesian, 25% Norwegian Red and 12.5% Jersey. These will in turn be mated to high EBI Jersey and so on.

Genomic selection and other breeds

Genomic selection in Ireland is currently only undertaken in Holstein-Friesians due to a lack of high reliability proofs on a large number of sires from other breeds; however, genomic selection is undertaken in other countries on different breeds but these are not for EBI or its constituent traits under Irish production conditions. Research is on-going, however, to evaluate the possibility to extend genomic selection to other breeds/crossbreeds in Ireland.

Conclusion

Genetic change, be it improvement or otherwise, is cumulative and permanent. Now, more than ever, there is a large choice of bulls of high genetic merit AI sires available. Farmers can choose to use high EBI black and white sires or choose to capitalise on the merits of crossbreeding – high EBI, breed complimentarily and hybrid vigour. ***If sufficient high EBI 'alternative breed' sires can be identified, crossbreeding is the logical option for <u>all</u> to maximise profitability.*** The right genetics is crucial for future success. Irish farmers must maximise their use of superior AI sires this season.

Getting cows in-calf

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Summary

- Use only bulls that will improve genetic merit for fertility traits.
- Maiden heifers should be inseminated with high EBI easy-calving AI sires to increase availability of high genetic merit replacements.
- Maximising submission rates is critically important. Heat detection aids must be used.
- AI should be used for at least the first six weeks of the breeding season to increase the proportion of heifers born to high EBI sires.
- Herd synchronisation could help reverse slippage in mean calving date
- Good records of all problems/disorders around calving are essential in identifying cows with potential fertility problems during the breeding season
- Examine body condition. Thin cows are less likely to go in-calf. Take action immediately to improve fertility performance
- Nutrition has a major effect on fertility. If grass supply is inadequate, introduce buffer feeds.

Maximising submission rate

Submission rate is a key driver of fertility performance. To maximise submission rates, you must use heat detection aids. Moorepark research has shown little difference in reproductive performance when tail paint, paint stick, Checkmate mount detector or scratch cards were used as the heat detection aid. The type of aid used is a matter of preference, but after choosing an aid, use it properly for the period of AI use.

Pre-breeding heat detection

Pre-breeding heat detection should begin 3-4 weeks before the planned mating start date. This is a good time to improve heat detection skills, to train new staff to correctly identify cows in oestrus, or to try alternative heat detection aids. All heats should be recorded. By mating start date, you will be able to anticipate when cycling cows will next come on heat, and you will also have a list of all cows that have not yet been seen in heat.

The following is a simple pre-breeding heat detection programme using tail paint, but other heat detection aids can also be used.

- Apply tail paint of one colour (e.g. red) to all milking cows 28 days before the planned mating start date. Apply red paint to late calvers as they enter the milking group.
- Check the tail paint on all milking cows weekly until mating start date. Depending on weather conditions, cows may need to be topped up with red paint.
- Record all cows that have had tail paint removed, and paint with a different colour (e.g. green).

- At mating start date, any cows with red paint are unlikely to have been in heat during the preceding 28 days. Cows with green paint have been in heat at least once during the same period.
- You can calculate the percentage of the herd that is cycling and showing oestrus by dividing the number of cows with green paint by the number of cows with either green or red paint, and multiply the result by 100.
- The figure should be >70%. If the figure is lower that this, you may need to:
  - o Improve your pre-breeding heat detection.
  - o Look at your calving pattern (i.e. too many late calving cows).
  - o Examine the average body condition loss after calving and current body condition score. Thin cows or cows that lost a lot of body condition after calving are at risk of anoestrus.
  - o Ensure that heifers have reached their body weight and body condition targets at calving.

If pre-breeding heat detection is carried out as outlined above, you should switch to a new colour paint after cows have been inseminated (e.g. blue). This will allow you to rapidly get a picture of how your submission rates are progressing. Cows with blue paint have been inseminated. Cows with green paint were detected in heat before MSD and you should know when to expect them to return to heat. Cows with red paint have not yet been inseminated and have not been observed in heat. The target 3-week submission rate for efficient seasonal calving systems is 90%.

Automated heat detection
Activity meters can be useful for automated heat detection. A trial conducted in the Ballydague farm in 2007 indicated that the MooMonitor activity collar manufactured by Dairymaster had a heat detection rate of 82% when 173 cows were managed as a single group at pasture. These are encouraging results, and indicate that if labour is limiting the time available for heat detection, then automated heat detection should be considered.

Cow synchronisation and fixed-time AI
In 2008, a large trial was carried out on eight commercial dairy farms with lactating cows to examine the effect of different synchronisation protocols on reproductive performance. Two of the protocols evaluated utilised fixed-time AI, meaning that cows were inseminated at a designated time with no requirement for heat detection. Increased use of AI is facilitated with fixed-time AI, as you know in advance when the cow will be inseminated. Cows that calved on or before mating start date were included on the study. Treatments were carried out to facilitate AI on MSD (earliest calving cows), and again at 21 days after MSD and 42 days after MSD (for the later calving cows). All cows were at least 42 days calved at the time of insemination. The treatment protocols are outlined in Table 1. The CIDR_OBS treatment is a CIDR based oestrus synchronisation treatment, and cows had to show signs of oestrus before being inseminated. Both the CIDR_TAI and Ovsynch protocols are ovulation synchronisation fixed-time AI protocols. The fourth treatment was a control group, and these cows received no hormonal intervention.

Table 1. Hormone treatments for 3 different synchronisation protocols.

	CIDR_OBS	CIDR_TAI	Ovsynch
Mon	GnRH + CIDR in (8 am)	GnRH + CIDR in (8 am)	GnRH (8 am)
Tue			
Wed			
Thu			
Fri			
Sat			
Sun			
Mon	PG (8 am)	PG (8 am)	PG (8 am)
Tue	CIDR out (8 am)	CIDR out (8 am)	
Wed		GnRH (5 pm)	GnRH (5 pm)
Thu	AI at observed oestrus	FTAI (10 am – 1pm)	FTAI (10 am – 1pm)
Fri	AI at observed oestrus		

GnRH = Gonadotropin Releasing Hormone; CIDR = Controlled Intravaginal Drug Release Device; PG = Prostaglandin F_{2a} ; FTAI = Fixed-time AI

The fertility results are outlined in Table 2. What is immediately obvious is that the two fixed-time AI protocols resulted in the greatest submission rates. Compared with the Control treatment, CIDR_TAI had similar conception rates to first service, but combined with the greater submission rate, resulted in a shorter to calving to service interval and a shorter calving to conception interval. The results for CIDR_OBS and Ovsynch are intermediate between the results for Control and CIDR_TAI.

Table 2. Fertility results for different synchronisation treatments.

	TARGET	CIDR_OBS	CIDR_TAI	OVSYNCH	Control
SR-24d	90	74.6	91.2	91.0	78.6
CRFS (%)	50-55	53.7	49.4	42.6	49.3
CSI (d)	60-70	60.0	55.4	55.1	64.1
CCI (d)	80-85	79.0	76.3	79.4	83.9

Heifer synchronisation

Synchronisation should be utilised us a management tool to maximise the number of heifers that become pregnant as quickly as possible after MSD. Appropriate synchronisation protocols for heifers are outlined in the paper by Emer Kennedy in this booklet.

Body condition scoring

Body condition scoring is an excellent tool to monitor herd nutritional status. Moorepark research has shown that body condition score (BCS) at the time of first service and the loss in body condition from calving to first service affect the reproductive performance of dairy cattle. Target scores for key times during the year have been identified and are summarised in Table 1.

Table 1. Target body condition scores at key times of the year

	Target scores Herd average	Range
Drying off	3.0	2.75 to 3.25
Pre-calving	3.25	3.0 to 3.5
Start of breeding	2.9	2.75 to 3.25

The key points are that you want your cows to gain very little during the dry period, and hence they must be close to the desired BCS at dry-off. Excessive loss of bodyweight and body condition after calving results in anoestrus, cystic ovaries, poor expression of oestrus, decreased conception rates and increased incidence if embryonic mortality. Feed cows in early lactation to minimize BCS loss.

It can be difficult to achieve the BCS targets outlined above with cows that have been aggressively selected for increased milk yield. Feeding higher levels of concentrate to these cows results in higher milk production, but does not improve BCS. In the short term, the BCS of these cows can be improved by 1) turning cows out to a high quality pasture soon after calving rather than feeding indoors on grass silage; 2) shortening the duration of the dry period from eight weeks to four weeks, reduces the inherent drive to produce milk in the subsequent lactation, and hence improves BCS; 3) adopting once-a-day milking for set periods of time when necessary. In the long term, these cows are unsuitable for seasonal-calving grass-based systems of production. See the paper by Buckley and Berry in this booklet for detailed information on the most suitable cow genetics for grass-based systems of production.

Nutrition

The breeding season occurs while the cows are at pasture, and grass makes up the majority of the cows diet. Concentrate supplementation usually declines as the breeding season progresses. Research at Moorepark has indicated that increasing the total amount of concentrate fed during the lactation from 350kg to 1500kg had no effect on reproductive performance. Diets fed pre- and postpartum should be correctly balanced for the major nutrients (protein, carbohydrate, lipid, fibre) and minerals. It is important to avoid major changes in the nutrition programme immediately prior to and during the breeding season. In situations where grass supply does not meet demand, a buffer feed or additional concentrate must be introduced. When supplementing cows with concentrate at pasture, avoid high protein concentrates (>18% CP). Spring grass is high in degradable protein, and in excess can lead to reproductive problems.

A number of minerals are essential for normal growth and reproduction in cattle. Trace mineral deficiency can be a problem in certain regions of the country. The main trace minerals associated with poor reproductive performance are deficiencies in copper, selenium and iodine. Molybdenum also plays an indirect role because high levels of molybdenum reduce the absorption of dietary copper. Supplementing with minerals where no deficiency exists can lead to toxicity problems. The requirement for specific mineral and vitamin supplements varies from region to region. Consult your advisor/veterinarian to discuss deficiency and toxicity problems in your area. A pre-calving mineral mix should be fed for the final 4-6 weeks of pregnancy.

Problem cows

The majority of problem cows are those that had a health problem during calving and/or early lactation, and good records will identify many of them. Records should be maintained of cows having twins, calving difficulty, retained foetal membranes, and peripartum disorders (metritis, displaced abomasum, mastitis, etc.). Cows that encounter any of these problems are at risk of reduced reproductive performance. Anoestrus is the term used to describe cows that have not resumed cyclicity after calving. Most cows start cycling by 35 days post calving, and show heat by 45 days post calving. High producing cows that are thin and have lost a lot of body condition (0.75 to 1 BCS units) are most at risk of anoestrus. Efficient pre-breeding heat detection will identify cows that are not cycling.

"Phantom cows" are non-pregnant cows that have been inseminated, but do not return to oestrus. Typically, these cows are not identified until examination after the end of the breeding season, and represent a major challenge to efficient reproductive performance. Phantom cows arise due to late embryonic mortality (weeks 4 and 5 post-insemination). The incidence is increased when body condition score is low, and when cows are inseminated <50 days postpartum.

Managing grass through a spring grass deficit

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Summary

- Budget grass supply so that the first grazing rotation finishes in early April (spring rotation planner).
- Ensure all nitrogen is up to date on the farm.
- Use 'pasture wedge technology' to manage and control grass supply in the main grazing season
- Maintain pre grazing herbage mass between 1200 - 1600kg DM/ha during the main grazing season.
- Grazing swards <1100kg DM/ha will reduce overall grass production by 10%
- Perennial ryegrass dominant pastures are crucial to achieving high production from pasture.

Introduction

Spring 2010 is proving to be a big challenge in terms of cow and grass management. The first rotation should not be targeted to finish too early (before April 10th) otherwise grass availability will be reduced in the second rotation. The spring rotation planner should be used as a guide on the area to graze weekly. The target area grazed per day should not be exceeded. Feeding level should be based on herd calving date and the quantity of grass available on the farm. If there is insufficient grass available the remainder of the diet will have to be made up with concentrate and/or grass silage. Huge variations in feed supply exist on farms; some farms have a plentiful supply of grass while others have limited grass availability and rapidly dwindling silage supplies. When grass growth returns to normal, farms will move from grass deficits to surpluses in a short time period. The key to making these decisions should be based on having a continued update on grass supply (farm cover). The use of the grass wedge in making informed decisions will be key to a successful grazing management in 2010.

Spring grass quality

This spring even though grass visually looks like it is of poor quality (a lot of brown - dead material), analysis has shown it to be 20-24% crude protein, 79% DMD and 18-24% dry matter. These pastures were 60% leaf with the remainder stem and dead material. Grass is only slightly lower in digestibility than previous years (Table 1). Spring grass is still better quality than grass silage and has an adequate supply of crude protein.

Table 1. Chemical composition of Spring swards from 2004 - 2010

	DMD (%)	Crude Protein (%)	Dry Matter (%)
2010	78.9	22.6	22.4
2009	83.0	24.1	17.8
Mean Previous 5 years	84.1	24.2	18.9

Budget available grass to April 10

In a situation where spring growth is reduced it's advisable to try and extend the finish date of the first grazing rotation, preferably to April 10th. Returning too early (1st week of April) to grazed paddocks may compound grass scarcity for the second rotation. From March 20th to April 10th about 30% of the farm should be left to graze. The second rotation in normal grass growing years is generally about 21 days however in poor grass growing years it may have to be extended to 24-25 days.

Nitrogen

All farms should have 50kg N/ha spread on the farm at this point (late March). The nitrogen applications from now on should be applied after the grazing herd. Slurry can be applied after grazing to the area required for first cut silage, 2,500 gallons of dilute slurry per acre in spring can replace the requirement for 28kg N/ha (half a bag of urea), this can make a significant contribution to fertiliser cost savings.

Grass growth this spring

Soil temperatures were on average 2.3°C in January and 3.9°C in February. This is in sharp contrast to the previous 5 years when soil temperatures averaged 6.1°C for January and 7°C for February. This has left the deficit in grass growth this spring. Soil temperature should be 5-6°C for grass growth to begin.

For the first week of March, grass growth rates were 50% below average; due mainly to low soil temperatures. If we reflect on the recovery of previous poor grass growing springs of 1983 and 1996 it is apparent from Table 2, that a high amount of compensatory grass growth can take place in late April once temperatures recover. For the last three weeks of April in both 1983 and 1996 grass growth increased by 26% and 12%, respectively. Therefore, farmers need to be ready to react to high grass growth when they appear. The key aspect of mid season grazing management is how paddocks are grazed on the second and third grazing rotations. If reaction time to increased grass growth is slow in April, pre grazing herbage masses will increase and will be difficult to graze out with the dairy herd. The key point for farmers is the farm must be walked weekly and farm cover measured, without having an estimate of the farm cover grazing management decisions cannot be made with precision and confidence.

Table 2. A comparison of grass growth in 2010 compared to the normal year and two previous grass growing springs.

	1983	1996	Average Year	2010
March 4th	3.5	2	12	4
March 11th	7	5	16	7
March 18th	14	9	22	12
March 25th	32	17	30	
April 1st	55	30	40	
April 8th	81	47	54	
April 15th	100	66	65	
April 22nd	101	86	75	
April 29th	85	101	86	

Controlling grass supply mid season

During the main grazing season (April to September) the objective is to achieve high cow performance from an all grass diet. This will be achieved by allocating an adequate quantity of high quality pasture (pre-grazing herbage mass (1200-1600kg DM/ha) and grazing to a post grazing residual of approximately (4 - 4.5cm). Research at Moorepark has shown that adopting a strategy of grazing pastures at 1500kg DM/ha compared to 2500kg DM/ha had a clear advantage in milk output per cow and per hectare. Research work in 2009, has shown that grazing swards <1100kg DM/ha is not desirable. Continuous grazing of low covers can reduce herbage production by 10% (1t DM/ha) compared to grazing swards at 1500kg DM/ha. Furthermore, cow grass dry matter intake was reduced by 0.6kg DM/cow/day with this grazing regime. Optimum rotation length is between 18-21 days during the mid season period. Where pre grazing herbage mass are maintained between 1200-1600kg DM/ha, pasture topping can be minimised.

The net result of this approach operating this grazing management regime will result in cows been well fed at grass. This will result in extra milk output, which can generate an extra €150/ha in milk receipts. **During the mid season period the farm must be walked weekly and a farm cover completed.** This information must then be used to make critical decisions regarding the quantity of feed available to the herd. The **'pasture wedge'** is a simple method of interpreting this data. The amount of grass in each paddock (cover) is drawn onto a graph, starting with the highest cover. The target pre-grazing yield is calculated using the following equation:

Grass intake × Stocking Rate = Herd Demand

Herd Demand × Rotation length + Residual = Pre Grazing Mass Target

Example:

Herd Demand (16kg DM/cow/day × 4 cows/ha) = 64kg DM/cow/day)

64kg DM/cow/day × 20 days + 100kg DM/ha residual
= 1,380kg DM/ha (target pre grazing yield)

A line is then drawn from the target pre-grazing yield to the target residual (using the example 1,380kg DM/ha to 100 kg). The pasture wedge visually illustrates the breakdown of the pre-grazing herbage mass distribution on the farm. If the paddocks are above the target line there is surplus grass on the farm, if they are below the line there is a deficit, and grass is in short supply on the farm. The amount of grass in terms of kg DM/cow can be calculated by dividing farm cover by stocking rate. Figure 1, represents a farm which is on target with its pre grazing mass profile, as the paddocks have a stepped profile and are almost all on the pre grazing target line. Figure 2, shows the profile of a slow grass growing spring with half the pre grazing herbage masses below target, the rest of the paddocks are growing at the same level, with the farm eventually heading for a grass surplus. Keys decisions to be made will be when to reduce concentrate feeding and allow an all grass diet. If grass growth continues then further decisions will be have to be made on how many paddocks will have to be skipped over and closed for first cut silage or harvested as round bale silage.

Figure 1: Ideal Grass Wedge with Growth Equaling Demand

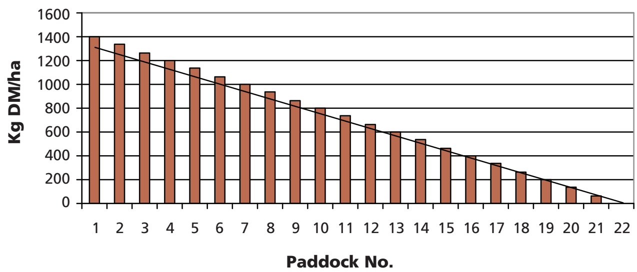
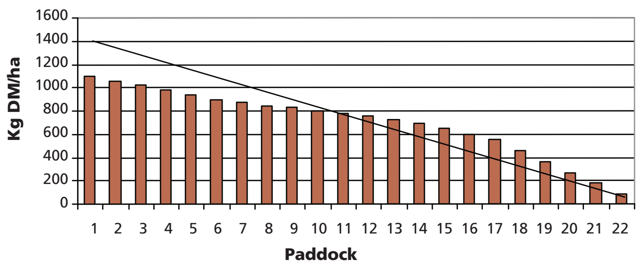


Figure 2: Slow Spring Growth, with a Sudden Increase in Grass Growth



Perennial Ryegrass Pastures (PRG)

Many farms in Ireland now have swards that are unable to recover quickly due to poor winter growing conditions. These swards have high levels of unsown species that will not be capable of recovering grass growth until late April/early May. The lack of growing capacity is due to a number of reasons but primarily the absence of perennial ryegrass (PRG) tillers in swards. Currently, in Ireland only 25% of dairy farmers have a planned reseeding program. Reseeding pastures makes a lot of sense for a number of reasons: (i) Reseeded swards have the capacity to provide grass in the shoulder periods, especially early spring (ii) PRG swards are 25% more responsive to nitrogen relative to permanent pasture (iii) PRG swards have higher sward quality and re-growth ability (iv) PRG swards can carry higher stocking rates. Investment in PRG swards is rewarding, the opportunity loss of old permanent pasture is about €300/ha, with reseeding costing (full costs €500/ha) the costs of a successful reseeding program is returned within two years. There are huge developments being made in the area of grass and clover breeding, reseeding swards with the best grass varieties will allow farmers to harness these developments in terms of more money made from grass.

Increasing the availability of replacement heifers

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Summary

- Well bred heifers should represent the highest genetic material in the herd and have the capacity to improve herd calving pattern and farm profit
- Currently only 26 dairy bred heifers per 100 are produced per year, when calving pattern and mortality levels are factored in this indicates insufficient numbers to grow the national dairy herd
- Target liveweights at 6, 15 and 24 months of age should be identified as part of the heifer rearing programme and achieved
- Once-a-day feeding reduces the labour requirement of the pre-weaned calf
- Out-wintering heifers on kale can improve weight gains and result in superior fertility performance
- Weight gains can be significantly increased by turning heifers out to grass 6-weeks pre-mating start date
- Synchronisation is a management tool to maximise the number of heifers that become pregnant as quickly as possible after mating start date

Introduction

Well bred and well reared maiden heifers have the potential to substantially impact upon herd profitability in that 1) they should represent some of the highest genetic material in the herd in terms of potential profit, 2) if calved early they have a capacity to significantly improve herd calving pattern, 3) if mated to high EBI sires will provide a (further) source of early-born high genetic merit replacement heifers for the future and 4) they may be a source of extra income from sale of surplus heifers. In order to capitalize on these benefits however high levels of husbandry and management will be required.

The scarcity of heifers is a major limitation to expansion

In a recent survey almost 50% of farmers indicated that they intend to expand their dairy enterprise over the coming years. The potential to expand post quota will be dependant on the availability of well bred, high EBI replacement heifers. Increasing numbers of replacement heifers generated will provide the opportunity to benefit from improved herd performance or capitalise on the increasing demand for replacements from those choosing to expand. This necessitates the number of replacement heifers to be greater than the number of dairy cows that are removed from the herd due to culling and death. In Ireland, while progress has been made in recent years we are struggling to achieve this objective. Furthermore, since the introduction of milk quotas the Irish dairy herd has contracted by over 1 % per year which is partly being compensated by an equivalent increase in milk yield per cow. The Irish CMMS data reveals that the proportion of dairy bred females born to the dairy herd has risen somewhat in the last three years from 21 per 100 cows to 26 per 100 cows. On the face of it this may appear acceptable. The reality is that when issues such as 1) the pattern of births nationally (only 68.6% of these are born during the months of January to March), and 2) the expected losses from birth to lactation (over 10%) are considered, it is clear this level of supply is not sufficient to sustain the current national herd, let alone facilitate expansion. Irish dairy farmers are minimising the cost of current performance by recycling cows; estimated at 18% nationally in spring calving herds (10% in the top 10% of spring calving herds based on EBI). Secondly, of 268,000 dairy heifers born in 2009 it is estimated that only 55.6% were sired by an AI bull.

There are clear issues with regard to the quantity and quality of replacement heifers available to service the national herd going forward. The trend is in the right direction but pace of change needs to be accelerated. Between 2008 and 2012 Ireland's milk quota will increase by approximately 6% and it is likely that in the final two years of the quota there will be further adjustments made towards complete devaluation. Unless we get an increase of greater than 20% in the number of cows bred to dairy AI bulls in 2010 we are unlikely to ever fill our national quota again.

Rearing the pre-weaned calf

Specific liveweight targets have been established aimed at optimising the balance between lifetime performances and rearing costs. Frequently, the heifer rearing component of the overall dairy system is overlooked despite important long-term effects on subsequent milk production performance. The rearing of high quality replacement heifers starts from the day the heifer is born. Calf mortality rates are high during the first six weeks of life (50% of all mortalities in year 1) so extra care and attention needs to be given during this period. Ensuring that all calves receive 2 – 3l of colostrum within the first six hours of life is essential to maximising calf health.

Table 1. Effect of calf feeding system on daily labour input, calf weight and weight gain

	Automatic Feeder	Once daily with teats	Twice daily with teats	Twice daily with trough
Total calf care time incl. vet. time (sec/calf/day)	38	23	36	27
Calf weight at 77 days (kg)	95.0	94.8	93.2	90.5
Calf weight gain per day (kg)	0.70	0.79	0.80	0.65

To reduce labour requirements once-a-day feeding can be implemented – once feed is offered at the same time daily it can be carried out at any time during the day. However, if feeding calves once-a-day they will still need to be checked twice daily and will need *ad-lib* access to fresh water and solid food (e.g. hay, meal, grass). Experiments conducted at Moorepark have shown that once a day feeding requires the least labour input (23 sec/calf/day). In addition calf weight at 77 days is not adversely affected (Table 1). When weaned, calves need to be offered low covers of high quality grass throughout the grazing season. When calves are six months old they should achieve a target weight of about 30% of their mature liveweight.

Over-wintering options

There are options available when over-wintering weanling heifers that will enhance growth at a lower cost. In a Moorepark trial during the winter of 2008/2009 heifers were assigned to three diets to assess if winter feeding treatment affected the attainment of target weight at mating start date. The three treatments were: i) indoors offered grass silage (65% DMD), ii) 70% kale and 30% (66% DMD) baled silage and iii) 100% kale. As shown in Figure 1, the 70% kale and 100% kale heifers were significantly heavier (311kg) than the grass silage heifers (294kg) at mating start date (April 16). This difference in liveweight remained for the rest of the year – on 15 September 2009, the grass silage heifers weighed 435kg while the 70% kale and 100% kale heifers weighed 454kg. There was no difference in BCS at mating start date (average of all treatments = 3.10). This difference in liveweight was reflected in superior fertility performance of the heifers over-wintered outdoors on kale as a greater proportion of these animals are pregnant and are expected to calve, on average, seven days earlier than the grass silage heifers. This concurs with the data from the large Teagasc on-farm Norwegian Red study which commenced in 2005. In that study, greater liveweight and BCS were associated with a greater proportion of animals cycling pre-mating start date.

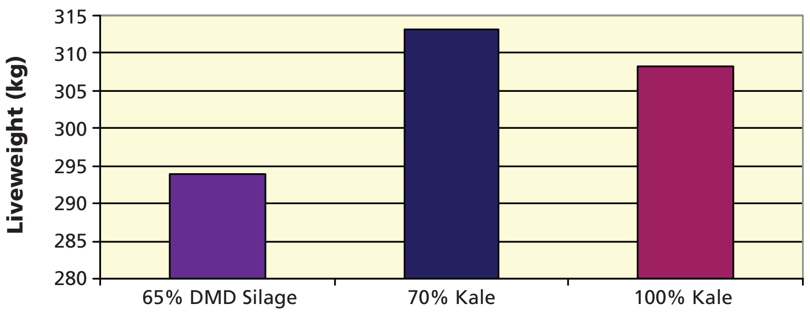

Figure 1. Effect of over-winter feeding treatment on heifer weight at the start of the breeding season (16 April 2009)

The study was repeated this winter (2009/2010) – there were 5 different treatments: i) 70% kale and 30% grass silage, ii) 100% kale, iii) indoors offered grass silage only, iv) indoors offered grass silage and 1.5kg concentrate and v) out-wintering pad offered grass silage and 1.5kg concentrate. The weight of the five treatments on 8 March 2010, 12 days after turnout were: 70% kale – 269kg; 100% kale – 264kg; indoors (grass silage) – 245kg; indoors (silage and

1.5kg concentrate) – 264kg; pad (silage and 1.5 kg concentrate) – 275kg. The silage offered this year was 71% DMD and 28% DM. The weight gains and fertility performance of these heifers will be monitored over the coming year.

Liveweight targets

Previous research has indicated that heifers should be 25 to 30% of mature liveweight at 6-months old, mated at 55 to 60% of mature live weight and should calve at 85 to 90% of mature live weight. Recommended mature live weights vary considerably between countries due to large breed variations. For example, in the USA mature live weight for Holstein cows is deemed to be 650kg. In New Zealand, however, this is 100kg less. By calculating target weight as a proportion of mature weight breed differences can be overcome.

In practice on many Irish dairy farms heifer rearing receives low priority and achieving target weights is not an issue of concern to farmers. As a result potential milk production is unlikely to be realised. Reduced levels of management will result in a lesser profit, as heifers may calve later than 24 months and produce less milk compared to better managed heifers. Well bred heifers, if calved early, have a capacity to significantly improve herd calving pattern and when mated to high EBI sires will provide a source of early-born high genetic merit replacement heifers for future herd development.

Heifers that become pregnant late in the breeding season are at risk of leaving the herd after their first lactation, as they may not have sufficient time during the short breeding period to recover from calving and become pregnant again. In addition, a late calving date reduces the length of the lactation, leading to reduced production potential. Hence, it is imperative that heifers conceive at the beginning of the breeding season to give them a good chance of surviving in the herd for many years. Thus, it is critical that heifers reach weight and BCS targets outlined in Table 2 to ensure they are cycling prior to the spring mating start date. Often the problem of heifers being too light is realised in March or April, by which time it is too late. Heifers should be examined and a representative sample weighed 4 – 6 months before the planned start of breeding. Growth rates of 0.6 to 0.7 kg/day should be anticipated if heifers are managed correctly (*ad*-lib high quality grass in autumn, early turnout after 1st winter) and will need to be realised if heifers are to reach the liveweight targets set out in Table 2. If not, then they will need to be supplemented with concentrate to ensure they reach these target weights. This supplementation can begin from autumn onwards. Weight gain from spring grass can be over 1kg/day, significantly higher than when indoors so it is important to target an early turnout date.

In addition maiden heifers should have a minimum BCS of 3.25 to ensure at least 90% are cycling at mating start date. It is imperative that only easy calving sires are used on the heifers, i.e. sires with direct calving difficulty PTA values of 1.7 or less (consult figures provided by ICBF).

Table 2. Liveweight targets for maiden heifers at breeding and pre-calving

	HF	NZFR*HF	NR*HF	J*HF
Maiden heifer LW(kg)	330	330	330	295
Pre-calving LW (kg)	550	550	550	490

HF = Holstein-Friesian, NZFR = New Zealand Friesian, NR = Norwegian Red, J = Jersey

Synchronisation for Heifers

Synchronisation should be utilised as a management tool to maximise the number of heifers that become pregnant as quickly as possible after mating start date. The most popular and cost-effective synchronisation protocols for heifers involve intramuscular injections of prostaglandin (e.g., Estrumate, Lutalyse, Enzoprost etc.). Prostaglandin synchronization protocols work very well for heifers that have started cycling, but will not work in non-cycling heifers. The following protocol works well:

- Tail paint all heifers, and inseminate following observation of oestrus during the first 6 days of the breeding season.
- All heifers not inseminated in the first 6 days receive a prostaglandin injection on day 7, and are inseminated following observation of oestrus in the next 3 – 5 days.
- Heifers that failed to come into heat following the first injection of prostaglandin receive a second injection 10 days later.
- Heifers are again inseminated at a standing heat, or receive fixed time AI at 72 and 96 h after the second injection.

This protocol generally results in submission rates close to 100% and conception rates to first service of 70%. If it is desired to reduce costs and use less prostaglandin, the first injection of prostaglandin can be delayed until day 10, and the second injection would then be given on day 20. Alternatively, if it is not possible to dedicate time to daily heat detection (e.g. heifers on an outside block), all heifers could be injected with prostaglandin 12 days before MSD and again two days before MSD. With this protocol, most heifers will be in heat in the first three days of the breeding season, and those not seen in heat could receive fixed time AI at 72 and 96 h after the second injection. However, the cost will obviously be much higher due to the greater amount of prostaglandin required (two injections for all heifers). If possible, all heifers, regardless of protocol, should be observed for repeat heats and inseminated to a high EBI easy-calving AI bull, and a stock bull introduced to “mop up” 5 to 6 weeks after the start of the breeding season.

Cleaning and disinfection of milking equipment to minimize bacterial counts and detergent residues

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Summary

Important rules to follow to achieve maximum benefit from a detergent sterilizer product and to avoid leaving harmful residues in milk

- Select detergent sterilizer products labelled with manufacturer's name and recommendations for usage.
- For daily cleaning use either detergent or detergent sterilizer products-do not use sterilizer only products for daily cleaning.
- Mix at the recommended usage rate READ INSTRUCTIONS AND MEASURE
- Use in hot or cold water as recommended for the product.
- Products containing chlorine should be rinsed from the milking system immediately after the main wash cycle.
- Products containing caustic only (no chlorine) should not be rinsed out of the machine until the next milking.
- Use at least 14 litres (3 gals) per unit to rinse out both milk before the main wash and the detergent after completion of the main wash.
- Avoid adding additional chlorine to the main wash of the milking plant.
- Do not re-use detergent solutions more than once.
- Automatic washers need to be re-set if new products are introduced.
- The expiry date should not be exceeded. For detergent sterilizers this is normally six months from the date of manufacture.

Introduction

Ireland is a major global producer, processor and exporter of milk (worth €2.2bn in exports in 2008). The production of high quality milk is of central importance to maintaining/expanding this market. Premium milk quality means (a) perfect hygiene status and (b) absence of residues. Microbial composition is a key indicator of milk quality and is most frequently assessed as a Total Bacterial Count (TBC). Proper cleaning of the milking machine is crucial to producing milk with satisfactory TBC (10,000 -15,000 cells/ml in the bulk tank at milk collection). Regarding residues, there are a number of quite strict export regulations in place for specific dairy products. One such regulation is the content of trichloromethane (TCM). Presently, Irish dairy processors are experiencing difficulty in producing products that meet the TCM regulation of the importing country. There can be a direct association between milking machine cleaning and chemical residues in milk. Chlorine is a very economical antimicrobial, it is also very effective in removing protein deposits and as a sterilizer of the machine. However, it can result in TCM residues in milk if (i) the machine is not rinsed sufficiently before and after the main wash cycle, (ii) an incorrect detergent sterilizer product type or volume is used. The key to good hygiene without residues is to use a reputable product at the recommended usage rates together with sufficient rinsing.

The success of any detergent product in giving satisfactory cleaning of a milking plant will be determined by (i) the chemical composition of the detergent (ii) the correct temperature of detergent/water mix (iii) the correct usage rate (iv) milking system design (v) the correct use of the product (vi) water hardness. In order to make an informed decision on what product to choose and how to achieve successful cleaning, an understanding of the different types of products available and how they are best used is necessary.

Composition of detergent sterilizer products and water temperature

Detergent sterilizer products contain varying levels of caustic, chlorine and surfactants and are now widely used for cleaning milking machines and bulk tanks. The trend towards liquid detergent sterilizer products has been influenced by the use of automatic machine and tank washers. As these products contain chlorine, the detergent solution should be rinsed from the plant immediately after the main wash cycle is complete with clean water (extended contact time with chlorine can damage rubberware).

There is a wide range of products for the cleaning of milking machines and bulk tanks on the market. However, there is much confusion as to what products to use and how best to use them to achieve high quality milk with no detergent residues. A key point in selecting such products is to only purchase products with the following details displayed: (i) clear instructions on usage; (ii) manufacturer details; and (iii) date of manufacture. The compositional ingredients and the usage rate are the two most important parameters of any cleaning product and both have a significant impact on price. The recommended working solution rates for cold and hot circulation cleaning provide 350 and 235 ppm available chlorine based on 3.5% available chlorine in the product. The usage rate of similar product types can range from 80 mls to 450mls per 45 litres water. So while a drum of detergent may appear cheaper than a competitor the usage rate required may be double. A recommended target for the level of caustic in a product would be 18% w/w and very few products reach these compositional levels. Having lower levels of caustic in the product will make a product cheaper to manufacture but in some instances will limit the products ability to clean effectively if used with cold water. A large proportion of farmers do not use hot water daily and detergent sterilisers are recommended to be used with hot water (70^{0}C) at least once daily. Thus, while products containing high levels of caustic (10 to 18%) may be used effectively with hot or cold water, it will be necessary to use hot water to achieve satisfactory cleaning with a low caustic product. The cleaning effectiveness of detergents generally improves as temperature increases and as water hardness decreases. Products containing high working strength solutions of chlorine will lead to the problem of high TCM residue levels in milk if not used correctly followed by sufficient rinsing.

Detergents

Detergent only products contain caustic only, are generally available in powder form and are used as a cold circulation wash. For maximum cleaning benefit of this product the stain of the detergent wash should be left in the milking system between milkings then rinsed out prior to the subsequent milking.

Sterilizers

Sterilizing milking equipment prior to milking using these products is carried out in situations where caustic only products are used for the daily cleaning of milking equipment and where water quality is not satisfactory. Sterilizer products contain approximately 8 to 11% chlorine and are effective against a range of bacteria and certain viruses and spores. When used it is critical to only use the recommended levels of chlorine (14 mls/45 litres of water) in order to avoid residues in milk. Alternatively, peracetic acid (which is toxicologically safe) may be used in this situation instead of chlorine. The use of peractetic acid has also been shown to be effective when used in conjunction with the "Clustercleanse" system in reducing bacterial numbers on clusters between cow milkings and thus the transfer of bacteria from cow to cow.

Acid rinse (descale)

The purpose of a descale acid wash is to remove mineral deposits such as calcium, magnesium, iron, and manganese. Mineral deposits on pipelines will result in biofilm formations where Thermoduric bacteria grow. The descale acid wash should be carried out weekly especially in hard water situations and is used in conjunction with both cold and hot cleaning.

Usage rates

Regardless of the composition of products if the detergent is not mixed at the recommended levels then ineffective cleaning or issues with chemical residues in milk can occur. Detergent products should only be used if instructions for use are clearly stated on the label. The use of the alkaline detergent-steriliser in hot water (70-80^{0}C) for the morning wash and reused for the afternoon wash provides adequate cleanliness provided that pre-rinsing has been done correctly. Traces of milk remaining after inadequate rinsing will neutralise the chlorine in the solution and render the detergent ineffective. Detergent sterilizers intended for hot circulation cleaning should not be used as a cold circulation cleaner. All products containing chlorine should be rinsed from the milking system after circulation cleaning. Sterilizer only products (which contain high chlorine levels) should never be used for the daily cleaning of milking equipment.

System design and the cleaning process

All pipelines, hoses and components should be installed so that they can drain by gravity between cleaning cycles. Drainage is an important aspect of cleaning because any standing solution remaining in the system between milkings leads to dilution of the subsequent liquid entering the milkline, e.g. milk or rinse water, and also increases the risk of bacterial growth between milkings. Additionally, the risk of chemical residues is increased. Thus, all parts of the milking system should drain properly when the system is cut off. The non-sanitary parts of the milking system (pulsator airline, vacuum line) may also be a source of bacterial contamination and thus, should be cleaned periodically as part of the routine maintenance of the system.

Automatic machine and bulk tank washing

Automatic systems are electronically set by the supplier for a given product usage rate and if the detergent product is changed then it is absolutely necessary that the system is reset to allow for the different usage rate of product, as under or over use of detergent may result in either poor cleaning or an increased chemical residue risk, respectively.

With automatic bulk tank cleaning in particular, there is a tendency to minimize the rinse water usage rate for the purpose of energy and time saving, however there is also an increased risk of residues in milk as seen in some farm surveys carried out by Teagasc. Indicators of inadequate bulk tank rinse water would be a strong chlorine smell from the tank after washing and a high pH (>8.5) of the final rinse water at the tank outlet. For liquid chlorine-based products the expiry date is normally six months from the date of manufacture. A problem may arise when large quantities are purchased by individual farmers through buyer groups and are stored for a year or more. Some products can crystallize or become more viscous over time. This may result in a lower level of the product being drawn through the milk lines for washing.

List of products

Teagasc have now analysed a wide range of detergents used for cleaning of milking equipment and this list will be published shortly. The purpose of this exercise is to highlight a list of products for which the chemical composition and working strength can be shown, which would, in-turn help dairy farmers and milking operators to make an informed decision on which products are most suitable for the task required and thus, the best value for money.

Herd health management for breeding

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Summary

Your management of herd health can have a critical impact on the success of your breeding season. Consult your local vet now, about a herd health plan combining these four components designed specifically for your herd.

1. Know your herd health status – through good stockmanship and use of new laboratory screening tests to establish your herd health status.
2. Prevent disease introduction by biosecurity – talk to your local vet about what additional tests might be useful on bought-in stock.
3. Prevent disease spread by vaccination – now is a good time to implement vaccination programmes prior to your mating start date.
4. Monitor you control programme – on-going checking both of your herd, new purchases and your implementation of the control program.

Introduction

Poor herd health can impact the probability of you picking up a cow in heat, the likelihood of a conception following AI at that heat and the chances of that pregnancy holding to full-term. Important herd health problems which can affect your breeding season include problems at calving (hard calvings, retained placentae, twins, induced calvings, abortions), lameness, mastitis, leptospirosis, infectious bovine rhinotracheitis, bovine viral diarrhoea and other clinical herd infections such as Johne's disease.

Recent Teagasc and DAFF surveys of dairy herds nationally have shown that antibodies to some of these infectious diseases which can affect breeding are widespread in our dairy herds.

- Leptospirosis, BVD and IBR (over 80% of herds antibody-positive)
- Salmonellosis (65%)
- Johne's disease (30%)

However, infectious diseases affecting breeding need to be kept in context. The presence of antibodies is not the same as active infection causing clinical disease. Cow nutrition, body condition, grassland management, genetics, sire fertility, heat detection and non-infectious disease control are equally important aspects of breeding management.

So what can you do to improve herd health prior to breeding?

There are four key steps in management of herd health; 1) know your herd health status, 2) prevent disease introduction, 3) prevent disease spread by vaccination and 4) monitor your control programme. You are in the 'driving seat'; start the process by sitting down with your local vet and planning a herd health program together using these four simple steps to protect your herd (Figure 1).

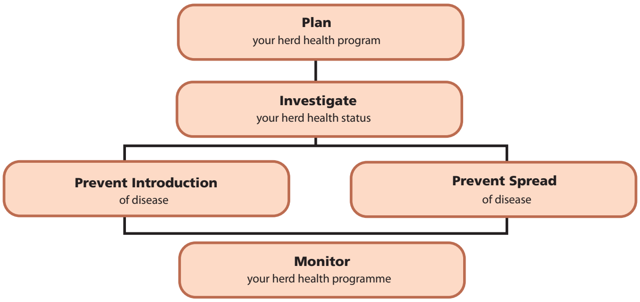

Figure 1. Management plan for herd health in dairy herds

Step 1: Know your herd health status

The simplest way to keep an eye on your herd health status is to herd your stock regularly for clinical signs of disease and to use your local vet to pick up problems at an early stage. In addition, there are now new diagnostic tests which allow economical screening of herds using:

- Bulk milk testing (BVD, fluke, IBR, leptospirosis, neosporosis, salmonellosis, worms)
- Individual milk testing (BVD, IBR, leptospirosis, Johne's neosporosis, salmonellosis)
- Targeted blood sampling of weanlings (BVD, leptospirosis)
- Pooling of blood samples to reduce costs (BVD)
- Ear-notch testing of calves (BVD)

These test methods can be used to give you a starting point from which to decide in conjunction with the clinical herd history what to do next, e.g. the implementation of biosecurity and or vaccination protocols, what tests you need to do on bought-in cattle, which vaccination policy to follow. Samples collected as part of a herd health plan with your vet provide the vital interpretation of the results.

Step 2: Prevent disease introduction

With herd expansions likely to increase in the phased lead up to quota abolition bought-in stock will become a major source of disease transmission. Currently, nine out of ten dairy farmers carry out no additional routine herd health screening when buying-in cattle. Biosecurity in its simplest form means the implementation of measures to prevent the introduction and spread of infectious diseases:

- A closed herd policy (i.e. no cattle movement, including bulls, onto the farm) will prevent the direct transmission of disease onto a farm. Ireland is currently one of the few EU Bluetongue-free countries; importation threatens this.
- Testing of bought-in stock should include more than TB and brucellosis. Diseases such as BVD, IBR and Johne's can all be tested for. **The most dangerous animal is the pregnant animal as the fetus may be infected and the dam test-**

negative ('Trojan animals'); the calf needs to be tested also. Ideally bought-in stock should be tested upon arrival and again three weeks later. Non-pregnant, non-lactating cattle bought over the summer are the lowest risk.
- On-farm biosecurity measures, such as quarantine, stock and disease-proof boundaries (to prevent nose-to-nose contact and breakouts) and footbaths increase protection against the introduction of infectious diseases.

Step 3: Prevent disease spread by vaccination

Sales of cattle-specific vaccines have increased by 78% over the last four years (Denise Roche, dmrkynetec, personal communication). Vaccine costs now average between €5 and €20/cow on many dairy farms. This increased vaccine expenditure is borne out buy a recent Moorepark survey of Teagasc clients. Of the 450 dairy farmers who responded to the survey, 87% were using at least one vaccine. Leptospirosis, clostridial disease (e.g. Blackleg), BVD, and salmonellosis were the most common diseases farmers vaccinated against (Figure 2).

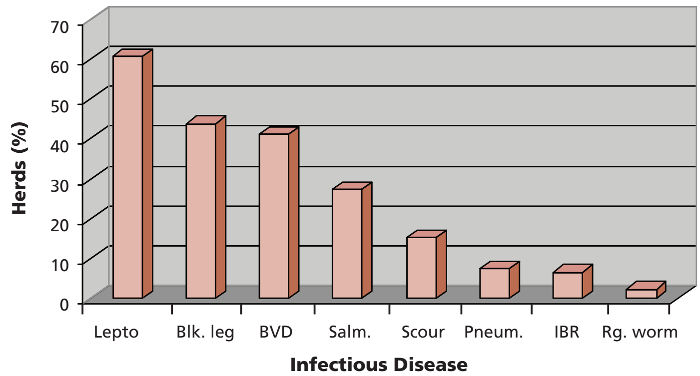

Figure 2: Vaccine use (% of herds) amongst Irish dairy farmers

Vaccination programmes are best implemented where there is close veterinary involvement in the decisions:
- Whether to use a vaccine or not?
- Which vaccine to use?
- When to administer the doses?

Vaccines should be viewed as a component of a herd health plan but not the sole means of disease prevention within a herd as is commonly the case. Over-reliance on vaccination without the backup of proper compliance, management and biosecurity can lead to real or apparent vaccine breakdown. Examples of strategic vaccination protocols are provided hereunder. Note these are generic programmes which would need to be tailored to individual herd circumstances through consultation with your local vet to work effectively. **By listing these diseases below it is not suggested that you need to vaccinate for all of them. Rather, this list provides you with the information to compare with what you currently do and to stimulate discussion with your local vet on best-practice for your particular herd.**

If you find it difficult to remember when to vaccinate it is worthwhile designing with your vet a simple calendar of which month which animals need to be vaccinated on one sheet of paper and stick this up beside your farm files and in the dairy. Pick a date and stick to it. In addition, write these dates, and when you need to order product, into your diary each year. Linking vaccination dates to prominent calendar dates also helps, e.g. *'first lepto vaccine dose for heifers on St Valentine's Day and second dose on St Patrick's Day'.*

Leptospirosis *(Leptavoid-H)*

Vaccination against lepto has been associated with improved fertility and reduced incidence of intrauterine growth retardation and abortions. The four main principles underlying vaccination against lepto are

1. To prevent disease spread before the peak period of transmission at pasture
2. To provide protection before, not during, the breeding season
3. To prevent early infection in heifers and
4. To prevent infection in humans.

To apply these principles involves administering the single annual booster dose to all cows in early spring. This dose should be given at least a month before mating start date. For problem herds biannual vaccination may be required, upon veterinary consultation. Heifers should be vaccinated twice when they reach 6 months of age.

BVD *(Bovidec, Bovilis BVD, PregSure BVD)*

Vaccination against BVD has been associated with improved fertility and reduced incidence of late embryonic mortality and abortions. The two main principles underlying managing immunity by vaccinating against BVD are

1. To provide maximum protection before mating and
2. To provide foetal protection.

Application of these principles depends on the particular vaccine used. Where *Bovidec* is used a single annual booster is recommended by the manufacturer at least a week before the mating start date to the entire herd. Where *Bovilis BVD* is used a single annual booster is recommended at least one month prior to the mating start date. Where *PregSure BVD* is used a single annual booster is recommended at least a month before the mating start date to the entire herd. Differences in recommendations between products reflect differences in onset of immunity and indications for use. Heifers can be vaccinated pre-breeding with two doses approximately a month apart. Note, vaccination alone without sampling, testing, re-testing and removal of persistently infected cattle (including fetuses) will not control BVD; consult your local vet for further details.

IBR *(Bovilis IBR, Rispoval IBR)*

Vaccination against IBR has been associated with reduced incidence of clinical signs, including abortion, and reduced virus shedding. The main principles underlying vaccination against IBR are

1. To provide protection prior to the period of stress or risk of infection,
2. To use live, intranasal vaccine in the face of an outbreak of clinical disease

To apply these principles involves administering the basic vaccination course (one or two doses depending on the vaccine) at least a month precalving to prevent virus shedding from recrudescent latent carrier dams to newborn calves and boosting this course after six months. Calves vaccinated at less than three months of age with maternally derived antibody need to be revaccinated thereafter. In cattle at immediate risk of IBR, local respiratory tract immunity can be stimulated within days by administering live vaccine via the intranasal route. Note spread of vaccine virus to in-contacts may occur following administration of live intranasal vaccine causing seroconversion. Seroconversion to IBR from field or vaccinal virus precludes admittance of male cattle to AI facilities.

Roll-over cows

For cows that fail to go in-calf in one breeding season and are retained and bred in the next breeding season it is advisable to vaccinate them in the same way as the group of cows into which they have moved. Note that roll-over cows in excessive body condition are at greater risk of compromised immune function. Beware also of movement of undetected 'Trojan BVD' cows between herds.

Concurrent use of vaccines

It is not recommended to administer another vaccine within two weeks either side of the date of vaccination unless the manufacturer has tested their product for interactions, though this is widely practised. Some vaccines can be used together, but not mixed, on the same day by injecting into opposite sides of the animal, for example, *Bovilis BVD and Leptavoid-H, Bovilis BVD and Bovilis IBR and PregSure BVD and Rispoval IBR.*

Step 4. Monitor your control programme

Once you have decided to implement a control programme through a herd health plan you need to check that it is working year after year. You can do this by

- Routine herding of stock to pick up early signs of disease,
- Monitoring of records to detect changes in performance
- Testing/treating bought-in stock and
- Use of screening tests to detect a change in herd health status.

Disease conditions worth testing for on an ongoing basis include any abortions, BVD and IBR. In addition to monitoring for disease you need to monitor the control programme itself, e.g. has the timing of your vaccination programme drifted over the years?

Conclusions

So how does this article help you improve control of infectious diseases affecting breeding on your farm prior to the mating start date? Well, this article is merely a starting point. Firstly, it advises you to make more use of your local vet as a professional adviser in your business. Secondly, it provides you with technical information on control strategies which you can compare with what you currently do. And finally, it raises specific questions on disease control for better breeding in your herd for you to discuss with your local vet.

Notes

Notes