Development of an efficient milk production profile of the Irish dairy Industry

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1 Summary

Fluctuation around milk price will be the biggest factor that the dairy industry will experience over the next number of years. This fluctuation is being driven by fluctuation on the world dairy markets. In the past, when intervention was a much bigger feature of the CAP regime, the fluctuation in world markets had little effect on the EU price. This was because the Intervention system bought product from the market when prices were depressed and placed products on the world market when the price rose. This in effect meant that the CAP regime was having a regulatory effect on the world market as well as the EU markets. An example of the type of fluctuation observed on the world market can be gleamed from the Fonterra milk price in 2006-2007 ($4.50/kg (MS) milk solid) versus 2007-2008 ($7.90/kg MS). This corresponds to a 76% increase in price in 1 year. For the Dairy Industry in Ireland to prosper under these conditions all sectors will be required to be as efficient as possible from the farm, processing and marketing sectors. This report deals with; (1) Milk payment (2) Optimum milk production systems and (3) Seasonality of milk supply.

(1) Milk payment systems in Ireland currently do not adequately reward high solids quality milk. Virtually all milk payment systems include a positive constant which reward the production of volume rather than the production of protein and fat kilograms. The A+B-C system of milk payment would adequately reward the production of protein and fat while at the same time correcting for the volume related processing costs.

(2) Optimum systems of milk production will be built around the maximization of grass utilization in the future. Grazed grass is the cheapest feed that can be fed to dairy cows. Stocking rates nationally are 1.74cows/Ha around the milking platform and therefore when dairy farms are expanding they should do so by increasing stocking rate. The inclusion of supplementary feeds will reduce profitability for the vast majority of dairy farmers and could only possibly lead to increases in profitability when coupled increases in stocking rate.

(3) Grass based systems while substantially reducing costs at farm level result in a seasonal milk supply profile. This results in a reduced capacity utilization of the milk processing facilities as well as restricted product port folio. However the production of Winter milk will lead to significant cost increases at farm level and should only be encouraged if the specific product produced would be sufficient to cover the additional costs associated with over winter production. Within spring calving systems milk payment systems should be used to encourage an efficient milk supply profile with a mean compact calving date of mid February.

2 Milk payment System

Irish milk production has been controlled by milk quotas since 1984. The EU Commission now have a view that milk quotas are constraining the development of an efficient European dairy industry. The Commissions have stated that milk quotas will end on 1st April 2015. As part of the EU commission Health Check milk quotas will be increased by 9.3% between 2007 and 2013, which will pave the way for the full removal of milk quotas by 2015. These changes in policy at EU level will also result in reduced market support for commodity type products of which the Irish dairy industry produces a large proportion.

FAPRI-Ireland analysis has shown that Irish milk supply could be increased by almost 60% using existing resources on dairy farms which concur with Teagasc surveys carried out across milk processors in Ireland showing that it was possible to increase milk output between 60 and 70%. This increase in milk production will necessitate increased milk processing capacity to deal with peak supply as current capacity is just about adequate to deal with current supply. Any increase in processing capacity will have to be paid for by the dairy farmer in one form or another. One way of increasing the return on any investment in processing capacity is through increasing milk protein and fat concentrations of the milk.

Both the fat and protein content of Irish milk has improved over the last decade, however both are less than the EU 15 (fat 3.73 % v 4.08 %; protein 3.27 % v 3.32 % in 2002), especially compared to countries where a large proportion of milk is utilised for manufacturing. Milk pricing systems have a pivotal role in signaling market values of the individual milk components to the producer. The incentive structure provided by the pricing scheme should promote desirable changes in milk composition and provide opportunities for producers to enhance profitability through the production of more valuable milk. All Irish dairies should move towards an A+B-C milk pricing system, like that adopted by our main competitors Netherlands, Denmark and New Zealand. The Danish volume charge is approximately 7% of the base price while in the Netherlands the volume penalty equates to around 15% of the base price. Given the small proportion of Irish milk sold as fluid, the payment of a positive constant for volume is hard to justify but is present in a large number of payment systems. Furthermore, the inclusion of a positive constant in Irish payment schemes is an undesirable feature as it reduces the value placed on milk solids and thereby diminishes the incentive for increases in fat and protein content by farmers.

Dairy farmer profitability is comprised of receipts for milk and livestock, less the costs associated with producing milk. Approximately 90% of the sales from the farm come from the sale of milk. The price a farmer receives for milk should be directly related to the yield and value of the milk products that can be produced, less the processing costs. Milk pricing systems are a method of communication between the processor and the dairy farmer. Within this communication the processor should provide a clear indication to the farmer of the type of milk required and when it should be supplied. If this communication is functional, and dairy farmers respond to the signals of the processor, both the farmer and the processor should gain substantially. To this end dairy farmers should be rewarded for milk that increases the profitability of the industry (farmer and processor), while at the same time milk that is reducing the profitability of the industry (farmer and processor) should be penalised. The objective of this chapter is to examine the effects of changing the milk pricing systems currently operated by most milk processors in Ireland to a system that rewards dairy farmers for producing milk that will increase the profitability of the industry. This chapter analyses the effect of two areas of milk payment:

2.1 A+B-C
2.2 Ratio of fat to protein

2.1 A+B-C

The A+B-C system (Multi Component Price System, MCPS) of milk payment is used in many countries around the world (e.g. Denmark, Holland, Australia, New Zealand, etc.). This system operates by putting a value on each kg of protein and fat supplied by the farmer to the processor, and subtracting a cost for collection and as well as the volume related processing costs of the milk supplied. This methodology is substantially different to the system currently operated by many of the processors in Ireland. The system operated by many of the processors is the differential milk payment system where each 0.1% change in fat and protein is rewarded while there are no processing costs deducted. Therefore, the increased milk price achieved at farm level for increasing milk solids is less under the Irish milk payment systems when compared to the systems operated using the A+B-C systems. When dairy farmers are not adequately rewarded for increasing milk solids they do not put as much emphasis as they should on it, this ultimately results in increasing costs to the industry as a whole.

The Irish and New Zealand dairy industries are similar in that most milk is seasonally produced, and is primarily used for manufacturing and export. Table 2.1 shows the average milk production and composition per cow for both Ireland and New Zealand. Average milk yield per cow in Ireland is approximately 4,600 kg, containing approximately 339 kg of milk solids (fat and protein), while in New Zealand the average milk yield is 3,987 kg, with 344 kg milk solids. Therefore, for the Irish dairy industry to process a similar level of milk solids per cow as in New Zealand, an extra 613 kg of milk carrier (mostly water plus lactose) must be processed. Based on a volume related processing cost of 4c/l of milk, it is estimated that this additional water costs the Irish dairy industry (farmer and processor) €27/cow or €27 million annually. When the dramatic increases in energy and labour costs observed over the past number of years (CSO 2008) are included, it is clear that the processing and transport costs of milk at processor level have increased sharply in recent times. As these rates of energy costs increase (oil from $15 a barrel in 2002 to $140 in mid 2008), the costs associated with processing milk in the future will continue to increase and the potential benefit of moving to a system that rewards high solids milk, thereby reducing the volume of water for a given level of product, will be even more beneficial.

Table 2.1 Milk yield, protein %, fat % and milk solids yield per cow per year in Ireland and in New Zealand

	Milk Yield kg	Protein %	Fat %	Milk solids kg
Ireland	4,600	3.34	3.82	339
New Zealand	3,987	3.70	4.68	344

(CSO 2008; DairyNZ 2008)

The value of A (kg/protein, €/kg), B (kg/fat, €/kg) and C (the costs to process a litre of milk, €/litre) are specific to each processor. They are dependent on the product portfolio of the processor, the margin for the products produced and the costs associated with processing one litre of milk. The C component of the milk payment may differ between processors for varying reasons. Berry et al., (2004) reviewed total milk processing costs in Ireland in 2004 and showed that the average costs of processing milk were 5.92c/l. In all cases the total costs of processing milk should not be included when developing an A+B-C system; only the volume related processing costs should be included. The proportion of the processing cost included in the milk price has a large effect on the benefits gained or not from increasing milk solids. Milk processors should include the costs associated with milk transportation, milk assembly, standardization and a proportion of the processing costs.

2.1.1 Effect on milk price

Milk payment systems in operation in Ireland are currently based on the differential system or derivatives of the differential system where each 0.1% increase or decrease the price of milk to a certain extinct. A second system used by some processors is the payment of a flat rate on a portion of the milk price in combination with a differential payment system, resulting in a lower differential values for fat and protein. Analysis was carried out to determine what the effect of payment system was on overall milk price and milk receipts. Three systems of milk payment were compared across the average, highest 10% total solids and lowest 10% total solids on milk price and overall milk receipts of a large group of suppliers (9,186) with 2.3billion litres of milk. The three systems were set up so that the milk receipts were the same across milk payment systems at the average milk solids percentage of the 9,186 farmers, therefore the systems was price neutral at processor level. The components of the milk pricing systems are shown below:

(1) Differential pricing system where a
 0.1% change in fat in 0.25c/l
 0.1% change in protein 0.45c/l

(2) Differential pricing system with a
 constant figure of 7.0c/l
 0.1% change in fat in 0.178c/l
 0.1% change in protein 0.321c/l

(3) MCPS with a c of 5.92c/kg
 1 kg of fat valued at 310c/kg
 1 kg of fat valued at 559c/kg

Table 2.1.1 The effect of three alternative milk pricing systems on milk price with milk of varying compositions of fat and protein content.

	Average	Highest Total Solids 10%	Lowest Total Solids 10%
Protein %	3.32	3.47	3.18
Fat %	3.81	4.05	3.59
Milk price differential (c)	25.77	27.10	24.51
Milk price differential with constant (c)	25.77	26.72	24.87
Milk price (MCPS) A+B-C (c)	25.77	27.31	24.20

Table 2.1.1 shows the average protein and fat percentage of the group of suppliers as well as the lowest 10% and highest 10% of total milk solids concentration. The average of the group had a protein percentage of 3.32% and a fat percentage of 3.81%, while the 10% lowest group had a protein content of 3.18% and a fat percentage of 3.59% and the 10% highest solids group had a protein percentage of 3.47% and a fat percentage of 4.05%. These differences have a large effect on milk price irrespective of the method of payment. There is a 2.59c/l, 1.85c/l and a 3.11c/l difference between the highest and lowest groups with the differential, differential plus a constant and the A+B-C systems of milk payment, respectively. The highest milk price with high total solids is achieved with the A+B-C system, while at the same time the lowest milk price is achieved with the A+B-C system with the lowest total solids group. The differential milk payment system is intermediate with the differential plus a constant milk payment system paying the lowest for high solids milk while at the same time paying the highest for low solids milk. Therefore, within the current milk payment systems increasing total milk solids is not adequately being rewarded by the differential system or the differential plus a constant system of milk payment.

2.1.2 Effect on milk receipts

The effect of an A+B-C system of milk payment on Irish milk producers milk receipts was calculated using data from 9,186 suppliers that supplied over 2.3billion litres of milk to various Irish processors in 2005. The A+B-C system of milk payment was compared to the payment system being used by the processors currently. The ratio of the value of protein to fat was not altered. The analysis was carried out with two different C values reflecting either the inclusion of total processing costs (5.92 c/l) or the inclusion of volume related processing costs at (4.0 c/l). The analysis was carried out to demonstrate the effect on each individual supplier within the group. The suppliers were then grouped into categories based on the gains or losses that were achieved at farm level.

Table 2.1.2 The effect of an A+B-C system of milk payment on milk suppliers at two different C levels when compared to the differential milk payment system

	€	Processing Costs 4.0c/l		Processing costs 5.92c/l	
		Gain/ Loss Number	Gain/ Loss %	Gain/ Loss Number	Gain/ Loss %
Loss	5,000-6,000	-	-		-
Loss	4,000-5,000	-	-	1	0.0
Loss	3,000-4,000	1	0.0	3	0.0
Loss	2,000-3,000	3	0.0	11	0.1
Loss	1,000-2,000	37	0.4	128	1.4
Loss	750-1,000	67	0.7	159	1.7
Loss	500-750	200	2.2	471	5.1
Loss	0-500	4,848	52.8	4,397	47.9
Gain	0-500	3,552	38.7	3,147	34.3
Gain	500-750	279	3.0	407	4.4
Gain	750-1,000	98	1.1	205	2.2
Gain	1,000-2,000	78	0.9	207	2.3
Gain	2,000-3,000	15	0.2	27	0.3
Gain	3,000-4,000	6	0.1	13	0.1
Gain	4,000-5,000	3	0.0	7	0.1
Gain	5,000-6,000	-	-	1	0.0
Gain	6,000-7,000	-	-	1	0.0
Gain	>10,000	-	-	2	0.0

The analysis shows that when the A+B-C systems with a C value of 4.0c/l is compared to the differential milk pricing systems, 91.5% of suppliers are within the losing €500 to gaining €500 category. Both the losers and those gaining from the system are spread evenly. There are a small number of people that lose up to €4,000 and there are a small number of producers that gain up to €5,000. When the same exercise is completed with a C value of 5.92c/l the variation between winners and losers is higher. There are now 82.2% of producers in the losing €500 to gaining €500 category less than when the C value was lower. There are also higher numbers of producers gaining and losing higher amounts of money with the higher C value.

Table2.1.3 The effect of an A+B-C system of milk payment on milk suppliers at two different C levels when compared to the differential plus a constant milk payment system.

	€	Processing Costs 4.0c/l		Processing costs 5.92c/l	
		Gain/ Loss Number	Gain/ Loss %	Gain/ Loss Number	Gain/ Loss %
Loss	>8,000	0	-	0	-
Loss	7,000-8,000	1	0.0	3	0.0
Loss	6,000-7,000	2	0.0	0	-
Loss	5,000-6,000	1	0.0	4	
Loss	4,000-5,000	8	0.1	10	0.1
Loss	3,000-4,000	22	0.2	33	0.4
Loss	2,000-3,000	78	0.8	138	1.5
Loss	1,000-2,000	557	6.1	704	7.7
Loss	750-1,000	424	4.6	497	5.4
Loss	500-750	803	8.7	798	8.7
Loss	0-500	3,286	35.8	2,997	32.6
Gain	0-500	2,371	25.8	2,177	23.7
Gain	500-750	495	5.4	499	5.4
Gain	750-1,000	338	3.7	353	3.8
Gain	1,000-2,000	576	6.3	655	7.1
Gain	2,000-3,000	139	1.5	194	2.1
Gain	3,000-4,000	37	0.4	57	0.6
Gain	4,000-5,000	14	0.2	27	0.3
Gain	5,000-6,000	9	0.1	8	0.1
Gain	6,000-7,000	10	0.1	6	0.1
Gain	7,000-8,000	8	0.1	13	0.1
Gain	>10,000	4	0.0	9	0.1

The analysis shows that when the A+B-C system with a C value of 4.0c/l is compared to the differential plus a constant milk pricing system, 61.6% of suppliers are within the losing €500 to gaining €500 category. This compares to a figure of 91.7% of producers in this category when the differential system was compared to the A+B-C system. Again winners and losers between the two milk payment systems are relatively evenly spread. However, the spread in milk receipts is substantially wider than when compared to the differential system. There are larger numbers of suppliers losing and gaining larger amounts of money than is the case when the differential systems are compared to the A+B-C systems. When the same exercise is completed with a C value of 5.92c/l the variation between winners and losers is again higher, similar to when the exercise is completed with the differential system. There are now 56.3% of producers in the losing €500 to gaining €500 category. There are also higher numbers of producers gaining and losing larger amounts of money with the higher C value.

The majority of the milk payment systems in Ireland currently operate through a differential system. This analysis has shown that the A+B-C system of milk payment will not have a dramatically negative impact on milk price for a large proportion of suppliers when compared to the differential milk payment systems. When the A+B-C system of milk payment is compared to the differential plus a constant system there are larger numbers of suppliers gaining and losing larger amounts of money than when compared to the differential system.

2.2 Ratio of protein to fat

The EU Commission has implied that further reform of the EU internal market is likely. This may include abolishing export refunds as offered in the WTO negotiations. The export refunds for butter were reduced from €950/tonne to zero in early 2007 on the back of the market buoyancy even though they were projected to remain at €950/tonne. Based on the butterfat and protein price differential paid by Irish processors, the average protein to fat ratio averages 1.8 and varies from 1.1 to 2.2 (Simms and Thompson, 2006). Based on USDA quotations, Oceania World Prices currently value protein at a ratio of 2.9 more than butterfat, while European World Prices value protein at 3.3 times more than butterfat. FAPRI projections for world prices in 2015 suggest a price differential of 2.6 (Simms and Thompson, 2006). Therefore, to reflect these changes Irish milk payment systems in the future will require a greater differential between protein and fat.

Within any milk pricing system the value of 1kg of protein and 1kg of fat must be related to the market returns that are achievable from the products of these constituents. Therefore, there may be large differences in the value of 1kg of protein versus 1kg of fat between processors based on their product portfolio. A recent study carried out by Simms and Thompson (2006) showed that the milk payment systems operated in Ireland vary substantially in relation to the ratio of fat to protein and the value not attached to protein and fat. Table 2.2.1 shows that the value of a 0.1% change in protein relative to fat changes from 1.1 to 1 in Newmarket Co-op to the highest differential of 2.5 to 1 in Centenary Thurles Co-op. The review carried out by Simms and Thompson also highlighted the fact that all except two processors (Bandon Co-op and Tipperary Co-op) had a positive payment on volume within their milk pricing systems. This payment ranged from a positive 6.8c/l in Lakeland Dairies to a negative 1.9c/l in Tipperary Co-op. However since this report, Lakeland, Glanbia and Dairygold have moved to the A+B-C payment systems.

Table 2.2.1 Summary of the milk payment systems operated in Ireland (review of milk payment systems carried out by Simms and Thompson in September 2006).

	Butterfat Adj per 0.1%	Protein Adj per 0.1%	Protein to Fat Ratio	Implied Milk Price	Actual Milk Price	Implied Adjustment
Dairygold	0.28	0.46	1.6	25.3	26.70	1.4
Kerry	0.25	0.49	2.0	25.2	26.70	1.5
Newmarket	0.34	0.37	1.1	24.5	26.65	2.2
North Cork	0.3	0.4	1.3	24.0	26.65	2.7
Bandon	0.25	0.56	2.2	27.5	26.35	-1.1
Centenary Thurles	0.2	0.5	2.5	23.7	26.00	2.3
Tipperary	0.25	0.56	2.2	27.5	25.60	-1.9
Wexford	0.27	0.46	1.7	24.9	25.50	0.6
Lakelands	0.17	0.37	2.2	18.3	25.14	6.8
Arrabawn	0.29	0.4	1.4	23.6	25.02	1.4
Glanbia	0.25	0.46	1.8	24.2	24.60	0.4
Connacht Gold	0.24	0.4	1.7	21.8	24.25	2.4

The relative value of protein to fat has been historically lower within the EU when compared to countries trading on the World market without price support (e.g. Australia and New Zealand). This was largely because in the past there were high levels of support for butter within the EU through intervention, export refunds, etc. However, this support for butter fat has reduced substantially (-25%) in recent times as a result of the Luxembourg Agreement, and is projected to reduce further if export refunds are abolished as part of the World Trade Organisation (WTO) Agreement. The world market ratio could possibly be the best indicator of where the value of protein will lie relative to fat in the future within Europe when the support on fat is reduced. Simms and Thompson 2006 (Table 2.2.2) compared the current EU and world price ratios with possible future ratios as a result of the reform of EU CAP policy and the reform of the WTO Agreement. The results show that the ratio of protein to fat is running between 2.6 and 3.0 at world level while within the EU it is between 1.5 and 1.9. The report shows that if the support for butter was reduced by a further 10% the ratio would be 2.0 to 1.0, while if it was reduced a further 25% the ratio would be 2.7 to 1.0.

Table 2.2.2 Summary of the relative value of protein to fat under various scenarios.

		Relative Value of Milk in %		Ratio of Value per 1kg	
		Fat	Protein	Fat	Protein
USDA[1] Oceania World Price	Current	0.27	0.73	1	2.9
USDA Europe World Price	Current	0.25	0.75	1	3.3
USDA Europe World Price	2015f	0.29	0.71	1	2.6
US Domestic Price	Current	0.43	0.57	1	1.5
US Support Price	Current	0.41	0.59	1	1.6
US Support Price	Jan-00	0.23	0.77	1	3.8
EU 2000	2000	0.42	0.58	1	1.5
EU MTR[2]1	Jul-04	0.42	0.58	1	1.5
EU MTR2	Jul-05	0.41	0.59	1	1.6
EU MTR3	Jul-06	0.41	0.59	1	1.6
EU MTR4	Jul-07	0.39	0.61	1	1.7
Future EU Reform (Butter -35%)	2008-2013	0.36	0.64	1	2.0
Future EU Reform (Butter -50%)	2008-2013	0.29	0.71	1	2.7
Official Dutch Quotation	Current	0.37	0.63	1	1.9
IDB[3] Purchase Price	Current	0.37	0.63	1	1.9

[1]United States Department of Agriculture
[2]Mid-Term Review (CAP)
[3]Irish Dairy Board

The effect of changing the ratio of milk payment away from its current 1.8 to 1 was calculated using the same 9,186 suppliers as was used in the analysis of the A+B-C milk payment systems. The A+B-C system of milk payment was compared to the differential system of milk payment to determine the effect of changing the ratio of protein to fat. A processing cost (C) value of 4.0c/l (volume related costs only) was used in this analysis to compare the different ratios. There were 3 different ratios tested based on the Simms and Thompson (2006) report:

2.2.1 Scenarios investigated

Current ratio	1.8 to1.0
35% reduction in support for butter	2.0 to 1.0
50% reduction in support for butter	2.7 to 1.0

Table 2.2.3 shows the effect of the ratio of protein to fat on overall milk receipts. The analysis shows there is little difference in total milk receipts when the current ratio of 1.8 to 1 is compared to 2.0 to 1. In both circumstances there are over 91% of suppliers in the category of losing €500 to gaining €500 when compared to the differential systems. When the ratio is increased from 1.8 to 1.0 to 2.7 to 1 there are more suppliers gaining and losing more than €500. However, there are still over 87% of suppliers within this category, with those that are gaining and losing more than the €500 spread evenly around the winners and the losers. This analysis suggests changing the ratio of protein to fat from its current levels of 1.8 to 1.0 to either 2.0 to 1.0 or 2.7 to 1.0 will not have a large impact on total milk receipts at farm level.

Table 2.2.3 Effect of an A+B-C system of milk payment on milk suppliers at three differing ratios of protein to fat based on current prices and future predictions (current 1.8 to 1.0; future 35% cut in support for butter 2.0 to 1.0; future 50% cut in support for butter 2.7 to 1.0).

		Current1.8 to1.0		2.0 to1.0		2.7 to 1.0	
	€	Gain/ Loss No.	Gain/ Loss %	Gain/ Loss No.	Gain/ Loss %	Gain/ Loss No.	Gain/ Loss %
Loss	>8,000	-	-	-	-	-	-
Loss	7,000-8,000	-	-	-	-	-	-
Loss	6,000-7,000	-	-	-	-	-	-
Loss	5,000-6,000	-	-	-	-	-	-
Loss	4,000-5,000	-	-	-	-	-	-
Loss	3,000-4,000	1	0.0	1	0.0	0	0.0
Loss	2,000-3,000	3	0.0	3	0.0	3	0.0
Loss	1,000-2,000	37	0.4	38	0.4	70	0.8
Loss	750-1,000	67	0.7	71	0.8	110	1.2
Loss	500-750	200	2.2	210	2.3	332	3.6
Loss	0-500	4,848	52.8	4,758	51.8	4,381	47.7
Gain	0-500	3,552	38.7	3,641	39.7	3,731	40.6
Gain	500-750	279	3.0	266	2.9	315	4.4
Gain	750-1,000	98	1.1	99	1.1	139	1.5
Gain	1,000-2,000	78	0.9	73	0.8	87	0.9
Gain	2,000-3,000	15	0.2	17	0.2	11	0.1
Gain	3,000-4,000	6	0.1	3	0.0	3	0.0
Gain	4,000-5,000	3	0.0	1	0.0	1	0.0
Gain	5,000-6,000	0	0.0	1	0.0	0.0	0.0
Gain	6,000-7,000	1	0.0	1	0.0	0.0	0.0
Gain	7,000-8,000	1	0.0	0	0.0	0.0	0.0
Gain	>10,000	0.0	0.0	0.0	0.0	0.0	0.0

2.3 Conclusion

The analysis presented in this paper shows that the milk pricing systems currently in operation in Ireland are not optimum. Processors are not adequately rewarding dairy farmers that produce milk high in fat and protein constituents despite the fact that milk with a high solids content results in reduced processing costs for a given level of product production. High solids milk would ultimately result in increased profitability within the dairy industry for both the farmer and the processor. Differential milk payment systems pay the same milk price for a certain level of milk solids, irrespective of the volume of milk supplied. The MCPS system acts as a double edged sword in that it rewards dairy farmers for producing milk with high solids content, while at the same time penalising farmers for producing milk with a low solids content. The costs to the dairy industry to process the additional water supplied in Irish milk is and will continue to rise, resulting in losses in excess of those currently reported (€27,000,000) when compared to the New Zealand example. If a multiple component pricing system was introduced in Ireland, dairy farmers who seek to increase the potential profitability of their herds by investing in breeding strategies would see greater benefit from their investment. The ratio of protein to fat is going to widen from the current levels as the support for butter in the EU is reduced. The analysis of over 9,000 farmers shown in this paper suggests that for a very large number of farmers there is going to be a small effect on overall milk receipts when the milk payment system changes from the current system to an A+B-C system, and when the ratios of fat to protein change. The overall advantage to the industry as a whole in terms of increased profitability through the removal of expensive water from the system should be the over riding driver for change.

3. Optimal systems of milk production

Grazed grass is the cheapest feed available to Irish dairy farmers (O' Kiely, 1994). Therefore, the milk production system on Irish dairy farms should be largely based on the maximization of this cheap feed i.e. grazed grass. Significant variations exist in grass growth and trafficability of land between different regions in the country. Grass growth in the south of the country extends for over 300 days while in the north of the country grass growth occurs for only 270 days. Studies carried out at Moorepark and Ballyhaise have shown that there is little difference in the total herbage supply between the two sites but there are temporal differences in herbage growth throughout the year. At the Moorepark site which is in the south of the country approximately 23% of the total yearly grass production is obtained from January 1 to May 1 while the corresponding yield at the Ballyhaise site which is in the northern half of the country it is closer to 18%. Similarly from September 1 to December 31, 18% of the total grass production occurs at the Moorepark, while the corresponding value at Ballyhaise is 14%. The other main difference between the north and the south is the feasibility of grazing. The south generally has more free draining type soils than the north, allowing earlier grazing in the Spring and later grazing in the Autumn.

The objective of this study was to determine the optimum systems of milk production for two sites Moorepark and Ballyhaise by comparing three grass based feeding systems i.e. High Grass, High Concentrate and High Maize Silage.

3.1 Methodology used to compare the systems

Data from a three year study carried out at Moorepark comparing three different genotypes under three different feed systems was used for modeling the Moorepark site while an ongoing two year study being carried out at Ballyhaise comparing two groups of cows under two different feed systems was used for modeling data at the Ballyhaise site. The high durability type of cow from the Moorepark study was taken as being similar to the type of cow at Ballyhaise and to the type of cow on most Irish dairy farms. Both the Moorepark site and the Ballyhaise sites were managed based on best practice for the two respective regions with the overall objective of maximizing the amount of grazed grass in the diet (Horan et al., 2004; Horan et al., 2006).

3.2 Maize silage feeding systems

There may be potential to increase milk production by using alternative high quality forage instead of concentrates. Experiments at Moorepark and elsewhere have demonstrated the potential of maize silage to increase intake and milk production, or alternatively to reduce the requirement for concentrate supplementation. Therefore, in a scenario of expanding milk production, purchased maize silage is considered as an alternative to purchased concentrate in terms of its effect on farm profitability. The costs associated with maize silage were based on a utilizable yield of 12.5 tonnes DM/ha, with plastic used at the Ballyhaise site (Kavanagh, 2003). In the analysis a response of 0.35 kg of milk per kg of Maize silage DM was assumed based on experiments at Moorepark. Based on this assumption a high Maize silage system was evaluated for both the Moorepark (MHM) and Ballyhaise (BHM) sites.

3.3 Economic scenarios investigated

Four milk production scenarios were investigated at both sites:

1. EU milk quota applied at farm level where the consequence of higher milk (fat adjusted) production necessitated a reduction in cow numbers (S1). Therefore, the purchase of milk quota was not possible.
2. EU milk quota applied at industry level (quota purchasing possible) with fixed cow numbers (S2). Therefore, additional milk quota could be purchased but milk output could only be increased through increasing milk yield per cow with additional feeds.

3. EU milk quota applied at industry level (quota purchasing possible) with a fixed land base (S3). Therefore, additional milk quota could be purchased and cows could be expanded up to a point where land became limiting.
4. EU milk quota applied at industry level (quota purchasing possible) with land available for expansion (S4). Therefore, additional land could be rented, additional milk quota purchased and cow numbers increased. For the purpose of this analysis, expansion to the S3 level of milk sales was assumed.

Quota was purchased at a cost of €0.153 c/l (€0.70/gallon), which was financed over 5 years with the interest and capital considered an expense.

Table 3.3.1 shows the key assumptions used in the farm model for the four scenarios modeled. The overall farm size in the model was 29.5 ha, with deficits and surpluses of land valued at an opportunity cost of €262/ha. The model farm was assumed to have a milk quota of 323,327l (71,120 gallon). All costs and prices were based on projections from FAPRI in a post decoupling era (Binfield et al., 2003). Concentrate cost was assumed to be €180/t at Moorepark and €205/t at Ballyhaise. The differences in concentrate costs were based on regional data from Monitor Farms. No cost was associated with the first 1.1 labour units, while any extra labour was considered as an expense and charged at €12.37 per hour. Farm net profit included total receipts less total costs. It was assumed that there were 50 cow places available on the farm and when cow numbers increased over 50 conventional housing was constructed at a cost of €1,590 per cow. The cost of purchasing additional cows was financed over a 5-year period with the interest portion of the loan considered an expense.

Table 3.3.1: Assumptions used in the model farm.

	Moorepark	Ballyhaise
Farm size (ha)	29.5	29.5
Quota (kg)	323,327	323,327
Reference fat (g/kg)	36	36
Gross milk price (c/kg)	22.3	22.3
Price protein to fat	2.00	2.00
Replacement Heifer price (€)	1,397	1,397
Reference cull cow price (€)	270	270
Reference male calf price (€)	102	102
Labour cost per unit (€/month)	1,905	1,905
Concentrate costs (€/tonne)	180	205
Opportunity cost of land (€/ha)	262	262
No. of Cow places on the farm	50	50
Concentrate Cost (€/tonne)	180	205
Maize Silage Cost (€/tDM)	105	120

At both the Moorepark and the Ballyhaise sites, the MHG and BHG in S1 scenario were used as the control systems respectively i.e. each other system was compared to this system. Therefore at both sites, it was possible to investigate the economic consequences of opting for a higher concentrate or a high maize supplementation system under a variety of scenarios.

3.4 Results

3.4.1 Biological

Table 3.4.1 shows the milk production, liveweight, replacement rate and overall feed budget for the Moorepark and Ballyhaise sites. Milk yield was highest in the MHC system and was lowest in the MHG system. The response to increasing the level of concentrate supplementation at the Moorepark site (i.e. going from the MHG to the MHC system) was approximately 1.04 kg of milk per kilogram of extra concentrate, while at the Ballyhaise site it was 0.74 kg of milk per kilogram of additional concentrate (i.e. going from the BHG to the BHC system). Milk protein concentration was highest at the Moorepark site, while milk fat concentration was highest at the Ballyhaise site. Seventy percent of the diet of the MHG system is composed of grazed grass while only 57% in the MHC system. The corresponding figures for Ballyhaise are 61% in the BHG and 50% in the BHC. The level of grass silage supplementation in both of the Ballyhaise systems were greater than both of the Moorepark systems as a result of the shorter grazing season.

Table 3.4.1: Milk production, liveweight, replacement rate, feed budget and the proportions of each feed in the diet for Moorepark and Ballyhaise feeding systems

	MHG	MHC	BHG	BHC
Milk Production				
Milk (kg/cow)	6,143	7,229	6,389	6,894
Fat (g/kg)	40.2	40.4	42.3	45.5
Protein (g/kg)	34.7	35.0	33.0	32.8
Lactose (g/kg)	46.8	46.8	45.3	45.6
Average live-weight (kg)	539	549	539	549
Feed Budget (kg DM/cow)				
Grass DM intake	3,679	3,313	3,372	3,020
Silage DM intake	1,288	1,174	1,554	1,678
Concentrate DM intake	309	1358	604	1291
Proportions of total DM				
Grass	0.70	0.57	0.61	0.50
Silage	0.24	0.20	0.28	0.28
Concentrate	0.06	0.23	0.11	0.22

3.4.2 Economic Analysis

The Moorepark Dairy Systems Model (Shalloo et al., 2004), which is a stochastic budgetary simulation model, was used to simulate the model farms by integrating biological and financial data from each site. Table 3.4.2 shows the key herd output parameters from the model for the Moorepark site for each of the four scenarios and for each of the three feeding systems.

Where milk quota was fixed (S1) the farm profit from the MHG system was €2,617 and €1,279 more than the MHC and the MHM systems respectively. The margin per cow was highest with the MHC system and lowest with the MHG system, while margin per kilogram was highest for the MHG system.

Where milk quota purchasing was possible and cow numbers were fixed (S2) the MHG system returned €1,079 and €503 higher farm profit than the MHC and the MHM systems, respectively, when the additional labour was charged. If the additional labour was not charged then there was an advantage of €3,086 and €994 to the MHC and MHM systems, respectively.

Where milk quota purchasing was possible and land was limiting (S3) the MHG system was €770 more profitable than the MHC, while it was €137 less profitable than the MHM system, when additional labour was charged. If the extra labour was not charged then there was an advantage of €5,662 and €6,432 to MHC and MHM systems respectively. In the MHC and MHM systems, 82,724 and 81,251kg (17,672 and 17,357 gallons) of additional milk quota were purchased over the MHG system.

Where milk quota purchasing was possible and land was available for expansion (S4) (a similar amount of quota was purchased as in S3) the MHG system returned €931 more farm profit than the MHG system in the S1 scenario or €7,277 where extra labour was not charged.

Table 3.4.2: Key herd output parameters at the Moorepark site in a fixed quota scenario (S1), in a scenario with fixed cow numbers and quota leasing (S2), in a of limited land area with quota leasing (S3) and in a scenario where land is available (S4) for a high grass (MHG), high concentrate (MHC) and high maize silage (MHM) system.

	S1			S2		S3		S4
	MHG	MHC	MHM	MHC	MHM	MHC	MHM	MHG
Milk Price	24.0	24.5	24.2	24.5	24.2	24.5	24.2	24.0
Total hectares used	19.6	15.3	15.4	18.1	16.4	19.6	19.6	24.9
Quota lease (kg)	-	-	-	53,562	19,257	82,724	81,251	81,308
# Cows calving	49.4	41.9	46.4	49.4	49.4	53.5	59	62.8
Livestock units (LU)	46.3	39.3	43.5	46.3	46.3	50.2	55.3	58.9
Stocking rate (LU/ha)	2.37	2.57	2.82	2.57	2.82	2.57	2.82	2.37
Milk produced (kg)	306,806	302,688	305,158	357,127	324,762	386,767	387,873	389,667
Milk sales (kg)	301,055	297,815	299,755	351,376	319,012	380,539	381,006	382,362
Fat sales (kg)	11,990	12,027	12,005	14,190	12,777	15,368	15,259	15,228
Protein sales (kg)	10,328	10,420	10,340	12,294	11,004	13,314	13,142	13,118
Milk returns (€)	72,378	72,957	72,491	86,078	77,148	93,222	92,140	91,926
Livestock sales (€)	13,586	11,513	12,764	13,584	13,584	14,712	16,224	17,255
Feed costs per kg milk	3.74	5.62	4.76	5.62	4.76	5.63	4.76	3.74
Total costs (€)	55,382	56,506	55,992	70,159	60,697	78,121	77,700	77,755
Margin per cow (€)	619	668	631	597	609	557	521	502
Margin per kg milk (cents)	9.97	9.24	9.60	8.27	9.26	7.71	7.92	8.08
Single Farm Payment (€)	-	-	-	-	-	-	-	-
Labour Costs (€)	-	-	-	4,165	1,497	6,432	6,295	6,346
Farm Profit (€)	30,582	27,965	29,303	29,503	30,079	29,812	30,719	31,513

Table 3.4.3 shows the effect of variation in concentrate costs and the effect of the concentrate price (c/kg) to the milk price (c/kg) ratio on farm profitability for the Moorepark site. The analysis shows that concentrate cost would have to reduce to approximately €115, €160, and €155 /tonne in S1, S2 and S3 scenarios respectively before the MHC system was more profitable than the MHG system. Where milk quota purchasing was possible and land was available for expansion (S4), the MHG system is more profitable than the MHC (S3) system when concentrate cost was higher than €140/tonne.

Table 3.4.3: Variation in concentrate costs on farm profitability for different milk production scenarios at the Moorepark site.

		S1		S2	S3	S4
Concentrate Price	Conc Milk price Ratio	MHG	MHC	MHC	MHC	MHG
Base - €60/tonne	0.67	31,573	31,546	33,729	34,390	32,773
Base - €40/tonne	0.76	31,243	30,352	32,320	32,864	32,353
Base - €20/tonne	0.85	30,912	29,158	30,911	31,338	31,933
€180/tonne	0.94	30,582	27,965	29,503	29,812	31,513
Base + €20/tonne	1.04	30,252	26,770	28,094	28,287	31,093
Base + €40/tonne	1.13	29,921	25,576	26,685	26,761	30,674
Base + €60/tonne	1.22	29,591	24,382	25,276	25,235	30,254

Table 3.4.4 shows the key herd output parameters from the model for the Ballyhaise site for each of the same four scenarios (S1, S2, S3, S4) and for each of the three feeding systems (BHG, BHC, BHM).

Where milk quota was fixed (S1) the farm profit from the BHG system was €4,709 and €1,521 more than the BHC and the BHM systems respectively. The margin per cow was highest with BHG while margin per cow and margin per kilogram were lowest with the BHC system.

Where milk quota purchasing was possible and cow numbers were fixed (S2), the BHG system returned €3,602 and €1,095 higher farm profit than the BHC and BHM systems respectively, when the additional labour was charged. In the BHC and the BHM systems 42,061 and 14,996kg (8,985 and 3,203gallons) of additional milk quota were purchased, respectively.

Where milk quota purchasing was possible and land was limiting (S3) the BHG system was €3,103 and €599 more profitable than the BHC and BHM systems respectively, when additional labour was charged. In the BHC and BHM systems 62,055 and 69,659kg (13,256 and 14,881gallons) of additional milk quota were purchased over the BHG system.

Where milk quota purchasing was possible and land was available for expansion (S4) (a similar amount of quota was purchased as in S3) the BHG system returned €646 more farm profit than the BHG system in the S1 scenario or €6,101 extra profit where extra labour was not charged.

Table 3.4.4: Key herd output parameters at the Ballyhaise site in a fixed quota scenario (S1), in a scenario with fixed cow numbers and quota leasing (S2), in a of limited land area with quota leasing (S3) and in a scenario where land is available (S4) for a high grass (BHG), high concentrate (BHC) and high maize silage (BHM) system.

	S1			S2		S3		S4
	BHG	BHC	BHM	BHC	BHM	BHC	BHM	BHG
Milk Price	24.1	24.7	24.1	24.7	24.1	24.7	24.1	24.1
Total hectares used	19.4	15.7	15.8	18.2	16.6	19.4	19.4	24.1
Quota lease (kg)	-	-	-	42,061	14,996	62,055	69,659	69,601
# Cows calving	45.7	39.5	43.4	45.7	45.7	48.5	54	56.8
Livestock units (LU)	42.9	37.0	40.7	42.9	42.9	45.6	50.7	53.3
Stocking rate (LU/ha)	2.22	2.35	2.59	2.35	2.59	2.35	2.59	2.22
Milk produced (kg)	292,020	272,274	291,225	315,058	306,486	335,395	362,114	362,912
Milk sales (kg)	286,700	267,677	286,170	309,738	301,166	329,732	355,828	356,301
Fat sales (kg)	12,126	12,196	12,129	14,112	12,765	15,023	15,082	15,069
Protein sales (kg)	9,500	8,797	9,491	10,180	9,989	10,837	11,802	11,806
Milk returns (€)	69,010	66,168	68,990	76,565	72,604	81,508	85,782	85,764
Livestock sales (€)	12,568	10,860	11,942	12,567	12,568	13,378	14,849	15,619
Feed costs per kg milk	4.78	6.55	5.34	6.55	5.78	6.55	5.78	4.78
Total costs (€)	56,223	56,383	57,098	67,379	60,904	72,341	75,875	75,340
Margin per cow (€)	555	523	549	476	531	459	458	459
Margin per kg milk (cents)	8.69	7.58	8.19	6.91	7.91	6.66	6.83	7.17
Single Farm Payment (€)	-	-	-	-	-	-	-	-
Labour Costs (€)	-	-	-	3,054	1,164	4,515	5,416	5,412
Farm Profit (€)	25,355	20,646	23,834	21,753	24,260	22,252	24,756	26,044

Table 3.4.5 shows the effect of variation in concentrate costs and the effect of concentrate price (c/kg) to milk price (c/kg) ratio on farm profitability for the Ballyhaise site. Table 3.4.5 shows that the BHC system is less profitable than the BHG system, even at a concentrate cost of less than €145/tonne in the S1, S2 and S3 scenarios, respectively. When land area for grazing is available with quota purchasing (S4), the BHG system is more profitable until concentrate cost is reduced to €115/tonne when compared to the BHC system in S3.

Table 3.4.5 shows the effect of variation in concentrate costs on the profitability of the high and low input systems for Ballyhaise.

		S1		S2	S3	S4
Concentrate Price	Conc Milk price Ratio	BHG	BHC	BHC	BHC	BHG
Base - €60/tonne	0.55	27,092	23,839	25,447	26,175	28,210
Base - €40/tonne	0.64	26,513	22,774	24,216	24,866	27,482
Base - €20/tonne	0.73	25,935	21,710	22,985	23,559	26,763
€205	0.83	25,355	20,646	21,753	22,259	26,044
Base + €20/tonne	0.92	24,777	19,582	20,522	20,945	25,324
Base + €40/tonne	1.01	24,199	18,518	19,290	19,639	24,605
Base + €60/tonne	1.10	23,620	17,454	18,059	18,332	23,886

3.5 Implications

It has been shown from previous studies that dairy farmers need to expand and/or increase the efficiency of their dairy operation to maintain their real farm incomes over the coming years (Breen and Hennessey 2003). It is likely that land purchase price will continue to be high in future years. Dairy farmers can continue at their current level of production and efficiency, and suffer a decline in farm profit as milk price falls. It is likely that greater amounts of milk quota will become available in the coming years as a result of the reform of CAP; therefore many dairy farmers will have the option to increase production. Expansion opportunities will be limited by key constraints such as labour supply and cost, capital cost, milk quota availability and price and availability of land around the milking parlour. Labour efficient work practices will have to be adopted on farms to allow one operator to manage a higher number of cows. All expansion options will have to be based on low cost capital structures. The most profitable spring milk production system in both the Moorepark and Ballyhaise environments (in both a milk quota and non quota scenario) is one where grazed grass is maximised in the diet. The profitability of systems of milk production based on high concentrate /high maize silage systems will be very much influenced by milk: supplement price ratios as well as potential increases in stocking rate when these feeds are introduced into the system. Present day concentrate prices and projected future milk prices suggest there is very little to be gained financially by changing to a high concentrate/high maize silage feeding system, when full labour is included in the analysis. The large difference in farm profit between the Moorepark and the Ballyhaise sites emphasizes the importance of the length of the grazing season. In all the analyses carried out, grazing management was at the same level of efficiency in all three feeding systems (high grass, high concentrate and high maize). This may not be the case on most dairy farms because generally grazing efficiency reduces in high supplementation situations, especially with forage supplementation. On farms limited by land availability, options to increase the cow stocking rate through increasing cow numbers and moving off none milk producing animals first followed by developing strategies to increase the grazable area should be investigated before looking at high input systems.

4.0 Spring versus Winter milk production

4.1 Introduction

Ireland has enjoyed a competitive advantage within the EU due to its grass-based seasonal calving system. Grazed grass is the lowest cost feed available and in Ireland can make up a large proportion of the lactating cow diet (> 90%) over a 10-month grazing season. For climatic reasons most regions in the EU have a much shorter grazing season (~six months) which increases the requirement for both concentrate supplementation and conserved forages as part of the feeding systems. The comparative advantage of seasonal spring calving milk production systems are much greater in Ireland than other EU countries and therefore the incentive required to ensure all-year-round milk supply in Ireland is higher. Compact spring-calving systems of milk production result in highly seasonal milk supply patterns and this constricts the ability of the industry to produce certain products that require year around milk supply. Compact spring-calving systems also results in higher milk processing costs because of poor processing capacity utilization.

Approximately 85% of milk production in Ireland is produced for the manufacturing industry, which mainly goes into the development of commodity type products (butter, skim milk powder, etc.). There is a requirement for some milk to be produced out of season for the fluid milk market and specific markets that some processors have for specific products. Some of these products have the greatest demand for milk out of season such as cream for Baileys whose greatest volume requirement is in the November/ December period. On the other hand products such Jarlsberg cheese have an even requirement for milk right throughout the year. The vast majority of Processors have various schemes for the production of both liquid and winter milk which change on a regular basis. However at farm level the milk production system adopted must be the one that delivers the most profit for the farm whether that is based on spring, liquid or winter milk production. The optimum system of milk production may be different in different regions of the country, where there is a different level of milk quota available per hectare, where there are differences in land quality and with the operation of differing liquid or winter milk bonus schemes.

Ireland's predominantly seasonal spring calving milk production system has a number of implications for the dairy industry:

4.2 Milk supply profiles
4.3 Calving pattern and management
4.4 Product mix and plant utilization efficiency
4.5 Influence of seasonality on milk process ability
4.6 Future milk pricing systems

Each of these areas will be discussed in relation to Spring and Winter milk production

4.2. Milk supply profiles

The pattern of intake of milk supplies nationally on a monthly basis over the past 30 years is shown on Table 4.2.1. Peak month (May) accounts for 14 to 15% of the total, while the trough month (January/December) accounts for 2 to 3%. The proportion of milk produced in the peak month reduced from approximately 15.5% in 1975 to 14% in 2005. Up until EU milk quotas were introduced the proportion of milk supplied in the January to March period increased from approximately 10% in 1975 to 16% in 1985; since then it has reduced to approximately 13%. The proportion of milk produced in the

October/December period remained relatively static between 1975 and 1985 (approximately 12%), but increased steadily thereafter to approximately 15% in 2005. The peak to trough month ratio declined from 8.8 in 1975 to 5.5 in 2005 while the capacity utilisation has increased from approximately 53% in 1975 to 60% in 2005.

Table 4.2.1 Irish Monthly Milk Intake Patterns 1975 – 2005 (%)

	1975	1980	1985	1990	1995	2000	2005
January	1.7	2.1	3.0	2.8	3.0	2.4	2.5
February	2.6	3.8	4.9	4.2	4.1	3.7	3.8
March	6.0	7.2	8.4	7.7	7.2	7.2	6.7
April	10.2	11.5	11.7	11.6	11.2	12.2	11.9
May	15.4	15.6	14.8	14.5	13.9	13.9	13.8
June	13.9	14.8	13.9	13.8	13.8	13.5	13.0
July	13.9	13.7	12.8	12.7	12.5	12.7	12.5
August	12.8	11.7	10.8	11.2	11.2	11.4	11.4
September	9.7	9.1	8.2	9.1	8.7	9.5	9.6
October	6.7	5.9	6.0	6.3	7.0	7.2	7.7
November	3.4	2.6	3.2	3.5	4.5	3.8	4.4
December	2.1	1.8	2.2	2.5	2.9	2.5	2.7
TOTAL	100	100	100	100	100	100	100
Capacity utilisation %	53.2	53.3	56.3	57.4	60.0	60.0	60.4
Peak/trough ratio	8.8	8.5	6.8	5.7	4.8	5.9	5.5

Source : Derived from CSO data

Table 4.2.2 shows a comparison of the seasonality of milk deliveries to dairies in Ireland, Netherlands and Demark for 2003. Based on the 2003 milk supply pattern, Ireland had a peak/trough ratio of 5.6:1, while the milk supply pattern in both Netherlands and Denmark are evenly distributed over the twelve months. There are large differences in capacity plant utilisation being 60.9% for Ireland compared to 94.8% and 94.7% for Netherlands and Denmark, respectively. The capacity utilisation of the New Zealand dairy processing industry is much lower than that of Irish dairy processing industry at approximately 52.2%, based on 2000 milk supply pattern.

Table 4.2.2 Seasonality of milk delivered to dairies in EU countries 2003 (%)

	Ireland	Netherlands	Denmark
January	2.4	8.5	8.3
February	3.9	8.4	8.4
March	7.7	8.4	8.4
April	11.6	8.6	8.6
May	13.4	8.8	8.8
June	12.8	8.4	8.7
July	12.0	8.3	8.4
August	10.8	8.1	8.3
September	9.5	8.3	8.2
October	7.9	8.2	8.0
November	5.1	7.9	7.9
December	2.9	8.1	8.1
Capacity utilisation %	60.9	94.8	94.7
Peak/trough month ratio	5.6	1.1	1.1

Source$_2$: Dairy Economic Indicators 2004

4.3. Calving pattern and management

Calving date is the overriding factor determining milk supply profile with feeding and management also playing a part. Table 4.3.1 shows trends in the mean calving date and proportion of cows calving in each month on Irish spring-calving dairy herds from 2002 to 2006 using CMMS data. The data shows that mean calving date has been slipping by approximately 2 days per year over the last 6 years, with the highest month being March and the three months of February, March and April accounting for 76% of calving’s. From the mid-1970’s mean calving date of spring calving herds in Ireland had moved earlier in the year from the 18th of March in 1975 to approximately 1st of February in I985. However since 1985 mean calving date has slipped back to where it was in 1975. This slip in calving pattern was brought about by both management decisions to calve later in order to maximize profitability in a milk quota scenario, but more importantly, due to the lower reproductive potential of the national dairy herd. The introduction of the EBI index has curtailed this reduction in fertility and herds that have selected strongly on EBI have reproductive performance to-day similar to that which was achieved in the 1990’s on well managed dairy herds.

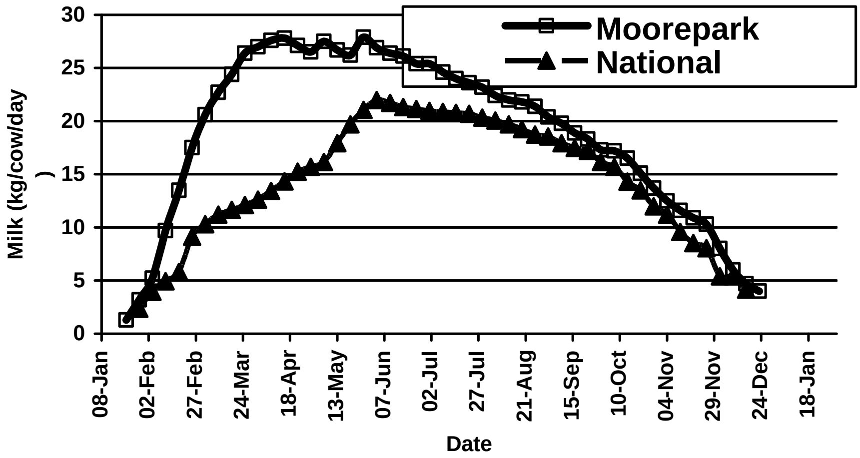
Table 4.3.1 Trends in the Mean Calving Date and proportion of cows calving in each month on Irish Spring-calving Dairy Herds (2002-2006).

Calving Month	2002	2004	2006
January	0.10	0.11	0.10
February	0.37	0.29	0.28
March	0.30	0.28	0.29
April	0.13	0.19	0.19
May	0.07	0.11	0.10
June	0.03	0.03	0.05
Mean Calving Date	08-Mar	14-Mar	16-Mar

Dept. Agriculture and Food CMMS Statistic Reports (2002-2006)

Figure 4.3.1 shows the milk production profile for Irish spring calving herds and that being achieved at Moorepark with the high EBI herd on a grass-based milk production system. Mean calving date in the Moorepark herd is the 10-15th of February compared to mid March nationally, with approximately 70% of the cows calved in the Moorepark herd by 1st of March compared to 40% nationally. Peak milk supply occurs in late-April early-May in the Moorepark herd while nationally it occurs in early June. Plant processing capacity utilization is approximately 5% higher (~65%) using the milk production profile from the Moorepark research compared to that being achieved nationally. The proportion of milk being produced in the months of February/March/April in the Moorepark herd is approximately 30% compared to 21% nationally.

Figure 4.3.1: Lactation Profile for Moorepark and National spring milk production



The Moorepark Dairy Systems Model (MDSM) (Shalloo et al., 2004) was used to model the effect of calving date on the overall costs of production. Animal production and feed budget data was based on a study carried out at Curtins Research Farm between 2000 and 2007 for Spring calving systems and was based on work carried out at Solohead Research Farm from September 1995 to January 1998 in relation to the Winter calving component of the data included in the model. The model farm was assumed to have 40ha, 468,000kg of milk quota and was based on post full decoupling costs and prices. The spring calving system was modeled using a calving pattern with 70%, 20% and 10% of the cows calving in February, March and April respectively, while the autumn calving system was modeled with 50%, 40% and 10% of the cows calving in September, October and November respectively. The cow type for both systems modeled was classified as high EBI. In the analysis full labour costs were included with an additional labour requirement of 20% associated with autumn calving systems when compared to Spring calving systems which were derived from the Moorepark labour study (O ‘ Donovan 2008). The replacement rate used in the analysis was

26.3% and 19.8% for the autumn and spring calving systems respectively. The infertile rates in the Solohead study were 23% and 10% for the autumn calving and spring calving systems. It was assumed that the cows in the autumn calving system produced on average 277kg of milk per lactation greater than cows in the spring calving systems.

Table 4.3.2 shows the influence of mean calving date on farm profit in no milk quota scenario at a milk price of 22.3 and 30.0 c/litre for free draining soils in the south of Ireland. In this analysis, grazed grass constituted 70, 75, 71.5 and 71% of the dietary intake of cows with a mean calving date of January 31, February 14, March 1 and March 15, respectively. Earlier calving increases overall milk sales, milk revenues and feed costs. Feed costs are highest with January 31 calving, intermediate for March 1 and 15 calving and lowest with a mean calving date of February 14. The highest farm profit was observed with a mean calving date of February 14 with the lowest profitability observed with a March 15 calving date. With a mean calving date of February 15, feed costs are lowest and margin per cow and per kg milk produced is maximised. Where the mean calving date is earlier than optimum, the gains in milk receipts are outweighed by the increased feed costs incurred through increased silage and concentrate use in the diet. Where the mean calving date is later than February 14, the losses in production and increased feed costs incurred result in a reduction in farm profitability. The economic optimum calving date in this analysis did not change with milk price however the relative advantage of achieving the optimum calving date is much greater in a low milk price scenario. In a milk quota scenario the optimum calving date will be slightly later and closer to March 1 mean calving date. In the northern half of the country the optimum mean calving date will be 1 to 3 weeks later depending soil type and location.

Table 4.3.2 Influence of mean calving date on farm profit in no milk quota scenario at a milk price of both 22.3 and 30 c/litre for a 40 hectare farm

	January 31	February 14	March 1	March 15
Grass (kg DM/cow)	3,598	3,716	3,492	3,384
Grass Silage (kg DM/cow)	1,034	935	1,071	1,131
Concentrate (kg DM/cow)	477	334	322	265
Cows calving (No.)	91.4	90.9	92.2	92.9
Milk sales (kg)	529,292	516,355	500,814	486,090
Fat sales (kg)	19,499	18,981	18,320	17,708
Protein sales (kg)	17,614	17,203	16,657	16,151
Livestock sales (€)	18,262	18,177	18,431	18,570
Total costs (€)	115,547	110,674	111,333	110,618
Feed costs /kg milk (c)	5.5	5.0	5.2	5.3
Labour costs (€)	36,163	34,599	34,477	33,921
Milk Price at 22.3 c/litre				
Milk returns (€)	116,782	113,920	110,091	106,562
Margin per cow (€)	213	236	184	156
Margin per kg milk (c)	3.57	4.02	3.28	2.88
Total profit/farm (€)	19,497	21,423	16,966	14,514
Milk Price at 30 c/litre				
Milk returns (€)	157,580	153,719	148,583	143,844
Margin per cow (€)	663	676	604	560
Margin per kg milk (c)	11.09	11.53	10.75	10.33
Total profit/farm (€)	60,563	61,465	55,680	51,996

Table 4.3.3 shows a comparison of the performance, cost and profitability of a compact spring and autumn calving system of milk production at a milk price of 22.3 and 30 c/litre for free draining soils in the south of Ireland. In this analysis, grazed grass constituted 75 and 56% of the dietary intake of cows with a mean calving date February 14 and October 15, respectively. The compact autumn calving system produced 75,253 kg greater milk production but at an increased cost of almost 4.5 c/l. At a milk price of 22.3 cent/l the spring calving system was €20,959 more profitable, while at 30 cent/litre the difference in farm profitability was reduced to €14,823. The difference in margin per kg of milk (approximately 4 cent of milk) in favour of the spring

calving system would have to be reimbursed by a higher milk price in the autumn calving system.

Table 4.3.3 Comparison of the performance and profitability of a compact spring and autumn calving system of milk production in a non quota scenario

	February 14	October 15
Grass (kg DM/cow)	3,716	2,999
Grass Silage (kg DM/cow)	935	1,330
Concentrate (kg DM/cow)	334	976
Milk sales (kg)	516,355	591,591
Fat sales (kg)	18,981	22,329
Protein sales (kg)	17,203	19,548
Livestock sales (€)	18,177	22,054
Total costs (€)	110,674	152,821
Feed costs /kg milk (c)	21.43	25.83
Milk Price at 22.3 c/litre		
Milk returns (€)	113,920	131,232
Margin per cow (€)	236	4.65
Margin per kg milk (c)	4.02	0.08
Total profit/farm (€)	21,423	464
Milk Price at 30 c/litre		
Milk returns (€)	153,719	177,023
Margin per cow (€)	676	467
Margin per kg milk (c)	11.53	7.65
Total profit/farm (€)	61,465	46,642

4.4. Product mix and plant utilisation efficiency

The potential for increases in efficiency in the processing of commodity milk products and increasing the proportion of output away from base/commodity type products were highlighted as two key strategies for the future in the Prospective Report on the ‘Strategic Development Plan for the Irish Dairy Processing Sector’. Rationalising the number of processing plants for butter, powder and casein production from the present level of eleven to four would deliver efficiencies and savings at manufacturing and enterprise level through scale and more efficient use of resources. Also, extracting greater value from processed milk by producing products that are growing in demand, results in a higher margin and reduces the dependency on commodity type products.

Table 4.4.1 and Table 4.4.2 shows the trends in milk utilisation and the quantities of major Irish dairy products produced from 1978 to 2005. It shows that the strategy of the Irish dairy industry has concentrated on maximising output within the constraints of quotas through a focus on cost-effective production of commodities and creating maximum values. The product portfolio has a strong emphasis on butter, which has not changed dramatically since EU membership, while the main competitors (Denmark and Netherlands) have all reduced their dependency on butter. The only noticeable change in the product portfolio in Ireland is increased production of cheese and the reduced emphasis in skim milk powder. Irish Dairy Board (Coakley, personal communication) forecast that the utilisation of milk fat for cheese production will increase from 21% in 2006 to 30% in 2013, while over the same time period the level used for butter production will decrease from 60% to 49%.

Table 4.4.1 Trends in whole milk utilisation (percentage of total)

	1978	1980	1985	1990	1995	2000	2005
Butter	70.0	66.3	72.8	72.3	67.7	64.5	64.0
Cheese	12.9	13.0	14.3	14.9	15.1	18.8	22.0
WMP	5.4	6.6	4.2	2.1	5.5	5.5	3.0
Butter-oil	6.8	8.7	1.6	1.8	4.6	4.0	6.0
Others	4.9	5.3	7.1	8.9	7.1	7.2	2.0

(Source: Irish Dairy Board, Annual Reports)

Table 4.4.2 Production of major Irish dairy products 1979-2003 (‘000 tonnes)

	1979	1999	2000	2001	2002	2003
Butter	130.5	146.0	145.0	139.0	147.0	149.0
Cheese	57.5	101.8	98.5	122.8	115.9	112.0
Whole milk powder	19.1	33.3	36.7	32.4	26.4	31.0
Skim milk Powder	148.0	84.4	78.8	86.3	97.2	78.4
Casein and Caseinates	13.3	47.0	43.0	51.0	44.0	48.9

(Source: Dairy economic indicators 2004)

4.5. Influence of seasonality on milk processability

Stage of lactation and/or changes in grass supply and quality affect milk compositional and processability, especially in late lactation. Changes in milk composition and procssability affect yield, composition and quality of dairy products such as cheese, milk powder, butter, food ingredients (e.g. casein and demineralized whey powder) cream liqueurs and yoghurt. Recent research has shown the importance of both cow management (cow nutrition, milking management and drying-off strategy) and the assembly and segregation of milk on improving the processing capabilities of milk from spring calving cows in the late autumn/winter period. Maintaining the herd with a high level of milk production with good nutritional management was important in maintaining high quality milk. Good herd management practices such as a correctly operating milking system, a defined drying-off practice and shorter milk storage intervals must be in place. Consistency in milk composition and quality can be maintained up to 275 days of lactation within the Moorepark blueprint for spring milk production.

Research has also indicated that early lactation autumn milk had better processing characteristics than late lactation spring milk. Combining autumn milk with spring milk resulted in milk with processing characteristics similar to autumn herd milk. The addition of 30% of early lactation autumn milk improved the processability of the late lactation spring milk. Milk from spring calving cows greater than 275 days in milk required 3 : 1 ratio of autumn : spring to be suitable for cheese making. Mixing of late lactation spring milk with early lactation autumn milk at the factory from separate herds would result in similar processing characteristics to a mixed spring and autumn calving herd.

4.6. Future milk pricing systems

Seasonal milk pricing systems should be developed that will encourage a profitable milk supply profile. Figure 4.3.1 has shown there are considerable differences between the supply profiles of the National calving pattern and the optimum calving pattern shown from Curtins herd. There are differences in the value of the products and the total processing costs of the milk produced from the two milk supply profiles. Seasonal milk pricing systems that reflect the processing costs and/or the product portfolio of milk will be required within the dairy industry to ensure that any additional investment in processing capacity gives the maximum return on investment within the confines of ensuring the optimum spring calving pattern and milk supply profile.

4.7 Implications for the Irish dairy industry
On cash cost basis Irish grass based seasonal spring calving systems of milk production are in a relatively advantageous position within Europe and may be well placed to compete in a more liberalized milk quota environment. This can be further improved by the adoption of new technologies resulting in better milk supply patterns and quality from spring calving herds. The calving pattern on Irish creamery milk herds has deteriorated in recent years. This has major implications for the Irish dairy industry especially in a milk expansion scenario in that plant utilisation efficiency is reduced. A shift to earlier calving will result in increased plant utilisation and in the short term lower peak: trough ratio. This will be facilitated greatly with widespread use of the EBI index. There may be a requirement for some winter milk production in the future for speciality products such as cream for Baileys. This milk should be supplied from producers that target 100% autumn calving systems (reduced collection and assembly costs). This milk could be mixed with late lactation spring milk at processor level to get the maximum benefit. The overall benefit from the products produced will have to be sufficient to cover the additional costs associated with autumn calving.

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