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Moorepark Dairy Levy Research Update

Moorepark Dairy Production Research Centre
Solohead Open Day

Thursday, 23rd April 2009
Series 11

Using Clover to Cut Costs on Dairy and Beef Farms

Agriculture and Food Development Authority
National Development Plan 2007 - 2013
Agriculture and Food Development Authority

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Introduction

This Open Day at Solohead coincides with a large reduction in milk price this spring. There is an urgent requirement for dairy farmers to reduce the cost of milk production. Research at the Solohead Research farm has shown that fertilizer costs can be substantially reduced by replacing chemical fertilizer with white clover and the efficient recycling of slurry. Well managed clover-based swards can supply 140 kg/ha of N each year at little cost, which is a large proportion of the N requirement on an average Irish dairy farm. Another benefit is that white clover herbage is of high quality and maintains high quality pasture under low nitrogen input systems. Other topics covered at the Open Day will include grazing management, dairy cow health and fertility and use of high EBI genetics.

The research programme at Solohead Farm forms part of the overall research programme of Moorepark Dairy Production Research Centre. The partnership between Teagasc and Tipperary Co-operative is making an important contribution to technology development for the dairy industry. This Open Day is an ideal opportunity to see at first hand the results of research programme and to meet with Teagasc research and advisory staff.

Dairy farmers must use the next five to six years to prepare their farm businesses for a freer market in the longer term. Dairy enterprises will need to grow in size, be very labour efficient as well as being low cost systems of production. Production technology will continue to play an important part in improving the profitability of dairy farms supplying high quality milk for the food processing industry.

It is hoped that dairy farmers attending this open day will find the information of value in improving the profitability of their farm business. The financial support for the research programme from state grants and dairy levy research funds is gratefully acknowledged.

Dr Pat Dillon,
Head of Centre, Moorepark Dairy Production Research Centre

Message from the Chairman of Tipperary Co-Op

I am extremely pleased that Teagasc has decided to hold this Open Day at the Tipperary Co-op Solohead Research Farm. Our association with dairy research at Solohead spans 32 years – originally An Foras Taluntais and now Teagasc. The exploration work carried out on our farm of 130 acres over this period, where land type is typical of our milk catchment area, has been of immense value to dairy farmers throughout the country.

The focus of the research programme, presently running, is on reducing fertilizer costs on dairy farms by using white cover to reduce nitrogen costs and efficient recycling of slurry. This is essential in an environment of low milk price and high fertilizer prices.

Our partnership with Teagasc over the years in technology transfer has proved to be most successful. As pressures increase from policy changes at national, EU and international level, we, dairy farmers and processors, have an even greater need for access to the latest technology and research findings.

I feel sure, that visitors to Solohead will be impressed by the farm layout and find the displays and the demonstrations topics of practical interest. It is my hope that you will go away with ideas that will help you in your own business.

A Céad Míle Fáilte to all our visitors

Matt Quinlan
Tipperary Co-Operative Creamery

Solohead Dairy Research Farm

***James Humphreys*[1], *Aidan Lawless*[2], *Bill Keogh*[1] and *Kevin McNamara*[1]**
[1]*Moorepark Dairy Production Research Centre*, [2]*Johnstown Castle Research Centre*

Solohead Dairy Research Farm is located near Limerick Junction in Co. Tipperary (latitude 52° 51' N; 08° 21' W; altitude 95 m a.s.l.). The farm is owned by Tipperary Co-operative Creamery, and since 1976, Teagasc has been using the farm to carry out applied research into systems of milk production and grazing management in partnership with Tipperary Co-op. The farm includes 63 ha (52 ha at Solohead and 11 ha 2 km away) and supplies 575,000 litres of milk. The herd consists of 95 cows plus 28 replacement units. The average EBI of the cows in November 2008 was 87, for the heifers born in 2007 it was 105 and for heifers born in 2008 it was 119 (Table 1). The current research programme is focused on white clover and 50 of the 52 ha on the farm are clover-based swards with an average clover content of 20 - 25% receiving annual nitrogen fertilizer input of between 0 and 100 kg N/ha (depending on experimental treatments, see below).


The clover content of swards is around 5 - 15% of pasture DM during April (left) and 35 - 45% in August/September (right)

The soils on the farm are a mixture of heavy Gleys and Grey Brown Podzolics. The soil had clay-loam texture, 25% sand and 42% clay in the upper 20 cm with increasingly massive structure and low permeability in lower horizons (poor drainage). However, a network of deep (2.5 m) open drains and underground feeder drains in the wetter fields were installed to lower the water table. This allows for a relatively long grazing season extending from early February to late November. The slow-draining nature of the soil means that it can get saturated during and following periods of high rainfall and is very prone to damage by grazing cows. A flexible approach to grazing management coupled with good farm infrastructure (roadways, water, paddock layout) are required to avoid this. The soils at Solohead represent almost 23% of the soils of Ireland that are typically under permanent grassland management.

Table 1 EBI of the herd at Solohead in November 2008

	Number	EBI (€)	Milk (€)	Fertility (€)	Calving (€)	Beef (€)	Health (€)
08 Heifers	28	119	54	55	14.9	-3.4	-1.5
07 Heifers	19	105	56	55	14.1	-3.9	-1.9
1st Lactation	26	97	56	32	15.6	-4.9	-2.1
2nd Lactation	19	104	51	38	20.8	-3.9	-1.7
3rd Lactation	19	63	38	21	4.3	-0.4	0.0
4th Lactation +	31	84	39	39	10.0	-2.3	-1.6
Overall cows	95	87	46	33	12.5	-2.9	-1.4

Average annual milk production over the last 10 years has been 6,400 kg/cow. The fat and protein percentage in milk between 1997 and 2008 is shown in Table 2. This steady increase in fat and protein in milk can mainly be attributed to selection of bulls with high milk solids composition. The objective has been to produce an average of over 500 kg of milk fat and protein per cow. The herd is mainly Holstein-Friesian with 15% cross-bred Holstein-Friesian x Montbelliarde cows. Bulls used in recent years include ILZ, KNW, HFL, RDU, RMW, OJI, GIO. Average concentrate input per year over the last five years was 490 kg/cow. Average number of cows in calf after 13 week breeding season during this period has been 86% (range 79 - 89%). Mean calving date is around 20 February.

Table 2 Trend in average annual milk fat and protein percentage at Solohead between 1997 and 2007

Year	Fat (%)	Protein (%)
1997	3.82	3.37
1998	3.85	3.34
1999	3.83	3.42
2000	3.94	3.48
2001	4.02	3.55
2002	3.98	3.45
2003	4.07	3.57
2004	4.15	3.56
2005	4.28	3.57
2006	4.17	3.57
2007	4.15	3.60
2008	4.33	3.62

White clover-based dairy production at Solohead

White clover has the ability to manufacture 150 kg/ha of plant-available nitrogen in the soil. This lowers the need for fertilizer nitrogen in grassland. Nitrogen fertilizer has been a rapidly increasing cost on grassland farms. Dairy systems research at Solohead has shown that clover-based grassland receiving fertilizer N input of 90 kg/ha in spring can carry up to 2.2 cows/ha producing 1,100 kg milk solids/ha/year. This is substantially higher than average milk production on dairy farms: 650 kg milk solids/ha with average fertilizer N input 170 kg/ha. On a 50 ha farm stocked at 2.2 LU/ha, the savings in fertilizer N made by using clover increases net margin by €7,000/year (1.5 c/litre).

White clover does not persist indefinitely in permanent grassland. However, our research has shown that the white clover content of permanent grassland can be maintained by over-sowing 20% of swards on a farm each year on a five-year rotation with white clover seed. The clover seed is mixed with a P & K fertilizer and broadcast onto silage stubble in late May.

Mixing clover seed with P&K fertilizer before over-sowing grassland. An open sward and moist soil conditions provide ideal conditions. Clover seedlings become established in open patches in the sward. Tight grazing after over-sowing is important to ensure success

Eight steps for successful over-sowing of clover into permanent grassland

1. **Soil fertility:** Need soil pH between 6.0 and 6.5, and adequate soil P and K levels (target index 3). Refer to soil sample results.
2. **Open swards:** For over-sowing to work, the clover seed has to come in contact with the soil. Therefore, over-sowing will work only where there is a reasonably open sward. For old butty swards and swards heavily infested with broad-leaved weeds, reseeding is a better option.
3. **Get rid of docks and other broad-leaved weeds:** Spray with a suitable herbicide before over-sowing, if docks or other broad-leaved weeds are a problem. Once the clover is established, the range of herbicides that can be used is greatly restricted (Dockstar is recommended).
4. **Sowing date:** The best time to over-sow is during May and June before the ground gets too dry. Moist soil conditions during and after over-sowing are crucial to success. On heavy wetter soils the ideal time is after harvest of first cut silage in late May or early June. On light drier soils, it is better to over-sow earlier in May – after grazing or a harvest of bales. Hard grazing before and afterwards is important to ensure success. One method that works well is where a leader-follower system is in operation. The sward is partly grazed by the leaders and the clover seed is broadcast and walked in by followers allowed in to graze out the sward. Over-sowing during the autumn is rarely successful and is not recommended.
5. **Sowing rate:** Apply clover seed with 0:7:30 or similar fertilizer at a rate of around half a bag/acre. Apply 2 kg of a mixture of two clover varieties; Crusader and Chieftain are recommended, although, there are a lot of other good varieties on the recommended list. Pelleted or unpelleted seed can be used with equal success.
6. **Broadcasting the mixture:** Mix the clover seed with the fertilizer in the field. This will avoid the fertilizer and seed sorting out while on route to the field. While pouring in the fertilizer, simultaneously, mix in the seed to ensure an even mixture of fertilizer and seed. Up to 12 acres can be done at one time.
7. **Post sowing management:** Apply slurry after over-sowing but apply no nitrogen fertilizer for the remainder of the year. Fertilizer N will drive on the grass to the detriment of the clover seedlings. Hard grazing is important. Do not allow covers to get too high (>800 - 1000 kg DM/ha) and graze out to low residuals <4 cm. As the clover seedlings get established, they will start to supply nitrogen to the sward.
8. **Over-winter management:** Graze tightly before closing up for the winter and do not leave a heavy cover build up over the winter. Graze tightly again in spring to allow light to penetrate down to the clover stolons. More stolen growth in spring greatly increased the clover content and productivity of swards later in the growing season.

Dairy Systems Research at Solohead

James Humphreys[1], *Bill Keogh*[1], *Kevin McNamara*[1], *Daniel Barrett*[1] *and Andy Boland*[2]
[1]*Teagasc, Moorepark Dairy Production Research Centre*
[2]*Teagasc, Moorepark Advisory*

Milk output from fertilized grassland and grass-clover swards

Since 1999, at Solohead, research has been conducted into nitrogen fertilizer, slurry and use of white clover in pasture-based dairy production. The focus of this research was determining optimum rates of nitrogen fertilizer for grassland at different stocking densities and working out application patterns of nitrogen fertilizer during the growing season that gave most efficient responses in terms of grass growth and milk output/ha. The results of this research in terms of milk output/ha are condensed into Table 1. At a stocking density close to the national average (2.0 cows/ha) we produced over 1000 kg/milk solids/ha with fertilizer input of 165 kg/ha. This compares with national survey data that indicates that average stocking density on dairy farms is 1.9 cows/ha producing 650 kg milk solids/ha with nitrogen fertilizer input of 170 kg/ha. The relatively high milk output/ha at Solohead is due to the high milk solids output/cow (averaging between 500 and 510 kg/cow in recent years). The milk production response to higher inputs of nitrogen fertilizer is shown in Table 1: increasing to 1225 kg/ha of milk solids with input of 285 kg/ha of nitrogen fertilizer. Research has found that higher output is possible with higher rates of nitrogen fertilizer but these are restricted under the Nitrates Directive Regulations. On the other hand, recent research at Curtins farm is showing that higher milk output/ha is possible with very high stocking densities while complying with the Nitrates Regulations.

Table 1. Milk output from grass and clover swards at a range of stocking densities and inputs of nitrogen fertilizer

Sward type	Grass + clover		Grass only			
Fertilizer nitrogen (kg/ha)	0	90	165	225	285	330
Stocking density* (cows/ha)	1.60	2.20	2.00	2.20	2.45	2.60
Output of milk solids (kg/ha)	825	1110	1015	1110	1225	1300
Milk output (gallons/acre)	912	1230	1120	1230	1360	1440

**Whole farm stocking density – winter feed as grass silage produced on the system*

In more recent years the focus of research at Solohead is on using white clover in grassland. The reasons for this are that (i) we have found that it is possible to produce high milk solids output/ha with low input of nitrogen fertilizer, (ii) the big increase in the cost of fertilizer in recent years and (iii) wet land where it is not feasible to increase stocking densities over 2.5 LU/ha. Substantial savings in fertilizer costs can be made using clover. For example, at a stocking density of 2.2 cows/ha we produced 1110 kg milks solids/ha with 90 kg/ha of nitrogen fertilizer on clover swards compared with 225 kg/ha of nitrogen fertilizer on grass only swards (Table 1). This is a difference in nitrogen fertilizer input of 135 kg/ha, worth €150/ha or, after taking into account the cost of maintaining the clover by over-sowing, a net saving of €140/ha. On a 50 ha farm this saving can add €7000 to net margin. This system leaves a higher net margin than the more intensive system stocked at 2.45 cows/ha (Table 1) under current circumstances.

We have also investigated producing milk from clover swards receiving no nitrogen fertilizer. Annual milk solids production was 825 kg/ha, which is high compared with national survey data outlined above. The problems that we found with applying no nitrogen fertilizer to clover swards was (i) relatively slow growth in spring – there was not enough slurry being generated by the system to drive on spring growth (because the cows were outdoors for up to 10 months per year) and (ii) all of the silage had to be harvested as bales – it was difficult to get ground closed up for first cut silage by early to mid-April (because of low spring growth rates) and it was impossible to build up high yields of herbage for first cut silage without nitrogen fertilizer. It made more economic sense to harvest these lighter herbage yields as bales.

The conclusion to this research is that relatively high milk production/ha was possible without nitrogen fertilizer. However, not applying nitrogen fertilizer spring curtailed the length of the grazing season. We used slurry in spring to replace this nitrogen fertilizer but there was not enough being generated by the system to go around – highlighting the fact that when managed for optimum response (see below), slurry is a relatively scarce resource on farms.

Nitrogen fertilizer and high stocking densities on the grazing area of clover systems.

Two questions that are often asked about clover-based systems are:

(i) What is the highest rate of nitrogen fertilizer to use on the grazing area during the year?
(ii) What is the stocking density that can be carried on a grazing block if winter feed (grass or maize silage) is coming from elsewhere?

The answer to the first question is around 60 kg/ha (50 units/acre) on the grazing area. At Solohead we apply 60 kg/ha on the grazing area before mid-April, and a total of 120 kg/ha to the silage area split between 30 kg/ha for early grazing and 90 kg/ha (plus slurry) for first cut silage. This means that average nitrogen fertilizer use on the system is 90 kg/ha. We also apply slurry to around half the grazing area in late January and dirty water during the autumn. Otherwise, no other nitrogen fertilizer is applied to the clover swards. After the application of nitrogen fertilizer in April, we are mainly relying on nitrogen fixation by the white clover for the remainder of the grazing season;

most fixation takes place between May and September when soil temperatures are at their highest. We have found that applying higher rates of nitrogen fertilizer does little to increase production. What is happening is that, as more nitrogen fertilizer is applied there is a simultaneous depression in fixation by clover with little or no improvement in overall availability of nitrogen in the soil or in herbage production. To get maximum economic benefit from clover, it is necessary to maximise nitrogen fixation by the clover. The nitrogen in fertilizer and slurry applied in spring has only a slight negative impact on fixation because the clover remains dormant during the winter and early spring. During the late spring, summer and autumn, nitrogen fixation by the clover supplies sufficient nitrogen to meet sward requirements and there is a poor response to fertilizer N. Applying fertilizer nitrogen in autumn is a waste of money. We apply dirty water in the autumn because there are long intervals between grazing and contamination and rejection is not an issue. It makes good use of the dirty water and the tanks are emptied before the winter. Where good money is spent on fertilizer nitrogen for clover swards, maximum benefit from this fertilizer will be achieved by applying it in spring.

The answer to the second question is around 2.5 cows/ha, once winter feed; grass or maize silage is brought from elsewhere. In Table 1, the nitrogen fertilizer is used to grow enough pasture for grazing and to produce sufficient winter feed for the cows as grass silage. However, on many farms winter feed is being brought in from an outside farm. Under these circumstances a higher stocking rate than shown in Table 1 can be carried by clover swards. The keys to carrying this high stocking density on the grazing block of clover systems are (i) getting slurry and fertilizer applied in early spring – slurry in January (see below), and fertilizer in February and again in late March or early April and (ii) tight grazing to 3-4 cm between turnout in late January and mid April. Tight grazing is also very important during the autumn. In recent years, we have been researching the impact of post-grazing heights of 6 cm, 5 cm and 4 cm on milk output and carrying capacity. We have found that tight grazing to 4 cm depressed milk and protein yield (both protein yield and percentage) by around 6% over the entire grazing season whereas carrying capacity was increased by 12% giving an increase in overall milk output/ha. The biggest benefit of tight grazing was in spring because it resulted in a substantial increase in spring pasture supply. Therefore, tight grazing is vital for carrying high stocking densities on clover swards in spring. Furthermore, tight grazing until mid-April caused no depression in milk yield and protein content. Tight grazing caused biggest depression of milk yield and protein content in summer. To maintain a stocking density of 2.5 cows/ha on the grazing block during the autumn, it is necessary to start building covers from mid-July. This can be achieved with clover swards because clover tends to be at its most productive in July and August - no additional fertilizer nitrogen is needed. Tight grazing during the last rotation (October to early December) is very important. Tight grazing during the autumn and spring increases the clover content of swards and nitrogen fixation in the following growing season.

Making efficient use of slurry

The nitrogen in slurry will give the best response in terms of pasture growth when it is applied in the spring. There are three opportunities to do this (i) in late January or early February before livestock are turned out to grass, (ii) after grazing during February and early March when there is a long interval (at least six weeks) before the next grazing and (iii) in late March for first-cut silage. In general, recovery of nitrogen in slurry applied later in the year will be relatively poor. It costs the same to apply slurry during the spring as it does later in the growing season. Applying slurry in spring gives most cost-effective use of the nutrients in the slurry.

Take a farmer that traditionally applies slurry after first-cut silage and the remainder after the last grazing rotation during October and November. The contribution of the nitrogen in this slurry to grass production is almost zero. By applying the slurry in a planned way in spring, this farmer is able to cut nitrogen fertilizer use by approximately 10%. This saving in expenditure on nitrogen fertilizer is made only if the slurry is used to replace nitrogen fertilizer. In January or February, it is recommended that 23 units/acre be applied as urea to grassland. An application of 2,500 - 3,000 gallons of slurry/acre can effectively replace this fertilizer. This slurry should be applied to ground that will not be grazed within the following six weeks. If the first grazing rotation lasts from 1 February to 15 April, any ground to be grazed after the middle of March can receive slurry in late January or early February. Another opportunity is where 3000 gallons slurry/acre is applied to first-cut silage ground in late March; the nitrogen fertilizer for the silage should be no more than 90 kg/ha as outlined above. This slurry should be applied to fairly bare ground and six weeks should be allowed between application and expected silage harvest date.

Realisable targets are to have 70% of slurry applied before early April and 100% by mid June at which point tanks should be more-or-less empty. Better utilization of the nitrogen in slurry applied to first-cut silage stubble can be achieved by diluting the slurry with dirty water. This helps infiltration and lowers losses due to volatilisation. Dilution should only be carried out where it is a convenient means of managing dirty water and at times of the year outside of the closed period for slurry application.

Grassland management calendar for the clover-based system at Solohead

Late January	2,500 gallons slurry/acre to 60% of farm – applied to swards with lightest covers that were grazed last in the previous autumn.
First week February	Calved cows out to grass (post grazing height = 3 - 4 cm) graze approximately 40% of farm that did not get slurry until mid-March. Graze the remaining 60% until early April.
Mid-February	Half bag urea (23 units/acre) to 40% of farm that did not get slurry in January (Blanket application)
First week March	Half bag urea (23 units/acre) to 60% of farm that get slurry in January (Blanket application)
Last week March	3000 gallons slurry/acre applied to the silage ground that has been grazed at this stage. Slurry tanks are virtually empty.
First week April	Bag and a half of urea (69 units/acre) to silage ground that got slurry and two bags (92 units/acre) to silage ground that did not. Allow around 10 days between applying slurry and fertilizer. Half bag urea (23 units/acre) to the grazing area (Blanket application).
April	End of first rotation in early April and 50 - 55% of farm closed for silage. Stocking density on the grazing area is approximately 4.5/per ha (0.55 acres/cow) during April and May. Clover content of swards is 10 - 15%. Clover starts supplying nitrogen in the soil.
May	Half bag CAN (13 units/acre) in early May if pasture supply is tight – otherwise no more nitrogen fertilizer for the rest of the year. Target post grazing height is 4 cm. Any surplus pasture harvested as bales before 10 May. First-cut silage harvested last week of May.
Late May	Twenty per cent of the farm area over-sown with white clover seed – broadcast onto silage stubble. Mixture of remaining slurry and dirty water applied to silage stubble. Slurry and dirty water tanks are empty.

June	Area harvested for bales in early May is back in the grazing rotation. Stocking density on the grazing area is approximately 4 cows/ha (0.62 acres/cow).
July	First-cut silage area is back in the grazing rotation. Stocking density is approximately 2.5 cows/ha (1.0 acre/cow). Surplus pasture is harvested as bales from approximately 10% of farm before 15 July. No bales harvested after this date. Commence building covers for the autumn.
August	Length of the grazing rotation increases to 30 days. Clover content of swards is approximately 40% - very high quality herbage available for grazing. Area harvested for bales in mid-July is back in the grazing rotation by end August. Target post grazing height is 4 cm.
September	Length of the grazing rotation increases to 40 days. Highest pasture covers on the farm in late September. Long intervals between grazing allow dirty water to be applied immediately after grazing with little fear of contamination and rejection by cows in the following grazing rotation. Stocking density is 2.2 cows/ha (1.125 acres/cow)
October	Rotation length is approximately 50 days. Commence the final grazing rotation in mid October. All paddocks grazed to less than 4 cm in the last rotation. Clover content of swards starts to decline (winter dormancy).
November	Cows housed by night depending on ground conditions and pasture supply. Cows housed by day and night in late November or early December.

Tight grazing is important to maintain the clover content of swards

Most efficient use of the N in slurry is made by applying it in spring

White Clover on a Commercial Dairy Farm

L.J and Margaret Ryan[1] *and Kevin Barron*[2],

[1]*Rossbeg, Annacarty, Co Tipperary;* [2]*Teagasc, Tipperary*

L.J. is chairman of the Clonoulty Rossmore Discussion group. Their farm was a Tipperary Co-Op/Teagasc Monitor Farm from 2005 - 2007.

Owned & Rented Land	85.38 (211 acres)
Nett Grass Area	81.57ha
Milk Supplied 2008	570,654 Litres (125,528 gallons)
Milking Cows 2008	98 cows
Dairy Calves	26
Breeding Heifers (1-2)	20
Beef Calves	55
Cattle (1-2)	12
Bulls	2
Whole farm stocking density	1.85 Livestock units per ha (1.35 acres/Livestock unit)
Milk Yield 2008	1280 gallons/cow (5818 litres/cow)
Fat % 2008	3.83%
Protein % 2008	3.40%
SCC	217,000
Milk Solids per Cow	421 kgs (Target 480)
Herd EBI	66

Advantages and disadvantages of clover according to L.J. and Margaret

Advantages	Disadvantages
• Lower fertiliser costs	• Early spring grass needs to be supplemented with Nitrogen.
• Good quality sward	
• Less tractor work	• Correct stocking rate is important
• Less need for topping	

TARGETS FOR THE FUTURE

- → Increase percentage of dry matter intake in the form of grass/clover
- → Remain at present stocking rate (does not intend increasing cows over 105)
- → To achieve a very fertile herd and improve EBI
- → Increase milk solids
- → To make a viable income from dairying
- → To have a reasonable lifestyle

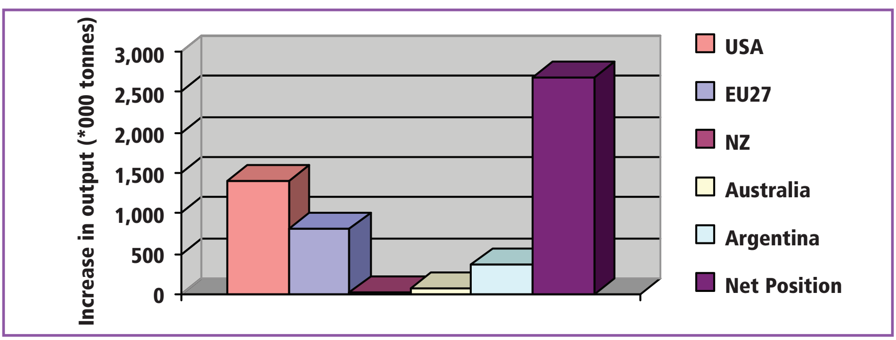
Milk Price Volatility – Essential Requirements

Laurence Shalloo
Teagasc, Moorepark Dairy Production Research Centre

Milk price in the EU is and will be exposed to substantial fluctuation over the next number of years as the supports available from CAP recede. These supports regulated the EU milk price by placing product into intervention when prices were low and selling product out of intervention when prices were high. This kept milk price in the EU to a large extent stable. This however also had a stabilising effect on the world market as it took EU product out of the market at times when the market was weak and put it back on the market when price increased. This effect has been abolished through the huge reductions in the limits allowable into intervention storage and the abolition of export refunds until recently.

In 2008 there was a sharp reversal of the trends that had seen the stocks of dairy produce virtually abolished over the period up to 2007. This reversal was brought about by a drop in the demand and an increase in supply of dairy produce, which were largely brought about by the unprecedented high prices seen around the world in 2007. Figure 1 shows the increase in output in the main exporting countries which resulted in a net increase of 1.3% in dairy produce between January and October 2008 and was mainly driven by increases in output in the US (2.0%) and the EU (0.7%). On the supply side within the EU the main contributor to increased production came from the French who increased output by 4.6% or 900,000 tonnes while milk production decreased in the UK by 300,000 tonnes or 2.4%. There was a general reduction in demand as some customers switched away from dairy products in 2007 due to price as well as the credit crunch and world recession hitting consumer incomes in 2008. It is expected that the increased supply will stabilise in 2009 largely as a result of reduced price with the vast majority of the increases seen in 2008 resulting from high input, high cost systems that are now under severe pressure as milk prices fall. The supply demand balance would be expected to start returning to a more desirable level as supply stabilises through 2009.

Figure 1. World milk supply (key exporters)



There is a real and urgent requirement at farm and processor level to focus on minimising exposure to this volatility in price. This will be achieved by focusing on cost reduction at farm level by maximising the proportion of grass in the diet and at processor level, by reducing costs and increasing product value by changing the product portfolio through increased co-operation between all processors nationally. This paper focuses on the essential cost reductions that must be achieved on dairy farms in 2009 in order to survive.

Table 1 shows the profitability of 440 dairy farmers that have completed a Profit Monitor for 2008. The table is divided into the Average, Top and Bottom 10% of producers by profit per litre. The results show a difference in profitability of 14c/l between the highest and lowest performers with an average profitability of 14.5c/l. The higher profit farms had a higher milk price and livestock sales and all variable and fixed cost items were lower, which resulted in a 5.6c/l and 14.0c/l higher net margin when compared to the average and low performing herds, respectively. To achieve substantial cost reductions in 2009 there is a requirement for a different strategy for the three groups of farmers depending on their current position. The average and 10% lower performing groups require much more urgent and drastic action when compared to the high performers in order to survive lower milk prices in 2009.

Table 1. Profit monitor results for the Average, Top and Bottom 10% of performers out of 440 spring milk producers for 2008

		Average	Top 10%	Bottom 10%
Gross Output (c/l)	Milk price	34.66	35.63	32.98
	Livestock sales	0.41	1.36	-0.70
Gross Output (c/l)		**35.07**	**36.99**	**32.28**
Variable Costs (c/l)	Feed	3.69	2.98	5.30
	Fertiliser	2.18	1.97	2.45
	Veterinary	1.07	0.91	1.18
	AI	0.61	0.57	0.61
	Contractor	1.49	1.33	1.80
	Other Variable Costs	1.69	1.65	1.94
Total Variable Costs (c/l)		**10.72**	**9.41**	**13.29**
Fixed Costs	Labour	1.12	0.77	1.07
	Machinery	1.34	0.90	2.01
	Car/ESB/Phone	1.33	1.15	1.80
	Depreciation	1.95	1.70	2.63
	Leases	0.96	0.62	1.41
	Other Fixed Costs	3.43	2.61	4.58
Total Fixed Costs (c/l)		**9.72**	**7.36**	**12.84**
Net Margin	**cent/litre**	**14.48**	**20.09**	**6.09**
	€/cow	**770**	**1,178**	**283**
	€/ha	**1,666**	**2,438**	**525**

Strategy
The strategy for survival in 2009, irrespective of whether farmers are average, high or low profit producers will centre on completing a financial appraisal of the farm business and subsequently completing a business plan. The business plan should have a short- term and long-term strategy with a different strategy for each farmer depending on whether they are low, average or high profit producers. A tailored plan should be developed by every dairy farmer to remain viable in the long-term.

Average profit producers
The average profit producers are characterised by being lowly stocked at 2.11cows/ha and producing 5,023 l/cow at 3.45% protein and 3.95% fat. At this level of performance there is a requirement to substantially reduce the feed and fertilizer input. Currently, there is €185 and €110/cow being spent on feed and fertilizer on these farms. Budgets for 2008 should be based on €50 and €65 for feed and fertilizer which would result in savings of 3.5c/l. Focusing on getting cows to grass early and achieving a long grazing season will reduce the requirement for both feed and fertilizer. There is very little justification to feeding concentrate at low milk prices and therefore the objective should be to eliminate purchased feed from the system. If there is a requirement to feed concentrate at pasture the supplementation process should be based on the purchase of low crude protein type concentrates. More focused use of slurry in the spring for both grazing and silage ground will have the effect of substantially reducing the requirement for fertilizer. A longer grazing season on the farm will reduce the requirement for silage and will therefore result in a reduction in the contractor bill and other variable costs. All avenues should be explored in 2009 to reduce veterinary and AI costs through using gene Ireland bulls and/or genomically selected bulls. There is potential here to reduce variable costs by 5c/l. The three main cost items to be tackled on the fixed costs side for the average cost producers are machinery, car/ESB/phone and other fixed costs. There is significant potential to reduce costs by 2c/l within this category. Only when this cost base is tackled should the average producer consider increasing milk output through increased stocking rates.

High profit producers
The potential reduction in costs for the high profit producers is substantially less than the average and high cost producers. However, there is still significant potential to reduce the variable costs by up to 2c/l and fixed costs by 1 c/l. There is also potential to reduce the feed costs from 3c/l to 1.5c/l. This would still allow €80/cow on concentrate or 300 kg/cow. There is further potential to reduce fertilizer costs by 0.5 c/l by a more targeted use of slurry on-farm. Between car/ESB/phone and other fixed costs there is additional potential to reduce cost by an additional 1 c/l. Therefore, there is much lower potential to reduce costs on currently efficient farms. However, there is potential to increase output on these farms while at the same time holding costs. One of the key strategies for the low cost producers must be in the form of expansion and ensuring that they have sufficient replacement stock coming

through the farm that are available to fuel the expansion potential. A 10% increase in milk output while holding the total farm costs the same would be equivalent to reducing the total costs by 1.6 c/l.

Low profit producers

There is an urgent requirement for action with high cost producers if they are going to survive long-term in dairying. There is a requirement for a dramatic change in direction with a strong focus on grass. These farms are, on average, stocked at 1.63cows/ha and are using €249/cow of concentrate and €115/cow of fertilizer. The combined target fertilizer and concentrate use on these farms should not exceed €100/cow which would result in a cost reduction of 5.5c/l and should be centred on not using any more than 200 kg/cow of concentrate and using no more than 100 kg of N/ha through making greater use of slurry on the farm. Focusing on grass will help reduce all contractor costs. Reductions in contractor, veterinary and other variable costs require close examination which could yield a further 2c/l. Machinery costs also require close examination as they are associated with the highest contractor costs and should be reduced. Car/phone/ESB and other fixed costs are also out of line for this group which could yield another 2 to 2.5c/l. An important feature of this group of farms is that milk price and gross output is lower than the average and high profit farms due to lower milk solids concentration and higher replacement costs. The type of cow in this system may be an issue as there is a lower milk yield, lower milk solids concentration, higher feed requirement and a higher replacement cost. This issue should be tackled immediately on these farms if they are going to produce milk in the long-term.

Summary

- Milk price volatility will be a key feature of the Irish dairy industry of the future.
- There is a requirement to complete a financial appraisal of the dairy farm business.
- Complete a financial plan setting targets based on the income requirements now, in five years time and in ten years time.
- Average cost producers should target cost reductions with the largest potential in the form of feed and fertilizer – then think about expansion.
- High profit producers can still reduce overall costs of milk production by up to 3c/l. They should target a 10% increase in milk output.
- Low profit producers must focus all of their attention towards cost reduction on farm. Surviving milk price volatility will be a key objective of this group of farmers. This group of producers should not consider expansion.

The Principles and Benefits of On/Off Grazing

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The main obstacles to achieving a greater number of days at grass, especially in early spring and late autumn, are poor soil conditions and inclement weather. Traditionally, during these periods dairy cows remain indoors and are primarily offered grass silage. If cows remain in the paddock treading damage caused during periods of heavy rainfall can result in reduced growth rates during subsequent grazing rotations. Allowing animals access to pasture for a few hours per day (on/off grazing) has previously been shown to increase milk production and milk protein concentration when compared to grass silage based diets and may be a strategy that can be implemented to extend the length of the grazing season.

How does on/off grazing work?

In a normal day a dairy cow grazes for approximately 9 – 10 hours, ruminates ('chews the cud') for between seven and nine hours; and spends the remainder of her time walking, idling or being milked. Cows have two main grazing bouts during the day. The first main grazing bout occurs early in the morning (where some cows can graze for up to three hours continuously), typically after morning milking. The second longest grazing bout occurs later in the evening after evening milking. Previous experiments show that dairy cows have a natural compulsion to graze after a period of fasting – this explains why cows have a long grazing bout after both milkings. The aim behind the concept of on/off grazing is to take advantage of the cows own natural instinctive ability to graze and to ensure she achieves a high intake level when given access to grass.

Effects of on/off grazing on milk production and grass dry matter intake

A number of experiments investigating the effects of on/off grazing on dairy cow production have been undertaken at Teagasc Moorepark over the past two years. Early lactation spring-calving cows were offered a daily grass allowance of 15.0kg DM/cow/day and 3kg DM/cow/day of concentrate. The treatments were as follows: i) full-time access to grass (22 H); ii) three hours access to grass after morning milking and three hours after evening milking (2×3H); iii) three hours access to grass after morning milking and three hours after evening milking with an additional 3 kg DM of grass silage offered at night (2×3H +Silage). The results of this experiment are presented in Table 1.

Table 1. Effect of on/off grazing on milk production of spring-calving dairy cows in early lactation

	22H	2×3H	2×3H +Silage
Milk Yield (kg/d)	28.1	28.5	29.1
Milk fat content (%)	4.21	4.26	4.33
Milk protein content (%)	3.37	3.27	3.21
Milk lactose content (%)	4.69	4.78	4.73
Milk solids (kg/day)	2.1	2.2	2.2
Bodyweight (kg)	489	481	509
Body condition score	3.02	3.05	3.07
Post-grazing height (cm)	3.9	4.3	4.8

In this study the behavioural adaptations of the cows to on/off grazing were sufficient to maintain milk production performance. Milk protein was highest when cows had full-time access to grass (22H) and was severely reduced (-0.16%) when cows were supplemented with grass silage at night. Restricting access time had no effect on total milk solids yield. This study shows that, with cows in early lactation (<30 days calved), on/off grazing can be used successfully as a method of increasing grass in their diet.

Effects of on/off grazing on sward re-growth

The benefits of on/off grazing are not only confined to the animal; removing animals from pasture, thereby preventing poaching damage, appears to increase the re-growth capacity of a sward. Studies carried out at Moorepark in 2008 show that poaching damage incurred with full-time access to pasture in wet conditions reduced re-growth by approximately 25% (400-500kg DM/ha) for the second grazing rotation. Early spring grazing improves the grass growth capacity of the farm. Therefore, the use of on/off grazing can be a key component of spring and autumn grassland management.

Increasing the Role of Grass this Spring

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In spring there are a number of key avenues through which more grass can be utilised. Given lower milk price forecasts for the coming months' costs on farms will have to be re-examined and reduced. Using grass efficiently in spring is one strategic way of lowering feed costs on dairy farms and subsequently improving grass quality for subsequent grazing rotations. The key point to remember when grazing in spring is that profit per cow can be increased by ***€2.70 per cow per day*** when the herd has access to grazed grass.

Benefits of grass in the diet in spring

Grass is the highest quality feed on the farm in spring, better than silage and equivalent to, if not slightly better than concentrate. Therefore, its proportion in the early lactation cow's diet should be maximised. If possible, from calving, cows should be grazing by day and night; if weather conditions are challenging **on/off grazing** (see paper is this booklet) can be used. During the early grazing season (February/March) a balance must be found between feeding the cow adequately, to sustain high animal performance and conditioning the sward for the late spring/summer grazing season.

In early lactation feed demand is lower and rises as days in milk increase. Directly post-calving dairy cows/heifers have low intakes (10-12kg DM) so the amount of area that the herd will graze in the first weeks after calving will be small. During the first rotation emphasis should be on grazing paddocks correctly, i.e., to a post-grazing height of 4cm in order to guarantee high grass quality in subsequent grazing rotations. To ensure high levels of utilisation cows should not be given access to higher covers (>1500 kg DM/ha) at the start of the grazing season. These paddocks can be grazed when the cows have re-adjusted to grazing thereby maintaining utilisation at a high level.

A number of experiments at Moorepark, since 2004, have evaluated the role of increasing grass in the diet of the freshly-calved cow. This work shows that offering 3kg concentrate in combination with 13-17kg of grass is the optimum allowance that should be offered during the first rotation. Table 1 summarises the results of grass and concentrate feeding levels in the first grazing rotation. The average post-grazing sward height was 4.0cm for these grazing treatments, which reflects very high levels of grass utilisation. The average response to extra grass offered was 0.33 kg milk/kg herbage offered. The milk response rates to concentrate achieved in this experiment were 0.7 kg milk/kg concentrate (0- 3 kg increment) and 0.5 kg milk/kg concentrates (3-6 kg increment). This suggests that if dairy farmers have sufficient grass in the system (or those with low stocking rates), low levels of concentrate supplementation can be used.

Table 1. The effect of supplementation level and daily herbage allowance on dairy cow milk production in early spring (Mid February – early April)

	13kg grass DM	13 kg Grass DM + 3 kg Conc	13 kg Grass DM +6 kg Conc	17 kg Grass DM	17 kg Grass DM + 3 kg Conc	17 kg Grass DM +6kg Conc
Milk yield (kg)	25.7	27.8	29.3	27.0	29.1	30.6
Fat content (g/kg)	3.94	4.13	3.99	4.00	3.87	3.94
Protein content (g/kg)	3.22	3.25	3.29	3.30	3.37	3.36
Milk solids (kg)	1.85	2.0	2.1	2.0	2.1	2.2
Bodyweight (kg)	511	520	518	513	525	527

Use of the spring rotation planner

In spring grass budgeting is critical. This is because herd demand exceeds grass supply. In order to manage this situation, it is imperative that farmers are aware of how much area they should make available to the herd each week. The spring rotation planner is a tool which can give specific guidance in this area. Table 2 shows the proportion of the farm that should be grazed at the end of each week. For the plan to be successful, the following is required:

- Stick to the target area, do not graze more or less per day
- Post-grazing height in the paddock must be 4cm (a mobile phone lying on its side) this ensures high quality grass in the next rotation
- If after allocating the correct portion of the farm, from Table 2, to the herd post grazing height is >4cm then the herd are over fed and will require no additional feed and concentrate should be phased-out to leave a grass only diet. If grass is in short supply and cows are underfed, then supplement.
- A strip wire must be used to allocate grass on a 12hr basis
- Grazing area should be back fenced in wet weather to avoid damage

If the proportions of the farm allocated are adhered to, it will guarantee enough grass to finish the first rotation. However, if you want to delay turnout date, the date to finish the first rotation will have to be adjusted. A more refined version of the planner is available on the Moorepark website: log onto www.agresearch.teagasc.ie/moorepark (Spring Rotation Calculator)

Table 2. Daily spring grazing area allocation

Week Start Date	Fraction of farm grazed per day	% of farm area grazed at weekend
1st February	$^{1}/_{120}$	6
8th February	$^{1}/_{109}$	12
15th February	$^{1}/_{99}$	19
22nd February	$^{1}/_{88}$	27
1st March	$^{1}/_{78}$	36
8th March	$^{1}/_{67}$	47
15th March	$^{1}/_{56}$	59
22nd March	$^{1}/_{46}$	74
29th March	$^{1}/_{35}$	94
5th April	$^{1}/_{25}$	Begin rotation 2
12th April	$^{1}/_{20}$	-

(e.g., for a 50-cow herd with 50 grazing acres, 0.42 acres (or 1,680m^2) can be allocated to the herd each day during the first week of February and 2.5 acres (or 10,000m^2) per day by 10 April without running out of grass.

Concentrate supplementation this spring: level and type

Spring grass has high levels of crude protein (19-23%) and is generally high in DM (approx 18%). If cows are offered a large proportion of their diet as grass, there is no need to feed high levels of concentrate. On a large amount of farms throughout the country concentrate supplementation can be reduced. National average grazing stocking rates are 1.7cows/ha, and nationally a lot of dairy farms have an extended calving pattern. Thus, full grass demand can be achieved by mid/late March.

If concentrate has to be offered, one with 14% protein is sufficient for cows milking 27-30kg (1.9-2.2 kg milk solids). For lower yielding cows a concentrate with a lower level of crude protein can be fed. The critical point to remember this spring is the return on the concentrate fed must be economical, therefore, the optimisation of grass in the diet should be the objective from turnout onwards. Concentrate supplementation levels offered to the herd this spring should be dependant on:

i) Grass proportion of the cow's diet: is it 60, 70, 80 or 100%
ii) Milk price
iii) Concentrate cost.

Table 3 shows the profit/loss per cow at a milk response of 0.9kg milk/cow/day. In situations where grass allowance is low (low grass supply), the milk response will probably be between 0.8-1.0kg milk/concentrate. Therefore, feeding concentrate levels in excess of 3 kg at grass will not be profitable with present day concentrate costs and milk price.

Using concentrate as a feed input in 2009 must be carefully evaluated. If concentrate is used it must be purchased at a competitive price. Table 3 below shows that purchasing concentrate at €200/t with a milk response of 0.9kg milk/kg concentrate will result in a gain of 5cent/cow/day at a milk price of 24c/litre. Where concentrate price is greater than this money is being lost.

Table 3. Profit/Loss (€/cow) based on a milk response of 0.9kg milk/kg concentrate offered and supplementing with 3 kg of concentrates daily

Conc Price	Milk Price/litre						
€/tonne	0.18	0.20	0.22	0.24	0.26	0.28	0.30
140	0.07	0.12	0.17	0.23	0.28	0.34	0.39
160	0.01	0.06	0.11	0.17	0.22	0.28	0.33
180	-0.05	0	0.05	0.11	0.16	0.22	0.27
200	-0.11	-0.06	0	0.05	0.10	0.16	0.21
220	-0.17	-0.12	-0.07	-0.01	0.04	0.10	0.15
240	-0.23	-0.18	-0.13	-0.07	-0.02	0.04	0.09
260	-0.29	-0.24	-0.19	-0.13	-0.08	-0.02	0.03
280	-0.35	-0.30	-0.25	-0.19	-0.14	-0.08	-0.03
300	-0.41	-0.36	-0.31	-0.25	-0.20	-0.14	-0.19

Summary: 5 key steps to successful spring grazing

1. Put cows out to grass straight after calving (day and night).
2. Try to keep grass silage out of the lactating cow's diet.
3. If soil conditions and wet weather are a problem on/off graze the herd in two three-hour grazing blocks.
4. Use the spring rotation planner to determine the amount of area to be grazed daily. This will ensure you have grass up to the start of April.
5. Let the level of concentrate offered be dependent on the proportion of grass offered to the herd.

Optimise the amount of grass in the cow's diet.

Improving Grassland Management on Beef Farms

Pearse Kelly, Teagasc, Kildalton

There are four key areas that the majority of beef farmers can improve in their grassland management that will increase their output per hectare significantly while at the same time reducing their input costs.

These are:-
(1) Increasing the number of grazing divisions per grazing group
(2) Targeting an earlier turnout date in the spring
(3) Incorporating white clover into their grazing swards
(4) Learning and using grass budgeting

1) Extra Grazing Divisions

Before any other improvements in grassland management can even be thought about this has to be got right first. For every group of stock that are being grazed how many fields / paddocks will they be rotating around? Add up all your grazing divisions that are available in April and May and divide it by the number of groups you have grazing. The answer often for a lot of beef farms is two to three. This means,

- they are spending a week or more in each field
- re-growths are constantly being grazed, reducing overall grass growth
- impending shortages and surpluses of grass are more difficult to predict
- early closing of a proportion of the farm in the autumn for early grazing in the spring is less likely to happen
- incorporating white clover and keeping it in a sward will be considerably more difficult
- grass budgeting to maintain grass quality will not be an option

Each group of stock being grazed should have at least six grazing divisions. This can be achieved by either reducing the number of grazing groups (grazing steers and heifers together, mixed grazing sheep and cattle, having one calving season) and by dividing up large fields permanently.

Two of the immediate benefits beef farmers see from having this ratio of at least 6:1 grazing divisions to grazing groups is that they are growing more grass (more output) and they can often cut the amount of nitrogen that needs to be spread (less inputs and costs) because of this extra grass growth. The knock-on affect that happens on a lot of farms is that they find that they can carry an increased number of stock/ha. because of the extra grass they are growing and these extra stock increase their output of beef/ha. and hence their gross margin/ha.

2) Targeting Earlier Turnout

There are a number of benefits to beef farmers from having a planned closing of paddocks in the autumn and then having cattle turned out to grass as early as possible in the spring:-

- The winter feed bill is reduced from the shorter winter
- The quality of feed growing cattle are eating improves dramatically
- The change in diet (from grass silage to grass) happens earlier and cattle are accustomed to and settled in on their new diet by the time the spring flush of grass arrives
- New born calves are at less risk of infectious diseases by being outdoors
- There is less labour involved with feeding and bedding cattle

However, for all the benefits there are from early grazing there is also a huge amount of excuses made for not trying to improve the spring turnout date on many beef farms.

Excuse 1: *I still have silage left in the pit in March and I want to have clean pits for the next harvest.*

Having enough silage in case you need it in March is a good plan but it should not stop you from getting stock out to grass early. If there is a significant amount remaining there is nothing wrong with leaving it there and putting the next years harvest in beside it. Well sealed silage can last for five years if it is of a good enough quality when it goes in originally. A lot of farmers are loath to do this and for that reason there is a strong argument for making 20% of your silage in round bales that are left to the end of the winter for using. If they are not used they can be kept until next winter or they may be needed during the grazing season if grass supply gets very tight and you want to slow down the rotation.

Excuse 2: *I want to wait until I am sure the weather is going to be good enough so I do not have to re-house stock.*

As we have seen over the last two summers, the weather can be worse in July and August than it has been in early March. The benefits of early turnout far out-weigh the risks of having to re-house some stock for a short period. Every year will not be wet and so you will take the full benefit of early turnout in the drier years. In wetter years if you do have to re-house stock for a short period all of the research done has shown that there is no loss in weight gained from early turnout if cattle are re-housed for a short period. Choose drier fields to graze first and those that are closest to your housing so that if you do have to bring cattle back in it is not a big task.

Excuse 3: *I will have no grass in April if I turn out my cattle in February.*

Early turnout of cattle does not mean turning all of the cattle out at the same time. Only graze the number of cattle that you have grass for. Depending on your stocking rate and the part of the country you are in, the target should be to have enough grass ahead of cattle so that you will not be back to the first field grazed until early to mid-April. For example if on the 20th February you are turning out 20 yearlings and by your calculations you have 40 days grass across the whole farm for them then this is all that should be grazed. If two weeks later there is more grass on the farm (due to growth) and this allows more yearlings to be turned out calculate how many more cattle can be grazed by making sure that all of the stock now grazing will mean that you are not back to the first field grazed before the end of March.

Excuse 4: *Parts of my farm are very wet*

So long as some of the farm is dry, early turnout is still an option. Again you are only going to be turning out a proportion of the stock on the farm. Leave your wetter areas until last which in any case will be late March or early April.

Excuse 5: *My farm does not grow grass early*

Having early grass on a farm is not because of the grass that grows in the spring it is because of the grass that has been saved up since the previous autumn. Start closing up paddocks in early to mid-October in rotation. With a 6:1 ratio of grazing divisions to grazing groups, if they get one week (at that time of the year) in each paddock the last of them will not be grazed until the second half of November. Early closing in the autumn does not mean early housing.

3) White Clover

With the rise in nitrogen prices since 2008 there has been a huge increase in the interest in incorporating white clover into beef grazing swards. There are a significant number of beef farmers who are stocked in the region of 100 - 180 kg of organic N/ha who are applying between 100 and 185 kg of bagged fertiliser N/ha (80 - 150 units/acre). These farms are using enough fertiliser to make it worth their while switching over to a clover system and are also stocked at a high enough level to be able to both get the clover established and maintained within their grass swards. Farms which have a very low stocking rate (less than 100 kg of organic N/ha) would be spreading very little N fertiliser to begin with and would probably not have enough stock to be able to get clover established properly to begin with.

For those beef farmers who used the over-sowing method to get white clover established on their farms in 2008 there have been a number of valuable lessons learned.

- A reasonable amount of regular rainfall is needed to germinate the seed. If a very dry period occurs after sowing the success is quite limited.
- Do not try to do too much over-sowing in any one year. One of the keys to success is keeping the sward grazed very tight in the year of over-sowing. With too much done this becomes impossible.
- As you are not spreading any nitrogen for the remainder of the year and you have none of the nitrogen benefits from the clover until the following year, grass supply can become tight on the farm. This is another reason to keep the area over-sown to no more than 20% of the grazing area.
- Without a paddock system over-sowing white clover is very difficult and keeping it in the sward is also a challenge.
- Where heavy covers of grass were on paddocks over the winter and they were not grazed early, there is now very little of the clover remaining.

Many of the farms that have had success in getting white clover established and maintained in swards are going ahead in 2009 with more over-sowing. While nitrogen fertilisers are not as high in price as they were in 2008 they are still well above previous years prices and there is always the danger that they will rise again. The savings from white clover are still quite large at today's nitrogen prices.

4) Grass Budgeting on Beef Farms

One could make a very strong argument that grass budgeting is more important for beef farmers than it is for dairy farmers.

There are a lot of advantages from budgeting grass but the main one has to be supplying the animal with the best quality grass possible. The dairy farmer sees very quickly in milk yields and in the milk composition figures if cows are grazing sub-standard high stem to leaf swards and reacts accordingly. The beef farmer has no such measurements and performance could be running at 75% of where it should be due to grass quality with nobody knowing it. Because of this ensuring that cattle are getting as close to optimum grass quality swards as is possible is the only option. The only way that this can be done is through grass budgeting on a weekly or forth-nightly basis.

Grass budgeting starts with:-

1. Knowing how much grass you have.
2. Knowing how much grass you need.

If you know these two things the rest follows. Knowing what these are today is a start. What grass budgeting will do is tell you what they are going to be a week and 14 days from today.

If you are going to have too little grass for what you need you will not have a quality problem but you may have a supply problem. If you are going to have too much grass for what you will need you will not have a supply problem but you may well have a grass quality problem to deal with. Taking action now will prevent the chances of either of these two things happening.

Grass budgeting is not something that you can learn from reading. You need to:-
- learn the techniques involved from those that are already doing it
- start doing it on your own farm
- meet at least a couple of times per month to begin with others who are also budgeting their grass to discuss what the best options are
- refresh yourself each year

Once again having a rotational grazing system in place (with at least six divisions per group grazing) is the first step before even thinking about grass budgeting.

Teagasc has a number of grass budgeting courses running for beef farmers throughout the country in 2009. If you are interested in learning and practicing grass budgeting, talk to your adviser about getting on one of these courses when they are started again. We also have an excel based computer program that farmers can avail of that is simple to use and helps with grass budgeting on beef farms.

Breeding for Profit - Current Best Practices

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Summary

- High EBI genetics has the potential to significantly increase the profitability of Irish grass-based systems of milk production.
- This spring genomically selected sires will be included in the ICBF active bull list increasing the average EBI of bulls available from €124 in 2008 to approximately €150 in 2009.
- To accommodate the inclusion of high EBI genomically selected sires in the ICBF active bull the minimum EBI reliability requirement has been reduced to 35%. Therefore, for dairy farmers using these genomically selected sires it is **very important** that a team of bulls is used (i.e., five to six sires).
- Crossbreeding trials both at Moorepark and internationally have illustrated significant animal performance benefits. The key must be to utilise the best available genetics to ensure real genetic improvement.

Introduction

The cow required for future Irish milk production systems must be robust and 'easy care' as well as being capable of producing high milk solids per unit area. The former is particularly true given expansion is likely to be the norm going forward. Compact calving is a critical component of the system. It enables cows express their production potential via a long lactation (target 305 days) and allows grazed grass to be utilised to the maximum in the dairy cow diet. Many decades of intensive selection for milk production within the Holstein-Friesian has resulted in unrivalled production potential, but unfortunately, a cow less suited to the demands of a seasonal production environment, in particular a decline in reproductive efficiency. Contrary to past ideals, the term 'high genetic merit' now recognises that many characteristics are required to reflect total economic profitability.

Economic Breeding Index

Since its introduction in 2001 the EBI has undergone an annual review of its traits and weighting factors to reflect expected differences in input and output costs and prices. This process is vital to ensure that the most up-to-date information is immediately incorporated making the EBI pertinent to future production systems in Ireland. Increased lifetime production is only achievable through a combination of high genetic merit for milk production and superior health, fertility and survival - the goal of the EBI. In 2008, the EBI consisted of five sub-indexes: milk production (43%), fertility and survival (37%), calving performance (7%), beef performance (8%) and health (5%). While, future developments to the Index are inevitable to take cognisance of changes in economic policy, costs of production and to include new traits pertinent to the production system, for 2009 the Index remains unchanged. Traits that will receive attention in the coming years will be those related to feed efficiency and environmental sustainability. However, means to include better information on hoof health, to better define fertility and incorporation of calf price (collected from marts) are also being examined.

Genomic selection

Genomic selection is a new tool used to increase the reliability of the EBI of unproven animals e.g., G€N€ IR€LAND® test bulls or cows with few lactations/progeny. Genomic selection in itself is essentially another source of information, over and above that already included in national genetic evaluations from parents, relatives and progeny. Based on the current methods of genetic evaluation, the maximum reliability of any trait for a young animal with no performance records or progeny is 49%. The actual reliability observed is usually somewhat lower and varies by trait; approximately 40% for production traits, 30% for fertility/survival traits and 30% for EBI. This is because the reliability of the bull dam is usually not high. The main goal of genomic selection is to increase this achievable reliability.

Genomic selection is based on looking for differences among animals at the DNA (gene) level. The DNA of an animal does not change over its lifetime. Therefore, if we know what is a good 'DNA signature' then we can measure the DNA signature of an animal very early in life. Allowing for a few weeks of laboratory work and statistical analysis we should know the EBI of a calf at a few weeks of age.

Teagasc in collaboration with the Irish Cattle Breeding Federation and the dairy cattle breeding organisations are developing genomic selection for the Irish dairy industry. Ireland is also collaborating with LIC in New Zealand to maximise the number of animals with known genotypes available for the analysis as well as ensuring the methods of analysis are the best available at this time. Genomic selection is a very new technique and new processes as well as their deficiencies are being constantly identified.

Estimated breeding values of animals, incorporating genomic and traditional information, are expected to be publicly available in early 2009. Although the research is still on-going, we hope to achieve EBI reliabilities of young animals in the region of 40%; this is likely to improve over the coming years. Ireland will be unique in that this year ICBF will produce genomic EBIs for bulls. This is vital for Irish dairy farmers as it ensures access to quality information on potential bulls from all over the world.

Although many different breeding programme designs are possible with genomic selection, initial research would suggest that genomic selection has the potential to increase the rate of gain by 50%. In other words increasing the potential rate of gain in EBI from €23/year to €35/year. Genomic selection in Ireland will only be undertaken within the Holstein-Friesian breed in 2009.

However, genomic proofs are available in New Zealand for Jersey and crossbred sires and research is on-going in Norway for the Norwegian Red. We need large numbers proven under Irish production systems before we can confidently implement for alternative breeds.

Genomic Selection and G€N€ IR€LAND®

Genomic selection technology is coming at a very important time for the Irish dairy industry. First, it has the potential to dramatically reduce the cost of the G€N€ IR€LAND® progeny testing programme. Funding from the DAFF is to reduce significantly in 2009 for the G€N€ IR€LAND® programme and genomic selection will allow the programme to continue. Second, it has the potential to increase the rate of genetic gain by 50%. Third, the availability of high EBI proven sires for the 2009 breeding season is limited; genomic selection has enabled the genomic screening and selection from up to 200 young bulls in lay-off that are already progeny tested for calving difficulty and genetic defects.

Team approach to genomically selected bulls

Because genomically selected bulls still have relatively low reliability, they should be used as part of a team (the recommendation is 5 to 6 bulls – see below) to minimise risk from breeding value fluctuation, an inevitable feature of low reliability. The performance of these young bulls is expected to be considerably greater than that of the top selection of proven bulls, thus the expectation is an accelerated rate of genetic gain. The calculation of the reliability of a team of unrelated bulls is simple and is given by the formula:

$$\textbf{Team reliability} = 1 - \left(\frac{\textbf{1 - average reliability of the individual bulls in the team}}{\textbf{number of bulls in the team}} \right)$$

Therefore, the EBI of a team of six young bulls, each with a reliability of 40% (i.e., 0.40 for the equation above), will have a reliability of 90% associated with it.

ICBF Active Bull list 2009

The ICBF Active Bull list was launched in 2002 with the objective of providing Irish dairy farmers with a single definitive list of the highest EBI (high profit) sires available. Until now, one limitation to qualifying for the list was that each bull had to have a minimum EBI reliability. For 2008 this was 60%. A fundamental change for 2009 is that the minimum EBI reliability for bulls to be listed in the Active Bull list will be reduced to 35%. However, additionally sires must either have daughter proven breeding values (from country of origin) for milk and fertility via Interbull or be genomically selected in Ireland together with a calving proof. The implications of this dramatic change is that the average EBI for the 75 bulls on the list will be over €150, up €25 on the 2008 list. This means there is a much greater choice of high EBI sires available for 2009. However, the average reliability has dropped from 76% to 58%. This means sire proofs will fluctuate with time, hence the need for increased awareness with regard to the selection of sire teams.

Crossbreeding the dairy herd – worth considering!

In the context of dairying, interest in crossbreeding has increased throughout the world in recent years. Principally to overcome the issues highlighted above. In New Zealand, however, crossbreeding has been recognised as a sound breeding strategy for many decades. Currently, about 40% of dairy cows are crossbred and this figure is increasing steadily of late. In New Zealand, it has been demonstrated that crossbred (Jersey×Holstein-Friesian) cows are the most profitable, with much of this resulting from superior longevity. On average, crossbred cows survive 227 days longer (almost one lactation more) compared to the average of the parent breeds. It has been calculated that at current rates of genetic gain for longevity (9.5 days per year) it will take 24 years of selection before a similar rate of survival is reached with cows within the straight breeds. For the most part this means Friesian and Jersey. Therefore, crossbreeding in the dairy herd is not a new phenomenon.

Crossbreeding studies at Moorepark

To evaluate/demonstrate the potential merits of dairy crossbreeding under Irish conditions two crossbreeding studies were established at Moorepark. Both studies are advancing with two lactations now completed in each programme. One study is evaluating crossbreeding with the Norwegian Red, a breed that has been selected with an index not dissimilar to the Irish EBI since the 1960s. This study is being run across 46 commercial dairy herds i.e., a study with large numbers. The second trial, based at the Ballydague research farm is evaluating Jersey crossbreds. Fundamentally when crossbreeding the aim is to: 1) introduce favourable genes from another breed selected more strongly for traits of interest, 2) remove the negative effects associated with inbreeding and 3) for many traits to capitalise on what is known as heterosis or hybrid vigour (HV). HV means that crossbred animals usually perform better than that expected based on the average of their parents.

The results to-date strongly suggest that using Norwegian Red or Jersey sires this breeding season will deliver high profit to Irish farmers. In both cases production potential is not compromised by crossbreeding, but crucially and consistent with the data emanating from New Zealand (and other countries to a limited extent), reproductive efficiency and survival of the crossbred cows is markedly improved compared to the Holstein-Friesian cows on trial. The advantage from crossbreeding is likely to be substantial where the EBI or more specifically the fertility sub-index is low. However, farmers will benefit from hybrid vigour even with high EBI herds. That is the basis for crossbreeding in New Zealand; use the best bulls (highest BW) from both breeds and also benefit from the added bonus that is hybrid vigour.

Crossbreeding and the EBI

At all times farmers must strive to use the best bulls. That means high EBI. However, ICBF don't have reliable EBI estimates for many alternative breed bulls. Essentially, this is down to a lack of data for many sires, and as far as individual breeds are concerned, a lack of data or poor data distribution. In the absence of Irish proofs with high reliabilities for Jersey and Norwegian Red bulls (or other breeds of choice for that matter) the index of country of origin should be assessed. This means taking somewhat of a leap of faith but as a general rule, bulls good on fertility and milk solids, in particular those tested in a grass-based environment, should deliver in EBI. ICBF has calculated the value of hybrid vigour is worth in the region of €50 per lactation. This value is not included in the published EBI of alternative breed sires. In essence a farmer can expect greater performance than that explained by the EBI of these sires; this is because of hybrid vigour. The value of €50 is based on an average value for all crossbreds in the national data base. It is likely to be different depending on the breeds being crossed.

How different is a crossbred cow?

Based on the studies at Moorepark, crossing Holstein-Friesian cows with a Norwegian Red sire will result in a type of cow very similar in general appearance and production characteristics to the Friesian cows' farmers are used to working with. However, improved fertility, udder health and body condition can be expected. Thus, it is an option for those wishing to avail of the benefits of crossbreeding but who feel crossing with Jersey is too drastic i.e., for those farmers who want to keep the type of cow they have; similar colour, size, weight, production characteristics, calf value etc. Jersey crossbred cows will, in general, be dark brown/black in colour. On average, they will be smaller and more compact, on average 50-60kg lighter than Holstein-Friesian contemporaries, but body condition will tend to be superior. Milk volume will be reduced, but milk solids content will be significantly increased and as a result the yield of milk solids will be maintained or indeed increased. Increased production efficiency is a consequence of maintained solids production at a reduced body size. This is due to a lower maintenance energy cost. High solids production in conjunction with lower milk volume will be favoured with the multiple component milk pricing payment system i.e., 'A+B-C'. Cull cow and male calf value will be reduced.

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 (F1) cow. These are as follows:

1) Two-way crossbreeding. This entails mating the F1 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 F1 cow is mated to a sire of a third breed HV is maintained at close to 100%. Then mate back to high EBI Holstein-Friesian. 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 F1 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.

Crossbreeding is often referred to as a quick fix solution (relatively speaking). Results from these studies indicate that this is the case. The ultimate aim for all Irish dairy farmers must be to generate cows that will maximise profitability in our system. Experience to date strongly suggests we can have confidence that crossbreeding works. The key is to utilise the best available genetics, ultimately based on the EBI, to ensure real genetic improvement.

Important Practices for a Healthy Herd

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Summary
- Biosecurity is the single most important contributor to the prevention of infectious diseases and subsequent losses on a farm.
- Non-regulated infectious diseases such as BVD are resulting in significant economic losses on Irish dairy farms e.g., a BVD outbreak in a 100-cow naïve herd can result in losses of approximately €30,000 through reduced fertility, peri-natal mortality and culling of persistently infected animals.
- The key to BVD control is identification and culling of persistently infected animals (PIs).
- The impact of BVD on the national herd can be reduced by implementation of on-farm health plans, which incorporate biosecurity, diagnostic testing and strategic vaccination.

Introduction
Biosecurity is the single most important contributor to the prevention of infectious diseases and subsequent losses on a farm. Biosecurity in its simplest form means the implementation of measures to prevent the introduction and spread of infectious diseases. The higher the level of a particular disease in a country (prevalence of a disease), the stricter the biosecurity measures required to reduce the risk of disease introduction. Infectious disease agents currently impacting on Irish dairy farms include;

Mastitis
Bovine Viral Diarrhoea Virus (BVD)
Infectious Bovine Rhinotracheitis (IBR)
Neospora caninum
Salmonella Dublin
Salmonella thyphimurium
Leptospira hardjo
Mycoplasma bovis
Mortellaro
Digital Dermatitis
Johnes Disease
(*Mycobacterium avium* subspecies paratuberculosis)

Implementation of a strict closed-herd policy is a critical component of disease control. A closed herd policy (i.e., no cattle movement onto the farm, including bulls) combined with on-farm biosecurity measures such as stock and disease-proof boundaries (3 meter gap between neighbouring farms to prevent nose to nose contact), restriction of visitors, disinfected veterinary equipment and single-use disposable needles, will optimise protection against the introduction of infectious diseases onto a farm. If feasible, a closed herd policy should be the primary biosecurity measure implemented.

In cases where the purchase of animals is required the following procedures should be followed:

- Animals should be purchased from a single source where possible.
- Data on the health history of the source herd, the individual animals to be purchased and their vaccination status should be requested. HerdPlus reports can prove extremely useful in this regard.
- All newly purchased animals including bulls should be quarantined correctly i.e., isolated for at least 30 days in an area that is at least three metres from other cattle groups with no sharing of feed or water troughs and no mixing of dung and urine. Using an isolated paddock is an ideal solution to avoid problems with indoor quarantine. Animals from different source herds should be quarantined separately.
- On day 21 of the quarantine period, newly purchased animals should be tested for BVD virus and antibodies against IBR and Leptospira. If economically feasible and if previous health history highlights the need, newly purchased animals should be tested for Johnes Disease, Salmonellosis, Neosporosis and Mycoplasma bovis.
- Test lactating animals for sub-clinical mastitis using the California Milk Test.
- All new purchases should be dosed for lungworm during the quarantine period.
- Vaccinate new purchases according to current on-farm practices.

As disease transmission can also occur by indirect contact with disease vectors e.g. farm visitors, vehicles etc., the following procedures should be implemented on all farms, regardless of cattle movement, in order to minimise the disease risk.

- Footbaths – to be effective these need to be well-maintained (cleaned and re-filled regularly).
- Signage should be used to maintain awareness of biosecurity on the farm.
- Basic veterinary equipment e.g. nose tongs, should be available on every farm. Transfer of nose tongs from one farm to another can result in disease introduction.
- Separate disposable needles should be used for each animal when administering medications or taking samples.
- Separate rectal sleeves should be used when scanning, examining or treating each cow.
- Importation of slurry and colostrum should be avoided.
- Vehicles visiting the farm should be kept at a safe distance from animal areas e.g. housing, holding yards, roadways.

It is important to recognise that an animal health plan combining biosecurity, testing and vaccination, once implemented, will act as an insurance policy against infectious diseases. It is not a guarantee that a herd will remain disease free but it will significantly reduce the risk of disease introduction into a herd.

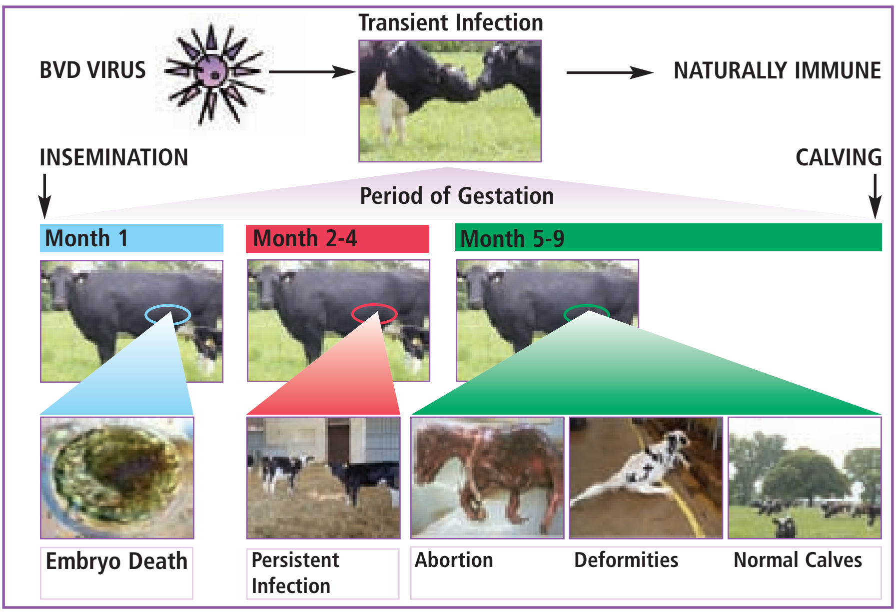
Bovine Viral Diarrhoea (BVD)

BVD (Bovine Viral Diarrhoea) is a highly contagious and economically important viral disease of cattle. It is a relatively new disease in Ireland, initial reports of its occurrence dating back to the late 1980s, early 1990s. The prevalence of BVD in Ireland is unknown, although it is estimated that approximately 80-90% of Irish herds have been exposed to BVD virus. The impact of this disease in terms of farm profit and animal welfare should not be underestimated, and on-farm control programmes must be initiated in order to increase the health status of the national herd and to limit future on-farm losses.

Two types of BVD infection exist:

- <u>Transient viral infection (TI).</u> This type of infection occurs when a previously unexposed healthy animal (naïve animal) becomes infected with BVD virus. This infection only lasts for a two-week period (approximately) and the majority of these transient infections do not result in clinical signs. On occasion, however, a severe transient infection (severe acute BVD) can prove fatal. Following a transient infection an animal develops long-lasting immunity.
- <u>Persistent viral infection (PI).</u> This type of infection can only be generated by infection of an unborn calf between months 2 and 4 of gestation (Figure 1) i.e. calves are born persistently infected and will carry and shed BVD virus for their entire lives. PIs, therefore, can only be generated *in-utero*. It should be noted that PIs cannot be cured and will allow BVD virus to persist in a herd. PI animals can look perfectly healthy or may look noticeably below target weight.

Figure 1. Possible outcomes of BVD viral infection



From Figure 1, we can see that if the dam becomes infected with BVD (transient infection) for the first time during gestation, there are a number of possible calf outcomes depending on the time of gestation that the exposure occurs. If exposure and transient infection of the dam occurs during month one of gestation, embryo death will result with the dam returning to heat. If infection occurs during months two to four of gestation, a persistently infected (PI) calf will result. If infection occurs during months five to nine of gestation, a number of possible outcomes are possible and include abortion and calf deformities. Infection of the dam at this time can also result in the birth of healthy off-spring. BVD is also an immunosuppressive disease in that it reduces the efficiency of an infected animal's immune system, to the degree that other infectious agents are allowed to establish. On the basis of this range of possible effects, therefore, indications that BVD exists in a herd include:

- Poor fertility (conception rates, % empty).
- Increased number of abortions, stillbirths, weak calves, and/or deformities.
- Poor calf health i.e. unprecedented or undeserved level of calf scour and/or pneumonia.
- Occurrence of severe acute BVD.
- Occurrence of fatal mucosal disease. This is only possible in persistently infected animals and is characterised by very severe diarrhoea and rapid deterioration of the affected animal. This can be accompanied by respiratory illness, lameness due to inter-digital ulceration and reduced appetite due to ulceration in the mouth.

How big an issue is it? A Case Study

The economic impact of non-regulated infectious diseases in Ireland can be clearly demonstrated by examining the effects that Bovine Viral Diarrhoea (BVD) can have in a naïve herd. A total of 47 heifers in a case study herd were served between 16 November 2007 and 23 February 2008 (14-week breeding season) to yield autumn calves in 2008. Poor fertility was noted during the breeding season (Table 1) with conception rates to first service well below target at 49%. Total number of services over the breeding period was 88, yielding 2.1 services per conception, again below target. A total of six heifers did not conceive yielding an empty rate of 13% (Table 1). A BVD control programme was initiated in this herd in July 2008. All autumn in-calf heifers (n=41) tested negative for BVD virus. The heifers began calving down on 20th August 2008. Of the 40 live calves submitted for testing, 18 tested positive for BVD virus. On repeat testing, only four calves had cleared the virus and were therefore classified as transiently infected. The remainder were deemed persistently infected, yielding a PI rate of 35%. The mean birthweight (BW) of the PI calves was 5kg lower than the mean BW of the non-PI calves. Outbreaks of both diarrhoea and respiratory illness were recorded in the autumn calf population. Prior to PI removal, approximately 50% of the entire calf group was affected with diarrhoea and/or respiratory illness. Based on the clinical picture recorded in this group of naïve animals, the overall cost of a

BVD outbreak in a similar herd of naïve animals in terms calf mortality, calf morbidity and PI culling alone is estimated at approximately €9000 per 100 cow herd. Although it was not possible to quantify the exact contribution of BVD to the poor fertility parameters recorded in this group of heifers due to the unknown BVD status of previous autumn calving groups on the farm, it is worth pointing out that such a fertility picture in a 100-cow spring calving herd would result losses of €19500 (Table 1). This study demonstrates the productive and economic consequences of BVD infection.

Table 1. Potential financial loss due to a BVD outbreak in a naïve 100-cow herd

Calf-associated factors	**Actual**	**Target**	**Cost/100 cows**
Direct PI costs General calf health	€101.25	€11.30	**€8,995**
Fertility parameters	**Actual**	**Target**	**Cost/ 100 Cows**
Conception rate to first-service	49%	>60%	€6,400
Serves per conception	2.1	<1.5	€2,400
% empty	13%	<5%	€10,700
		Total	**€19,500**

As well as the direct on-farm costs of BVD as outlined here, it should be noted that many countries in Europe, as well as Australia and New Zealand, have implemented BVD control programmes in order to reduce the economic and animal welfare impact of BVD on their national herds. Ireland is currently lagging behind its global trading partners in the implementation of such a control programme. This situation will have to change in order to maintain Irish competitiveness in an increasingly challenging global market.

What can we do?

At farm level

Figure 2 outlines the steps that should be taken to determine if exposure to BVD has occurred in a herd and the necessary follow up procedures should viral exposure be indicated. Briefly, it is first necessary to determine if viral exposure has occurred by testing a bulk milk sample and blood samples from a selection of nine-month-old (approximately) unvaccinated weanlings for ANTIBODIES to BVD virus. If exposure is indicated by a medium to high level of antibody in the bulk milk sample, combined with any or all of the weanlings testing positive for ANTIBODIES, control measures will have to be put in place. Both transient and persistently infected animals shed virus particles in all bodily secretions such as nasal and oral discharges, tears, milk and semen but persistently infected animals shed significantly higher levels of virus, and as such, pose a greater threat to the herd. The key to BVD control, therefore, is culling of PIs, as these act as the constant source of virus in a herd. Following diagnostic testing, if a PI is found in the herd, IT SHOULD NOT BE SOLD. As the number of PIs identified in an adult herd is usually low (approximately 1-3 in a 100-cow herd), immediate culling of these animals should be undertaken. Under no circumstances should a known PI be kept in contact with the breeding herd or the cycle of BVD infection will continue. Once all PIs have been removed from a herd, biosecurity, routine diagnostic monitoring, and vaccination should be implemented to prevent re-introduction of the disease.

Figure 2. Monitoring and control of BVD in a dairy herd

Determine if exposure to BVD virus has occurred

Bulk milk tank sample
Blood sample a selection of animals (9 month old unvaccinated) on the farm
Test bulk milk and blood for ANTIBODY

No Exposure
Biosecurity
± Vaccination (Recommended)

Exposure
Test all animals in the herd for VIRUS
Elimination PIs
± Vaccination (Current Year)
+ On-going vaccination
+ Biosecurity

If a PI found in the current year of testing, calves born over the following 9 months must be tested for VIRUS to eliminate all PIs

Continue herd monitoring programme using bulk milk samples

Vaccines play a hugely important role in the control of many infectious diseases. Their use however, without the supporting knowledge provided by diagnostic testing and the implementation of a biosecurity plan, could potentially undermine their effectiveness in a disease control programme. It is essential that they be viewed as a component of a control programme but not the sole means of disease prevention within a herd. Over-reliance on vaccination, without the backup of proper management, biosecurity and diagnostics should be avoided with vaccine breakdown a potential consequence.

Biosecurity

Once complete PI removal has been achieved, biosecurity is the single most important contributor to the prevention of BVD re-introduction and subsequent losses on a farm. Biosecurity in its simplest form means the implementation of measures to prevent the introduction and spread of infectious diseases. It can be applied at a national level where measures are employed to prevent the introduction of a disease into a country. Biosecurity can also be applied at farm level, in order to prevent the introduction and spread of an infectious disease onto an individual farm. The higher the level of a particular disease in a country (prevalence of a disease), the stricter the biosecurity measures required to reduce the risk of disease introduction. With the already high prevalence of BVD in Ireland, biosecurity must now become an essential component of good farm management both on dairy farms and at a national level.

Implementation of a strict closed herd policy is a critical component of biosecure disease control. A closed herd policy (i.e., no cattle movement onto the farm, including bulls) will optimise protection against the introduction of BVD onto a farm. This critical risk factor for disease introduction will assume much greater importance in the future as dairy farms expand their herds through cattle purchases. The current lack of disease control measures for BVD will result in farmers having to resort to purchasing cattle of unknown disease status with the resultant biosecurity risks. In order to minimise viral disease risk when purchasing, therefore, the following biosecurity measures can be employed:

- Animals should be purchased from a single source if possible.
- Data on the health history of the source herd, the individual animals to be purchased and their vaccination status should be requested.
- All newly purchased animals including bulls should be quarantined correctly i.e. isolated for at least 30 days in an area that is at least three metres from other cattle groups, with no sharing of feed or water troughs and no mixing of dung and urine. Using an isolated paddock is an ideal solution to avoid problems with indoor quarantine. Animals from different source herds should be quarantined separately.
- On day 21 of the quarantine period, newly purchased animals should be tested for BVD virus.

These procedures will minimise the risk of viral disease introduction and transmission in open herds.

As disease transmission can also occur by indirect contact with disease vectors e.g. farm visitors, vehicles etc., the following procedures should be implemented on all farms, regardless of cattle movement, in order to minimise the disease risk.

- Footbaths – the use of well-maintained (cleaned and re-filled regularly) will reduce the disease risk on farms.
- Signage should be used to maintain awareness of biosecurity on farm.

- Basic veterinary equipment e.g. nose tongs, should be available on every farm; Transfer of nose tongs from one farm to another without sufficient disinfection between farms can result in disease introduction.
- Separate disposable needles should be used for each animal when administering medications or taking samples.
- Separate rectal sleeves should be used for each animal when scanning, examining or treating cows.
- Vehicles visiting the farm should be kept at a safe distance from animal areas e.g. housing, holding yards, roadways. This is particularly important in the case of knackery carcass collection vehicles, which should not be permitted to enter farms and should collect carcasses from the farm entrance only.

It is important to recognise that biosecurity measures, once implemented, will act as an insurance policy against viral infectious diseases. It is not a guarantee that a herd will remain disease free but it will significantly reduce the risk of disease introduction into a herd.

At national level

Many EU and non-EU countries are now implementing disease control programmes utilising bulk-milk testing in centralised laboratories to routinely screen herds, monitor their disease status, and promote implementation of appropriate biosecurity strategies. With the increasing prevalence of diseases such as BVD in Ireland, it is necessary for dairy farmers to take such practices on board in order to maintain competitiveness. In this regard, Teagasc, Moorepark, in co-operation with ICBF, has initiated a new herd health research initiative – the 'Herd Ahead' programme. This project aims to address the lack of recent published disease prevalence data for BVD and a range of additional diseases, and to then use that data as a basis for designing a dairy herd health strategy. This project will identify the non-regulatory infectious diseases requiring prioritisation in Ireland based on prevalence and economic impact data. The baseline data generated in this study will act as a benchmark from which the impact of future herd health strategies and their contribution towards sustainable dairy farming in Ireland can be measured. Ireland has the advantage of an exceptional data reporting system i.e. the ICBF database and HerdPlus reporting system, which can be adapted to allow efficient reporting of results and interpretation of data and will pave the way for a health statement system for Irish dairy farmers. Diagnostics will play an important role in disease monitoring on dairy farms going forward and economical methods of sample collection and testing will be required. In this regard, the use of bulk milk testing in a centralized laboratory would provide the necessary vehicle to carry out economic and practical disease testing, as well as addressing the logistical concerns of running such a disease monitoring programme. Should such a milk-testing system be introduced and combined with the HerdPlus reporting system, a practical, economical and functional health screening system for Irish dairy herds could be implemented in order to maintain competitiveness in an increasingly challenging global market.

Conclusion

Diseased animals perform sub-optimally and decrease on-farm profitability through waste feed, labour and veterinary costs. By using the combined approach of biosecurity, diagnostic testing and vaccination on individual farms, control of BVD, both on-farm and nationally, will become feasible, will reduce the economic impact of this costly disease and will improve Ireland's trading status in future years.

Eliminate BVD from your herd by:

1. ***Testing for and removing persistently infected animals***
2. ***Designing and implementing a biosecurity plan including diagnostic testing***
3. ***Vaccinating***

Management for sustainable reproduction

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The efficiency of seasonal-calving systems of milk production is highly dependent on herd reproductive performance. The calving pattern in spring is a reflection of the submission rates and conception rates during the previous breeding season. The relationship between heat detection rate and conception rate on six-week in-calf rate is illustrated in Table 1. Commencing at the mating start data, it is imperative that as many cows as possible get pregnant as quickly as possible. This is a summary of essential management practices that are relevant to all seasonal-calving herds, and need to be aggressively employed.

1. Keep good records. The importance of this cannot be overstated. You can't improve herd reproductive performance without knowing where your specific problem lies.

- Keep records of calving date, all peripartum problems/disorders/infections, pre-breeding heat dates, insemination dates, submission rates, six-week in-calf rate, breeding season length, final empty rate.
- The main targets for seasonal calving systems are as follows: Submission rate in the first three weeks, 90%; conception rate to first service, >50%; six-week in-calf rate, 75%; final empty rate, <10%.
- Look at the performance that you achieve on your farm. This can be easily carried out by keeping all animal events (calvings, inseminations, etc.) up to date on Herd Plus. After looking at your results, set realistic targets for improvement.
- Prior to MSD, identify cows with peripartum disorders and cows not cycling, and get these cows examined.

2. Maiden heifer breeding management. Heifers are the highest genetic merit stock in the farm. To continue genetic progress, heifers should be inseminated with a high EBI easy calving dairy AI sire.

- Puberty in heifers is strongly influenced by bodyweight (BW) and BCS. Failure to reach BW targets results in an unacceptably high proportion of non-cycling heifers.
- By MSD, heifers should weigh >330 kg at a BCS of 3.25. BW targets for New Zealand Friesian, Norwegian Red and Jersey heifers are 315, 315, and 240 kg, respectively. Jersey × Holstein-Friesian crossbreds should achieve a target of 295 kg.
- Prostaglandin synchronisation regimes work extremely well with cycling heifers. The protocol that has worked best at Moorepark over the last number of years is to tail paint all heifers, and inseminate following observation of oestrus during the first nine days of the breeding season.

- All heifers not inseminated in the first nine days receive a prostaglandin injection, and are inseminated following observation of oestrus in the next 3–5 days. Heifers that failed to come into heat following the first shot of prostaglandin receive a second shot 10 days later.
- After this second shot, heifers are inseminated at a standing heat, or receive fixed time AI at 72 and 96 h after the second shot of PG. All heifers are observed for repeat heats, and a stock bull is introduced 5-6 weeks after the start of the breeding season. This protocol typically results in conception rates to first service of ~65-70% in Moorepark.

3. Heat detection. It is not possible to achieve good reproductive performance without having a good heat detection rate, and good heat detection is not possible without use of a heat detection aid.

- A number of aids are available. By far the most common is tail paint, but tail paint is only efficient if it is frequently topped up.
- Alternative stick on devices are also available that give comparable performance to tail paint (e.g. Checkmate, Estrotect 'scratch card').
- Choose one that suits your system, and use it properly throughout the period of AI use.

4. Body condition score. Body condition scoring is an excellent tool to monitor the energy status of the herd.

- Cows that are thin during the breeding season (<2.5) are frequently anoestrus, and even if cycling, they are likely to have poor conception rates.
- Calving cows at too high a body condition score is also problematic, as these cows are more at risk of metabolic disorders postpartum, and also have compromised reproductive performance.
- Cows should calve at a BCS of 3.0-3.25, loose <0.5 BCS unit after calving, and mean herd BCS at breeding should be >2.9.

Table 1. The relationship between conception rate, heat detection rate and six-week in-calf rate

		Conception rate (%)			
		60	50	40	30
Heat	90	79	70	59	47
detection	70	66	58	48	38
rate (%)	50	51	44	36	28
	40	42	36	29	23

Appendix 1 – Dairy Herd EBI - Solohead Farm

Cow ID	Lact No.	Breed	EBI (€)	Milk (€)	Fert (€)	Calv (€)	Beef (€)	Health (€)	SIRE	DAM SIRE
2044	10	HO	65	37	37	-3	-9	3	DEC	
2075	9	HO	47	39	-3	16	-5	-1	ENM	CHZ
2086	9	HO	81	29	49	10	-7	1	ENM	
1583	8	HO	93	26	52	9	7	-2	MAU	
1587	8	HO	131	55	70	11	-3	-2	GMI	
1596	8	HO	31	29	-3	16	-12	1	JOS	CAU
1610	7	HO	92	62	10	13	4	2	TOE	SBO
1616	7	HO	72	44	20	21	-10	-2	GMI	SBO
1620	7	HO	71	23	45	10	-5	-2	DTV	EAT
1626	7	HO	33	24	11	5	-4	-2	DTV	ASE
454	6	HO	131	99	34	2	-5	2	ESZ	ENM
456	6	HO	71	33	38	4	-5	2	ESZ	DEC
474	6	HO	94	75	10	19	-9	-1	TDE	JOS
534	5	HO	86	16	63	16	-6	-4	ESZ	TDE
548	5	MOxHO	45	-18	51	7	4	1	ILZ	SBO
554	5	HO	105	59	36	14	2	-6	DRH	MAU
559	5	HO	117	60	39	18	1	-2	DRH	WDH
575	5	HO	78	53	15	9	6	-5	DRH	MAU
580	5	HO	92	40	50	8	-3	-3	DRH	BUZ
583	5	HO	100	83	20	3	-6	0	MFX	GMI
586	5	HO	71	56	5	16	-7	0	MFX	BGI
587	5	MOxHO	100	31	70	-6	4	2	ILZ	DEC
621	5	HO	96	43	35	21	0	-2	MBH	DRH
628	5	HO	100	50	50	11	-2	-8	NHS	WDH
636	5	HO	111	53	53	12	-4	-3	MBH	ESZ
637	5	HOxFR	73	22	44	12	-3	-2	MBH	DSP
649	5	HOxFR	99	56	41	10	-4	-3	NHS	WDH
656	5	MOxHO	35	-11	47	-3	4	-2	LTU	MAU
657	5	HO	91	11	74	11	-3	-2	MBH	ESZ

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Cow ID	Lact No.	Breed	EBI (€)	Milk (€)	Fert (€)	Calv (€)	Beef (€)	Health (€)	SIRE	DAM SIRE
659	5	MOxHO	102	17	72	12	5	-5	ILZ	TDE
666	5	MOxHO	82	15	59	5	5	-3	ILZ	GMI
701	3	HOxFR	68	-8	72	14	-6	-4	LTA	ESZ
704	3	HO	47	40	8	2	-1	-2	AHD	DTV
707	3	HO	73	56	14	10	-3	-5	IRL	TDE
712	3	HO	50	40	-6	16	5	-6	DCD	DRH
713	3	HO	5	13	-9	9	-10	2	NWY	HSN
714	3	HO	83	48	8	27	3	-3	DCD	DRH
715	3	HO	76	54	8	19	-2	-3	DCD	MFX
716	3	HOxFR	106	58	42	10	-3	-1	LTA	ESZ
719	3	MOxCH	64	41	23	-15	7	7	MGX	TOE
720	3	MOxHO	38	51	-7	-12	3	3	MGX	PUM
721	3	MOxHO	85	61	29	-16	6	5	MGX	DRH
726	3	MOxHO	52	16	36	-9	2	6	MGX	GMI
730	3	HO	32	15	10	11	-2	-1	IRL	CAU
741	3	MOxHO	68	67	6	-18	5	8	MGX	DSP
742	3	MOxHO	110	53	57	-11	3	9	MGX	GMI
748	3	HO	69	64	0	15	-5	-5	DXD	SBO
749	3	HO	58	31	33	-3	-1	-2	IRL	ENM
753	3	HOxCH	61	-6	54	20	-5	-2	DXD	MAU
754	3	HO	47	31	13	11	-3	-5	DXD	PUM
792	2	HOxMO	104	12	63	23	3	3	RUU	ILZ
793	2	HO	126	43	55	28	3	-2	RUU	DRH
797	2	HO	109	55	27	28	-1	0	RUU	JOS
799	2	HOxFR	79	62	15	19	-13	-5	UYC	HSN
800	2	HO	122	60	43	28	-9	1	KLA	MBH
807	2	HO	64	58	7	11	-9	-2	RMB	JOS
808	2	HO	94	33	33	31	-4	1	RUU	JOS
814	2	HOxFR	107	89	12	18	-10	-2	UYC	ESZ

Appendix 1 – Dairy Herd EBI - Solohead Farm

Cow ID	Lact No.	Breed	EBI (€)	Milk (€)	Fert (€)	Calv (€)	Beef (€)	Health (€)	SIRE	DAM SIRE
816	2	HO	141	37	80	25	0	-1	RUU	GMI
817	2	HOxFR	103	40	45	19	0	-1	RUU	NHS
820	2	HO	122	13	78	28	1	2	RUU	MBH
821	2	HOxFR	77	73	-2	17	-3	-8	NHS	DRH
823	2	HOxFR	95	77	8	20	-6	-4	NHS	MFX
828	2	HO	115	44	47	27	-1	-1	RUU	MFX
835	2	HOxFR	132	66	53	24	-11	-1	UYC	WDH
837	2	HOxFR	107	120	-3	2	-6	-5	NHS	MFX
843	2	HOxFR	122	52	61	19	-9	-2	UYC	WDH
849	2	HOxFR	53	8	50	1	-1	-5	NHS	FDD
853	2	HO	94	17	47	29	2	-1	RUU	MAU
877	1	HOxMO	107	71	19	14	1	2	QUR	MGX
881	1	HOxFR	112	70	34	3	-12	-2	UYC	GMI
882	1	HO	100	67	22	20	-4	-5	BWZ	AHD
884	1	HO	99	59	25	28	-9	-5	BWZ	DXD
888	1	HOxFR	99	57	39	7	-6	2	HZO	ESZ
889	1	HOxMO	107	59	44	6	0	-2	BWZ	MGX
891	1	HO	72	39	27	17	-13	3	LBO	JOS
892	1	HOxMO	123	61	48	15	-2	1	BWZ	MGX
893	1	HOxFR	105	54	44	14	-8	2	HZO	DXD
902	1	HOxAA	64	49	-4	22	3	-6	KSY	DRH
904	1	HOxMO	93	41	41	14	-4	1	LBO	ILZ
906	1	HOxFR	102	84	16	6	-2	-2	RHU	DRH
908	1	HOxFR	131	68	44	21	2	-4	KSY	DRH
909	1	HOxCH	111	46	44	32	-6	-5	BWZ	DXD
910	1	HOxFR	67	45	25	11	-8	-6	KTX	NHS
912	1	HOxMO	77	24	42	14	-4	1	BCY	ILZ
913	1	HOxFR	73	34	38	9	-2	-6	ARX	DRH

Appendix 1 – Dairy Herd EBI - Solohead Farm

Cow ID	Lact No.	Breed	EBI (€)	Milk (€)	Fert (€)	Calv (€)	Beef (€)	Health (€)	SIRE	DAM SIRE
915	1	HOxFR	96	67	7	26	-1	-3	KSY	ENM
917	1	HOxMO	119	57	53	9	1	-1	RHU	ILZ
918	1	HOxFR	37	40	0	5	-2	-6	KIJ	PUM
924	1	HO	88	32	55	10	-8	-1	BSG	DTV
927	1	HOxFR	101	80	20	6	-5	0	RHU	MFX
929	1	HOxFR	101	64	26	26	-12	-2	UYC	MFX
932	1	HOxFR	118	73	44	17	-10	-6	UYC	NHS
933	1	HOxFR	110	61	39	27	-3	-3	UYC	GMI
934	1	HOxFR	97	48	40	10	-1	1	HZO	ILZ
974		HOxFR	100	70	20	20	-3	-7	NHS	MBH
976		HOxFR	93	76	13	13	-6	-3	GMI	NHS
978		HOxFR	140	48	67	28	-2	1	RUU	UYC
981		HOxFR	82	80	2	13	-5	-9	NHS	DXD
984		HOxFR	124	34	71	27	-6	-2	CBH	RUU
989		HO	115	50	40	27	-3	1	RUU	RMB
996		HOxFR	103	68	30	16	-6	-4	GWA	DRH
1002		HOxFR	98	36	52	11	1	-2	GXT	LTA
1003		HOxFR	87	33	60	3	-8	-1	RYT	LTA
1005		HO	85	47	38	4	-1	-2	LLO	AHD
1007		HOxMO	124	65	37	18	0	4	OLG	MGX
1008		HOxFR	104	36	58	15	-6	0	HZO	DXD
1013		HOxFR	89	56	22	11	2	-3	GXT	DXD
1014		HOxFR	113	81	28	10	-4	-1	ATI	ESZ
1016		HO	90	45	39	12	-7	2	LBO	IRL
1023		HO	96	55	41	6	-2	-3	LLO	IRL
1026		HOxFR	126	48	67	12	-1	-1	HZO	ILZ
1033		FRxHO	107	80	29	15	-13	-3	UYC	TDE
1050		HO	125	54	69	6	-3	-2	LLO	GMI

Appendix 1 – Dairy Herd EBI - Solohead Farm

Cow ID	Lact No.	Breed	EBI (€)	Milk (€)	Fert (€)	Calv (€)	Beef (€)	Health (€)	SIRE	DAM SIRE
1057		MOxHO	114	37	68	3	7	-1	ILZ	LTA
1061		HOxFR	123	60	55	17	-8	-2	RMW	HZO
1066		HOxFR	127	74	60	-1	-5	-1	KNW	MGX
1068		HOxFR	133	66	46	29	-3	-4	HFL	BWZ
1069		HOxMO	134	66	57	22	-7	-3	RMW	BWZ
1070		HOxMO	127	38	68	17	4	1	ILZ	KLA
1076		HOxFR	112	51	64	4	-7	1	KNW	MGX
1078		HOxFR	132	61	54	22	-4	0	HFL	HZO
1079		HOxMO	107	29	64	7	8	-1	ILZ	MBH
1080		HOxFR	106	68	42	3	-7	-1	KNW	MGX
1081		HOxFR	95	56	35	17	-8	-5	RMW	KIJ
1083		HOxMO	104	16	78	7	6	-2	ILZ	ESZ
1087		MOxHO	100	44	46	8	7	-4	ILZ	NHS
1088		MOxHO	79	22	45	8	3	1	ILZ	JOS
1089		HOxFR	123	55	52	22	-3	-4	LLY	RUU
1090		HOxFR	149	61	62	29	-1	-2	HFL	RHU
1091		HOxFR	156	76	73	24	-13	-3	KNW	UYC
1092		HOxFR	118	62	64	6	-13	-1	KNW	DEC
1093		HOxFR	120	76	49	-1	-5	1	KNW	MGX
1098		HOxFR	126	73	37	22	-5	-1	GZR	UYC
1108		HOxFR	122	45	64	25	-9	-3	GVV	UYC
1113		HOxFR	121	59	65	9	-11	-2	KNW	ESZ
1116		HOxFR	145	52	82	22	-5	-5	KNW	ILZ
1119		HOxMO	117	36	62	21	-5	2	AAP	RUU
1121		HOxFR	111	46	48	20	-3	0	HNI	MBH
1124		HOxFR	101	60	32	11	-4	2	HNI	MFX
1132		HO	139	66	47	26	1	-2	RDU	DRH
1136		HOxMY	89	50	22	21	-4	-1	CXC	ENM