Irish Grassland Association Journal

2004 VOLUME 38

IRISH GRASSLAND ASSOCIATION

CORPORATE MEMBERS 2004

ACC Bank
AIB Bank
Alltech
Bank of Ireland
Bord Bia
Connacht Gold
Dairygold
Dairymaster Limited
Dawn Group
Devenish Nutrition
FBD Insurances
Germinal Ireland Ltd
Glanbia
Goldcrop Limited
Grassland Fertilizers Limited
Greenvale Animal Feeds
I.A.W.S Group plc
Irish Cattle Breeding Federation Society Limited
Irish Country Meats/Slaney Meats Ltd
IFAC Accountants
Irish Farmers Journal
Janssen Animal Health
Richard Keenan & Co. Ltd
Kerry Agribusiness
Lakeland Dairies
LELY Ireland Limited
McQuinn Consulting
Monsanto Ireland Ltd
Mullinahone Co-op
Osmonds
New Zealand Genetics (Ireland) Limited
Premier Molasses Company Limited
SWS Farm Services Ltd
Timac Limited
Wexford Milk Producers

TEAGASC EDUCATION and ADVISORY SERVICES

Ballyhaise Agricultural College
Cork East
Cork West
Laois
Limerick
Regional Advisory & Training Services, Kildalton
Regional Office, North, Grange
Tipperary North
Tipperary South

Irish Grassland Association

JOURNAL

Vol. 38 2004

Edited by
David McGilloway

ISSN 0332-0588

Printed by Walsh, Printer, Roscrea

CONTENTS

COUNCIL 2004 – 2005

President	Brendan Barnes
Vice-President	Jan Frederiks
Past-President	Tony Pettit
General Secretary	Grainne Dwyer

Kevin Commins, Noel Culleton, Michael Doran, Jim Dwyer, John Donworth, Sean Flanagan, Jan Frederiks, Padraig French, Brendan Horan, Pearse Kelly, Jack Kennedy, William Kingston, Tim O'Leary, Pat McFeely, Mark McGee, Nicholas McGill, David McGilloway, Andrew Moloney, John O'Brien, Robin Talbot, Peter Young.

Irish Grassland Association, Moneymore, Borris in Ossory, Co. Laois

Phone/Fax 0505 41025 Email: grainne@irishgrassland.com

Life after Fischler

John Brooks[1] and Frank Young[2]
[1]Taughmaconnell, Ballinasloe
[2]Teagasc, Athlone

Introduction

Table 1. Forage area

	ha
Land owned	53
Land rented	20
Total	73*

*Land is fragmented over six separate parcels

Soils
Limestone and well drained brown earths (with the exception of 2 ha subject to prolonged winter flooding (Turlough).

Machinery
Basic range of own farm machinery. Contractor for silage harvesting and slurry spreading.

Buildings
Four slatted sheds – two with accommodation for 144 adult cattle, and two with accommodation for 800 ewes (one of the latter units can also be converted to hold a further 84 adult cattle). There is sufficient slurry storage capacity.

Grazing system
Controlled mixed grazing

Cattle Forty eight suckler cows – females slaughtered under 12 months old – males sold as weanlings/yearlings in April. 60 weanling heifers bought for slaughter under 12 months. (In previous years calves and bought in stores were finished at 20-26 months).

Sheep	Pedigree Suffolk & Texel ewes	85
	Pedigree ewe lamb replacements	40
	Commercial ewes	550
	Ewe lamb replacements	140
	Rams (Suffock, Texel, Beclare, Charolais)	15

Mid season system
Commercial flock – litter size 1.98 – 2.02, lambs reared/ewe to ram 1.70 – 1.75 and lambs reared/ewe lamb to ram 1.0

Impact on Fischler reforms

- Decoupling – no constraints on sale dates;
- Flexibility to change systems;
- Bigger differential in price for quality stock;
- Production – market led;
- Need for more farmer/factory/partnership for lucrative markets;
- Entitlement payments not index linked;
- Will entitlements have mid-term review?
- Income?
- WTO implications.

Table 2. Net entitlement payments (€)

Year	€	€/ha
2005	34,283	459
2006	33,970	455
2007	33,657	450

Note if National ceiling is exceeded then entitlements will be reduced accordingly.

Area based compensatory allowance = €4,000

Options post Fischler

- Reduce significantly total livestock numbers (sofa farming);
- Continue same farming system;
- Maintain current livestock units, but increase/reduce either cattle or sheep;
- Post 2005 – lease farm – trade entitlements – get job!
- Participate in REPS – comply with 170 kg organic N Limit.

Decision

- Reduce organic N from current level of 204 kg/ha to less than 170 kg/ha;
- Reduce ewe numbers to 50 pedigree and 500 commercial;
- Increase suckler cows to 60, and rear progeny for slaughter at 12 months;
- Discontinue purchase of 60 weanling heifers for slaughter at 12 months;
- Join REPS.

Benefits

- Significant reduction in workload – better life quality;
- Lower input costs;
- REPS payment of €8,800 to cushion any income drop;
- Scheme payments €46,456.

A new era for lowland sheep production? Flock performance and issues from on-farm studies

Seamus P. Hanrahan
Sheep Production Department, Teagasc, Athenry, Co. Galway.

Introduction

The implementation of the Fischler reform of CAP, which will decouple ewe premium payments from the actual production on the farm, is generally expected to usher in a new era in the lowland sheep sector. This new era will see much greater emphasis on individual animal productivity at farm level. Some commentators have described this new dispensation as "market-driven" rather than "subsidy driven" farming. The decoupling of support payments is widely considered to mean that producers will focus much more on the profitability of the enterprises on the farm, and the animal performance traits and associated management factors that determine variation in the productivity of the sheep enterprise. It should also be noted that stocking rate limits in the context of the Nitrates Directive and REPS are also pertinent drivers of the role of increased animal productivity and its impact on income.

In this presentation I will review some of the main animal performance factors that are important determinants of flock productivity and product quality against the background of information that has been accumulated in Teagasc over the last 3 years from on-farm studies, in collaboration with a widespread network of about 40 sheep farmers. This network has been the basis for a Technology Evaluation and Transfer (TET) project that was initiated just before the foot and mouth emergency in spring of 2001.

The main issues examined will be ewe productivity, lamb growth and drafting patterns, and carcass quality. The variation among farms in lamb growth and drafting pattern will be examined in relation to general measures of grassland management and flock management including the issue of parasite control. I will try and put this information in the context of our on-going research programme in Teagasc and the lessons and implications for the future.

The general characteristics of the set of TET flocks are summarised in Table 1. It is clear that the set of farms involved were well above the average for lowland farms in National Farm Survey (e.g. Connolly 1997). The lamb growth achieved is essentially equal to the targets set out in Teagasc advisory programmes and the performance levels reported for Teagasc research flocks (Hanrahan, 1999). On these farms the predominant ewe-type was Suffolk-cross and Suffolk and Texel rams predominated as the sires of the lambs.

Table 1. General characteristics of Technology Evaluation and Transfer flocks

Feature	Mean	Range
Area farmed (ha)	69	23 to 48
Stocking rate (LU/ha)	1.8	1 to 2.6
Ewes put to ram (no.)	340	100 to 1000
Lambing date	23 March	1 Mar to 14 Apr
Lambs per ewe to the ram		
lambs born	1.61	1.10 to 2.03
lambs weaned	1.48	1.10 to 1.96
Carcass weight (kg)	19.5	18.1 to 21.3
Growth rate (g/day) of twin lambs (birth to weaning)	275	220 to 320
Lamb mortality (%)	7	1.5 to 19

Flock productivity

The number of lambs reared per ewe put to the ram is the most important measure of ewe performance and hence flock productivity, since costs associated with annual maintenance of the ewe dominate the cost of keeping the flock. Results for lowland sheep flocks in the National Farm Survey show that the number of lambs reared per ewe joined has a very significant impact on both gross margins per ewe and per hectare. In the present context the concern is with gross margin per ewe. Thus, the evidence shows that increasing the number of lambs reared per ewe to the ram from 1.4 to 1.6 is expected to increase gross margin per ewe by 20% (Hanrahan and Connolly, 1997). In present day terms this is equivalent to about an extra €12/ewe. Improved feeding and management of current ewe flocks is unlikely to yield an increase of 0.2 in lambs reared per ewe – but some improvements are possible through this route. Teagasc research has consistently shown that improvements of this order can be achieved through implementation of an appropriate breeding policy for flock replacements. The impact of Belclare–cross ewes on ewe productivity has been clearly demonstrated at Blindwell and Knockbeg over many years. The performance data from the TET flocks over the last 3 years have been examined to see what further evidence there is on this issue. The TET flocks have been classified according to the predominant ewe breed.

The classes were:-

Suf_X : Suffolk cross only
Bel_X : Belclare crosses (among others)
Low_X : Mixture of lowland types but not Belclare
Mule : Hill cross types (e.g. Mules)

The average performance of the flocks in each of these categories is summarised in Figure 1. The results show that flocks with Belclare-cross ewe types significantly outperformed all of the other categories by an extra 0.1 to 0.2 lambs reared per ewe. This finding is remarkably consistent with the various research station studies over the years and confirms the ability of a breeding programme based on using Belclare genetic material, to significantly increase flock productivity. The data from the TET flocks show the importance of litter size in determining the number of lambs reared per ewe joined (Figure 2). This clearly highlights the need to pursue a breeding policy designed to increase litter size.

Figure 1. Effect of ewe breed on the number of lambs born (LBej) and reared (LWej) per ewe joined with rams in TET flocks (2001 to 2003)

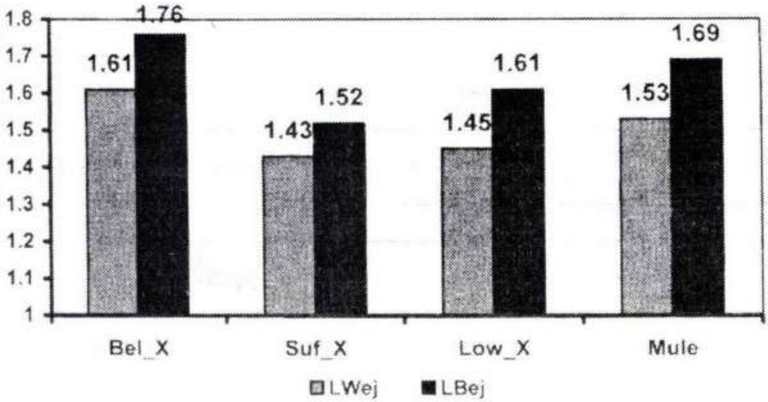
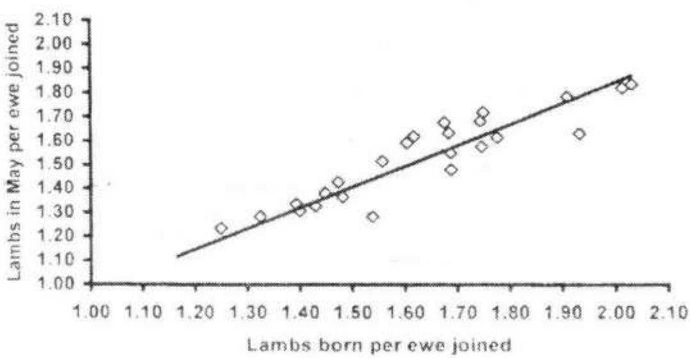


Figure 2. Relationship between lambs born per ewe joined and lambs reared

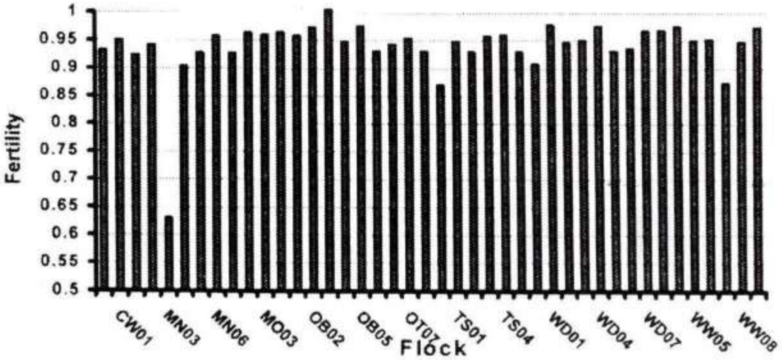


Another factor that is a source of variation in flock productivity is the proportion of ewes put to the ram that actually produce lambs. With good management around mating time and no unusual ewe mortality or abortion, at least 94% of ewes put to the ram should lamb. The variation among TET flocks in this regard is in Figure 3.

Ewe fertility, which is the proportion of ewes joined that actually lamb should be equal to or better than 94%. If lower, causes need to be sought (e.g. mating management condition of the ewe flock at mating etc.). Most TET flocks achieved fertility levels at or above 94%, so this aspect of flock performance appeared to be generally satisfactory – as one would expect in well managed flocks where joining is in October.

The third factor determining the number of lambs reared per ewe is lamb mortality. The average value from the TET flocks was 7.2% but the variation among flocks was relatively large. It is also likely that the true figure is greater as often only live-born lambs are counted – rather than all lambs born.

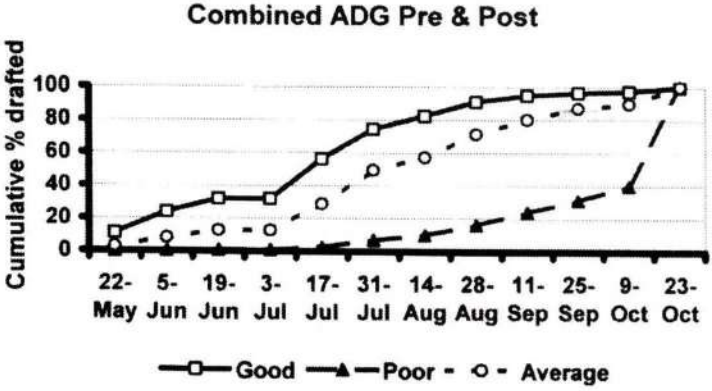
Figure 3. Average values for the proportion of ewes joined that actually lambed in TET flock (Fertility: 2001 to 2003)



Lamb growth

In the initial consultations on the performance factors that concerned sheep producers, "poor lamb thrive" emerged as one of the central issues. Consequently, a considerable effort has been devoted to establishing the lamb growth rate and drafting patterns in TET flocks. It appears that "poor thrive" is usually recognised in terms of slowness to get lambs fit for sale. Most of the growth of lambs towards slaughter weight is achieved by weaning at around 14 weeks of age. Due to generally much lower growth on pasture in the July-September period the weight of lambs at weaning is a major determinant of age at drafting. Thus, each extra 1 kg in average weaning weight will reduce the age of slaughter by 1 week. The pattern of lamb drafting is in fact, an excellent indicator of the growth rate of the flock and three different patterns are depicted in Figure 4. This figure shows the cumulative percentage of lambs drafted as the season progresses for flocks where growth rate is equal to the targets that represent an average performance for a lowland system without concentrates being offered to the lambs.

Figure 4. Examples of cumulative drafting patterns for mid season flocks



Also shown is the pattern for a flock where growth rate is below this target (15% less). The shape of the drafting curve is very different for these two scenarios. In the case of poor lamb growth rate the curve is "saucer" shaped whereas the 'average' lamb-growth flock is clearly convex and with a fairly steady increase in the cumulative percentage drafted from when the first lambs are drafted.

Table 2. Growth performance for twin lambs in TET flocks and Teagasc targets

Growth trait	TET average	Teagasc target
Daily gain from birth to weaning (g)	277	276
Weight at 14 weeks (kg)	32.4	32.0
Post-weaning daily gain (g) (July period)	187	205

The growth rate in TET flocks was about equivalent to Teagasc target figures as shown in Table 2. Compared with the Teagasc target values the average for TET flocks was comparable up to weaning, but was lower than the target in the early post-weaning period. There is no farm data for later periods of the summer/autumn season. However the generally satisfactory average values hide an enormous variability among flocks as shown for growth rate to 14 weeks in Figure 4. If the most extreme values are ignored, it is evident that growth varied from around 230 g/day up to around 330 g/day. This means a difference of 10 kg in weight of twins at 14 weeks. The reasons for this enormous range need to be understood and it will be reflected in profound differences in lambs drafting pattern with undoubted knock-on effects on all aspects of flock performance and management. Information on drafting patterns for the TET flocks is summarised in Table 3 as the percentage of lambs drafted by 20 weeks of age. The results show that the vast majority of flocks have no more than 10% of lambs drafted at 20 weeks. This reflects the wide range in lamb growth and probably a rapid fall off in lamb performance post-weaning. It also reflects the relatively large carcass weight at drafting – about 1 kg greater than research would indicate as appropriate weight for the export market. This practice is presumably a reflection of the monetary returns from extra weight despite the risk of and penalties for the over fatness that is inevitable with increased average carcass weight.

Table 3. Lambs drafted by 20 weeks of age in TET flocks

Flocks with	
At least 50% drafted	18% of flocks
Less than 25% drafted	49% of flocks
10% or less drafted	82% of flocks

The possible reasons for the wide flock-to-flock variation in lamb growth rate was the subject of a study by John Faughnan, using information on TET flocks for the 2002 production year. In this study a whole range of aspects that might impact on growth rate were considered. These included detailed assessment for evaluation of the grassland (herbage supply, height, digestibility), grazing management system (rotational grazing, set stocking, mixed grazing), grass supply at turnout and parasite control status throughout the grazing season based on regular assessments of worm eggs in the faeces of lambs and ewes. In addition to these straightforward measurements an assessment was made of the overall level of the flock management system. This essentially revolved around the grassland management planning and included

- closing date for paddocks to be grazed by the flock at turnout in spring
- the state of these paddocks in Dec/Jan including poaching etc.
- plans for hay/silage conservation (where/when)
- standard facilities for flock handling and the fencing on the grazing area
- timing of spring N application

Based on information on the above aspects, each farm was given a score of 1 (= OK) or 0 (not OK). Likewise information on parasite control was assessed and flocks were classified as either being parasites under Control (= 1) or not (= 0). These two variables, overall flock management system and parasite status of flocks, were clearly associated with differences among flocks in lamb growth rate, and together with average lambing date and grazing system accounted for about 70% of flock-to-flock differences.

Conclusions from this work are that while specific measurements like grass quality, herbage supply or stocking rate will impact on lamb growth rate, there is a more complex set of factors operating that need attention in order to improve the level and consistency of flock growth rate. Effective control of roundworm parasites is also important, as are facilities for flock handling and management. All of the above issues have been well tested and validated in research studies over many years. No one element on its own is adequate – what is required is a planned/conscious approach to the annual cycle of grass supply for the flock. This must be practised at farm level and not just "listened about" at open days and farm walks.

The need to improve flock management facilities on many farms is evident from an assessment that was made of handling facilities on TET farms, where over 50% were classified as having either poor facilities (35%) or none (22%). Similar results were found with regard to fencing. The opportunity for better grassland management is shown by information on the grass supply on the grazing area at flock turnout in relation to closing date (Figure 4) and the date of application of N fertiliser in spring (Figure 5). As stated previously, most of the flocks involved had a mean lambing date in March yet on many farms the first N application was not until March 1or later. This was clearly associated with whether grass supply during the year was in "shortage" or not (Faughnan 2003).

Figure 4. Sward height (cm) at flock turnout after lambing and closing date the previous autumn/winter

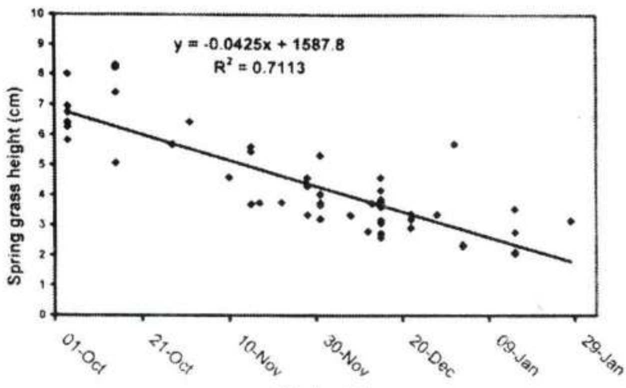
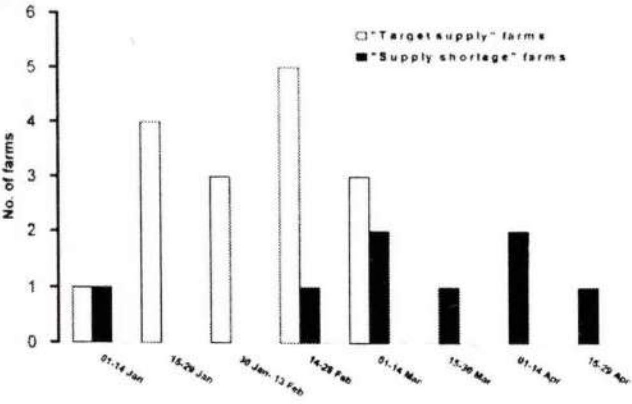


Figure 5. Date of Nitrogen application in spring and state of grass supply during the grazing season



Carcass weight

There are two aspects of carcass weight that need to be considered – the average weight and the variability of weight about this average. The overall mean weight of carcasses from TET flocks was 19.8 kg, ranging from 18.1 kg to 21.3 kg. The variation in carcass weight within the group of lambs drafted on any given date (from an individual flock) was estimated to be at lest twice what it should be! This aspect needs to be addressed by both farmers and factories to ensure that the sector makes the most of market opportunities and retains market share. The issue of carcass classification, market demands and meaningful price differentials in terms of weight, fatness and price need to be discussed and long–term needs identified by all concerned.

Parasites

The detailed study of parasite control status of flocks in the TET project highlighted apparent failures of control from anthelmintic treatment. Where follow-up studies were undertaken two distinct causes were clear.

- inappropriate dose due to faulty equipment or improper use;
- resistance to anthelmintics was confirmed on a number of farms. (Good *et al.*, 2003)

The latter finding was to some extent surprising as previous on-farm investigations of this issue highlighted the role of inadequate dosing procedures. The clear evidence for resistance to anthelmintics on farms such as those involved in the TET project should serve as a clear reminder to all sheep producers that anthelmintics cannot be relied on as the sole component of parasite control strategies, and that care must be taken to ensure that they are used wisely so as to postpone and hopefully avoid the emergence of anthelmintic resistance.

Concluding remarks

The experience and evidence from the TET project over the last 3 years has increased our appreciation of the features of sheep production at farm level. Results clearly show that on-farm lamb growth rates are similar to those from research flocks and systems such as those at Knockbeg. Furthermore the consistency of the ewe breed differences in prolificacy observed at farm level and those from Teagasc research are very encouraging, and clearly pinpoint that potential and need for a definite breeding plan at farm level for the production of productive flocks replacements. While I have not presented the evidence today there is a wide variation among flocks in the level of concentrate inputs and in many cases annual inputs of concentrates per ewe is in excess of 50 kg. There was little evident relationship between the input level and flock performance. The level of use of concentrates needs to be considered by individual farmers as to whether it represents value for money.

Another more general comment that seems justified is that there is considerable room for improvement in the application of well established research findings to farm practice. Evidence is presented on the genetic differences in ewe productivity and the continuing dominance of Suffolk-cross ewes, in the face of clear evidence for superior alternatives; the high divergence between practice on N application date in spring and the long standing recommendations; the effect of autumn closing date on grass supply at flock turnout; the often quite inadequate on-farm facilities for the flock management. There is clearly much scope for improvement and the areas for attention are evident. The gains from better grazing management planning was clearly indicated by John Faughnan's results for TET farms but this is not a simple "one element" fix but rather a more holistic integration of a variety of elements specific to individual farms and farmers (!). I suspect that there is often too much reliance upon, and expectations that research can identify the one key factor that will transform the situation on a given farm. Rather what is needed is determined application of what is known and well established to the management practices at farm level by the individual flock manager.

References

Faughnan, J.P., Nolan, T., Hanrahan, J.P and Crosby, T.F. (2003). Pasture production and quality on sheep farms. *Proceedings of the Agricultural Research Forum 2003*, (ISBN 1 8417 4016). Pp 77

Faughnan, J.P. (2003). Investigation of management factors responsible for farm-to-farm variation in lamb growth. *M Agr. Sc Thesis*, NUI.

Connolly, L. (1997). Sheep production 1997. *Teagasc Information Update Series No. 1.* (ISBN 1 901138 20 8). 46 pages.

Good, B., Hanrahan, J.P. and Kinsella, A. (2003). Anthelmintic resistance in sheep roundworms - preliminary observations. *Proc. Agricultural Research Forum 2003.* (ISBN 1 8417 401 6) page 78.

Hanrahan, J.P. and Connolly, L. (1997). Lowland sheep systems:- factors contributing to variation in margins *Farm and Food*, Sept 1997, pp11-18. Teagasc (ISSN 0791-6477)

Hanrahan, J.P. (1999). Genetic and non-genetic factors affecting lamb growth and carcass quality *End of Project Reports: Sheep Series No. 8* Teagasc 35 pages.

A family plan for sheep farming: 2005 – 2013

Ann and Brian Kehoe
Ballydine, Kilsheelan, Clonmel, Co. Tipperary

Introduction

Sheep farmers will face major challenges over the next decade. Decoupling will certainly change the approach to sheep farming, and for many will determine if they stay in sheep farming in the long term. For a sheep only farm, this paper will briefly review:

the farming system and flock performance details;
comment on decoupling implications for the farm;
set out our plans for the future.

The farming system

Background

The farm is situated in the Suir Valley near Kilsheelan, Co. Tipperary. It is in a non-disadvantaged area. The farm details are as follows.

Total Area Farmed:	78 ha
Grassland:	69 ha
Maize:	9 ha

The farm is divided into three parcels. The main block of 38 ha is located around the farmyard. A further two parcels of 22 and 20 ha respectively are located within one mile of the main block.

Prior to 1997, the farm comprised 60 suckler cows, 80 acres of tillage and a 250-ewe flock. In I997 fundamental changes to the farming operation were implemented, and a sheep only enterprise was pursued. The suckler cows were sold, and the quota leased for three years, before finally being sold in the spring of 2001. There are no cattle currently on the farm.

By 2001 ewe flock numbers had increased to 900. Most of the tillage ground was reseeded, and fencing upgraded. New sheep handling units were built and the winter housing for the expanded ewe flock was renovated and extended.

Discussion group

Membership of the *South Tipperary Sheep Discussion Group* has been of **immense benefit** over the last five years.

Labour and flock management details

The owners carry out the majority of the farm work, with hired labour kept to a minimum.

- agricultural contractors are hired for all maize work and dung spreading;
- some casual labour is used during lambing.

Management details

- ewes are housed in January;
- the flock lambs as one group in March;

- ewes go straight out to grass within 48 hours of lambing;
- lambs are sold directly to factories and to butchers from early July to early December;
- lambs are finished off grass with meals fed.

Flock breeding policy

Crossbreeding is an essential element of the current breeding policy. The ewe types are Belclare x Suffolk, Texel x Suffolk and Ile de France x Suffolk. The Ile de France are being phased out. The breeding programme for the last two years is given below (Table.1). There are no major plans to change the breeding programme into the future.

Table 1. Breeding programme

Flock	Ewe Nos.	Ewe type	Ram used	Progeny
Finishing Flock	650	Texel x Suffolk Belclare x Suffolk Ile de France x Suffolk	Charolais Texel Suffolk	All sold
Replacement Flock*	250	Suffolk x Texel Suffolk	Belclare	Male lambs: all sold Ewe lambs: kept for breeding

*40 to 50 hoggets are purchased each year as replacements for the 250-ewe flock.

Flock performance

Current flock performance is considered to be average. At present an average 1.4 lambs are reared per ewe to ram. Flock output problems are related to two issues.

- *Past emphasis on expansion.* During the period 1997 to 2001 efforts were concentrated on increasing ewe numbers from 250 to 900 ewes. Insufficient attention was paid to flock breeding and prolificacy during the expansion phase.
- *Ongoing Toxoplasmosis problem.* There is a *Toxoplasmosis* problem within the flock. This leads to lamb losses during pregnancy, especially at lambing time. All replacements are now vaccinated with Toxovax before mating. This has improved the situation but not eliminated the problem fully.

Financial Performance

Output per ewe and average lamb price realised have a major impact on gross margin figures (Table 2). It is believed there is scope to increase gross margin (excluding premium) if output per ewe can be lifted.

Table 2. Gross Margin per ewe

Lambs sold per ewe to the ram	1.4
Average lamb price (€)	73.50
Gross Margin per ewe excl. premium (€)	43.00
Ewe premium (€)	22.26
Gross Margin per ewe incl. premium (€)	65.26

Decoupling implications
All sheep farmers we will have to come to grips with the implications of decoupling. On this farm, it is estimated that EU entitlements will approximate to just under €25,000 per annum (see Table 3).

Table 3. Estimate of 'decoupled entitlements'

EU Scheme	2000*	2001*	2002*	Average	Rate (€)	Total Claim (€)
Ewe Premium	900	900	900	900	22.26	20,034
Maize Aid (ha)	9.15	11.99	9.15	8.33**	365	3,030
Cereal Aid (ha)	9.15			3.05	383	1,168
Peas Aid (ha)			2.84	0.95	383	364
Setaside (ha)	2.06			0.69	383	264
	Total					**24,780**

*Reference years for establishing EU entitlements.

**Maize area eligible for entitlements is 42% of the area claimed in 2002.

However entitlements are likely to be further eroded on two counts:

- Clawbacks for national reserve and modulation;
- Future price inflation.

National reserve and modulation cuts
Entitlements before deductions for national reserve and modulation, are estimated at approximately €318.85 per ha (or €129.03 per ac). It is not possible at this juncture to be precise about the actual entitlement cuts that will apply, but given the following assumptions, an estimate of the impact can be made.

- Deductions for the national reserve are likely to be in the region of 1-3 percent;
- Modulation cuts are expected to be in the region of 5 percent from 2007, however the first € 5000 will be exempt.

It is estimated that the modulation and national reserve deductions could exceed €1700 on this farm, reducing overall entitlements to approximately €23,200 per annum.

Future price inflation
Entitlement income is fixed for the foreseeable future. However, there are concerns that overall price inflation will also erode the real value of the entitlements. Again one can only speculate on the future rate of inflation. However, if an inflation rate of 3 percent per annum from 2004 to 2013 were assumed, this rate would reduce the value of entitlements by about 24% in real terms. Put another way current entitlements of €24,870 would need to increase by around €6,000 by 2013 to offset an annual rate of inflation in the order of 3 percent.

Consequences
Teagasc farm income figures indicate that EU payments account for a substantial proportion of actual farm income on a typical sheep or cattle farm. Taking the cuts and inflation into account, it can be seen that entitlements will meet less and less of income requirements as time goes on. This will put a lot more pressure on the sheep farming business itself to generate more income.

Planning a future strategy for the sheep farm

In trying to plan for the future, it is necessary to take account of family circumstances and dependence on sheep farming. Those areas that are likely to have the biggest impact on farming income must be identified and prioritised.

Family Circumstances

Family circumstances are a major consideration when deciding what income is necessary for a decent standard of living into the future. There are two children. The eldest has completed her education and is now financially independent, but the youngest is still in primary school.

Other income

At the moment there is an additional source of income, but this is not guaranteed to last. If/when this ceases, there would have to be a major adjustment to the current strategy.

Farming priorities

The following areas are viewed as a priority to improving farm profit in a decoupled environment.

Increase output per ewe

1. A major priority is to increase ewe output from 1.4 lambs reared to l.6. Achieving this target should increase gross margin per ewe by approximately €12. This can be achieved by increasing the Belclare influence in the replacement flock, and ensuring a good supply of grass at flushing.
2. *Draft lambs earlier*
   The sale of lambs must begin earlier, possibly mid-June. To have 50% of lambs sold at twenty weeks is the target. This can be achieved by feeding meals at an earlier stage. This change should also provide the extra grass needed for flushing. (Looking at lamb price patterns for 2003; earlier drafting should also yield a higher average price).
3. *Join REPS*
   Joining the new REP Scheme is essential to increase farm income.
4. *Extending the grazing season*
   Extending the grazing season is a very important strategy on a dry farm. This means keeping the ewes on grass until February 1 and lambing on March 1.

For the future?

The above strategy assumes continuation in sheep farming up to 2013, but this is by no means certain. In a decoupled situation there is no longer a need to keep sheep to draw down all entitlements. All of the above targets for the sheep enterprise will take hard work and commitment. This commitment will only continue be given if there is a good return from the market place. What is produced must be of value - lamb price will eventually be the deciding factor as to whether or not sheep farming is continued.

Conclusions

Decoupling is now a done deal, but there are concerns going forward. It is likely that the value of entitlements will be seriously eroded over time. Only time will tell if the market place will return the lamb price necessary to offset reduced entitlement income and ongoing price inflation.

Parasite resistance to anthelmintics in livestock in Ireland

Dermot J. O'Brien
CVRL, Abbotstown, Dublin 15

Introduction.
Grazing animals carry parasites, picked up from the pastures. These can cause serious, often fatal diseases or induce chronic conditions, which hinder economic husbandry and allow other pathogens exert their influence for disease. Under natural conditions a balance evolves between the parasite and the host, which allows both exist without too much disruption. Younger animals are less resistant to these parasites, but as they grow so too does their immunity. A group of parasites, gastro-intestinal nematodes or stomach and bowel worms, live in the intestinal tract, breed and lay eggs, which pass on to the pastures and hatch there into larvae that develop and re-infect their hosts. This cycle can become extremely rapid in mild moist conditions where animals are in a relatively confined area; larvae build up and cause parasitic gastroenteritis, with severe diarrhoea. To control this, anthelmintics are given to the animals. However as the pasture larvae re-infect the animals, treatment is repeated over and over again. The introduction of new effective anthelmintics in the early sixties made treatment an attractive efficient way of producing healthy animals in intensive systems. However, suppressive treatment systems, especially in young animals, may not allow natural immunity to develop, leading to problems later.

In the decade following the introduction of the benzimidazole anthelmintics (white drenches), resistance was first recognized (Le Jambre, 1976; Coles, 1977) and quickly spread, becoming common worldwide (Boersma, 1982; Cawthorne, 1983). Resistance soon became apparent in Ireland (O'Brien and Geraghty, 1990; O'Brien, 1992, O'Brien *et al.*, 1994) and now is common throughout the country in sheep, horses, pigs and goats. Although serious and widespread elsewhere, it has not yet become a problem in cattle. Recently resistance to acaricides for *Dermanyssus gallinae* (the red mite) of poultry has been detected in Ireland (Murphy *et al.*, 2002).

There are three main groups of anthelmintics used against nematode worms (round worms), the benzimidazoles, the imidathiazoles and tetrahydropyrimidines, and the macrocyclic lactones. The problem is not confined to the benzimidazoles, the other groups have also been affected, indeed multiple resistance, to all three, occurs and recently has been identified, in sheep, in Britain (Yue *et al.*, 2003).

Result of husbandry
This problem is caused by husbandry practices. Generally, animals kept in extensive systems do not have major problems from nematode worms and treatments are seldom required, so no pressure is exerted on the anthelmintics. In this natural situation, the parasite population is almost entirely susceptible to anthelmintics, however there may be a few individual nematodes carrying the gene for anthelmintic resistance. Where intensive systems are practised there is a build up of nematode eggs and larvae on the pastures with consequent heavy infection rates in grazing animals, this leads to lack of thrive, disease and economic losses, without anthelmintic treatment. Treatment is successful but animals soon become re-infected and require treatment once more. These repeated treatments lead to resistance as the proportion of susceptible to resistant

worms increases. Dosing with an anthelmintic, to which the strain is resistant, effectively gets rid of the competition for space and breeding, by killing the susceptible parasites and helps the resistant strain to develop until eventually only it remains. While these resistant worms are just a few in a population, there is no problem. However, the rate of dosing determines the speed and extent of resistance development. The problem occurs more readily in sheep, horses, pigs and goats, as their methods of husbandry involve frequent treatment of whole populations of animals at the same time; this leads to a an overall drop in-the number of susceptible larvae on the pastures and a relative increase in the resistant ones. Nematodes in goats are particularly inclined to develop resistance and if these are nematode species, which affect sheep or cattle, obviously there are implications. Prichard (1990), reviewed the extent of anthelmintic resistance, its mode of action in different anthelmintic groups and how it develops (the problem can also be introduced with replacement animals). Although under-dosing can also cause the problem, it is worth noting that poor responses to anthelmintic therapy are frequently attributable to inadequate dosing arising from underestimating the weights of animals or to the use of faulty dosing equipment. It is important to distinguish between the development of anthelmintic resistance and partially treated or re-infected animals, especially in intensive systems where parasitic problems are most likely to occur.

Anthelmintic resistance testing

Johansen (1989), made an evaluation of the *in vivo* and *in vitro* techniques used for the detection of anthelmintic resistance in domestic livestock. He stated that the faecal egg count reduction test (FECR) was the most suitable for field screening of resistance and that the larval development assay was likely to prove a valuable adjunct in such investigations.

Egg hatch assay (Le Jambre, 1976) is a suitable back up to FECR and provides an accurate evaluation of the problem when benzimidazoles (BZ) are involved. There are other laboratory tests available including the larval motility assay, tubulin binding assay, and various biochemical tests, described by Sutherland (1988).

Although newer assays are being developed, it is logical that, as the FECR involves the live animal, and measures the effectiveness of the treatment, and applies to all groups of anthelmintics, it is still the most valuable in-field test. FECR requires examination of faecal samples taken from a representative number of the animals under investigation, immediately before and twelve to fourteen days after dosing with the anthelmintic under test. It is necessary for this sampling interval to be observed, since post treatment egg laying suppression may persist for ten days and because longer sampling intervals may allow for re-infection and egg laying. A reduction of less than 90% in faecal egg counts warrants an assumption of a resistance problem. Confirmatory retesting by FECR or egg hatch assay is then indicated.

Measures to limit the problem

Efforts to control a problem, which is potentially disastrous and could leave farmers and veterinarians with few or no weapons with which to fight parasitic gastroenteritis in livestock, must be aimed at keeping the percentage of susceptible parasites in the host and on the pastures as high as possible relative to resistant ones. The methods of doing this include good husbandry as the first principle. This should be based on a system which allows rest time for pastures between grazing periods, so some of the larvae will perish and so less will be present to cause disease, whilst leaving enough to stimulate immunity and keep the ratio of susceptible to resistant as high as possible. This can be facilitated further, by avoiding suppressive regimens, managing pastures wisely and by using the older resistant animals or other species to pick up and waste the larvae. Fortunately, for many years in Ireland, farmers have been urged to treat animals for parasites as infrequently as possible, consistent with health, and to allow animals build up immunity by contact with them in controllable situation. It has also been stressed that correct diagnosis is necessary before treatment. For this reason the spread of resistance in the country has not been as rapid as in other countries and it is vital that farmers continue with that strategy. It is often possible to dose those animals with symptoms rather than the entire herd or flock.

As mentioned previously, there are three main groups of anthelmintics and changing of anthelmintic group should be done *yearly*, rather than more frequently. This slows the rate of build up of resistance by eliminating strains with resistance to the previous year's group; it should be noted that the change should be done on group rather than brand basis, for the resistance applies to all products within the group. There has been a move, in countries where widespread multiple resistance occurs, to combine drugs from several groups, to cross eliminate resistant strains to each group. However, this strategy is not recommended Ireland, at least not yet. Again the seriousness of the threat must be emphasised and farmers must work hard at keeping it at bay.

Goats should not be kept with sheep, as they require special attention in relation to parasite control and helminths more quickly develop resistance in them.

Other conditions such as coccidiosis, bacterial or viral infections, toxins or even over lush pastures can cause similar symptoms, so inexpensive faecal examination for parasite worm eggs is strongly urged before expensive treatments are contemplated.

The danger of introducing the problem must be borne in mind when bringing new animals on to the farm. To ensure that no resistant parasites enter, these animals should be treated with a macrocyclic lactone, to which no resistance has been found in Ireland, and kept away form the rest of the animals and pastures for 24 hours afterwards. This strategy is important in the case of liver fluke. Triclabendazole resistant strains of fluke have been found in the west of Ireland for a number of years now. Liver fluke disease is a serious disease, which causes heavy losses in cattle and sheep in Ireland. Resistant fluke can infect all species therefore pose a most serious threat. Suspected fluke infected introduced animals should be treated with closantel or some other non-triclabendazole based flukecide twice at three a three week interval, before introducing to the herd/flock.

Due to enormous cost, few new products are being developed, so we must guard what is available. In-feed nematophagous fungi have been shown to be a biological control method with promise, and for some time work on breeding parasite resistance strains of animals has been proceeding (Windon, 1990). Work on vaccines against helminth parasites has also been in train for many years (O'Donnell *et al.*, 1989) but we must wait some time for any hope of these being readily available.

References

Boersma, J.H. and Lewing-Van der Wiel, P.J. (1982). Benzimidazole resistance in a field strain of *Haemonchus contortus* in the Netherlands. *Veterinary Record* **110:** 203-204.

Cawthorne, R.J.G. and Whitehead, J.D. (1983). Isolation of benzimidazole-resistant strains of *Ostertagia circumcincta* from British sheep. *Veterinary Record* **112:** 274-277.

Coles, G.C. and Simpkin, K.G. (1977). Resistance of nematode eggs to the ovicidal activity of benzimidazoles. *Research in Veterinary Science* **22:** 386-387.

Jackson, F., Coop, R.L., Jackson, E., Scott, E.W. and Russel, A.J.F. (1992). Multiple anthelmintic resistant nematodes in goats. *Veterinary Record* **130:** p.210.

Johansen, M.V. (1989). An evaluation of techniques used for the detection of anthelmintic resistance in nematode parasites in domestic livestock. *Veterinary Research Communications* **13:** 455-466.

Le Jambre, L.F. (1976). Egg hatch as an *in vitro* assay of thiabendazole resistance in nematodes. *Veterinary Parasitology* **2:** 385-391.

Murphy, T.M., Mc Auliffe, A., Clegg, T. and O'Brien, D.J. (2002). Resistance of *Dermanyssus gallinae*, the poultry red mite, to insecticides on Irish farms. *Proceedings of EU COST Action 833 Conference*, Bari, Italy. September 2002. (EUR 20647) 44.

O'Brien, D.J. and Geraghty, V. (1990). Possible benzimidazole resistance in horses in Ireland. *Irish Veterinary Journal* **43:** 104-107.

O'Brien, D.J. (1992). Anthelmintic resistance in sheep. *Irish Veterinary News* **14 (4)** pp25-26.

O'Brien, D.J., Strickland, K.L., Parr S.L., Gray, J.S., O'Reilly, P.F., Clements, L., Dwyer, P.J., and O'Reilly, L.M. (1994). Anthelmintic resistant nematodes in farm animals in Ireland. *E.U. Publication VI/4125/94-EN* pp101-106.

O'Donnell, I.J., Dineen, J.K., Wagland, B.M., Letho, S., Werkmeister, J.A. and Ward, C.W. (1989). A novel host protective antigen from *Trichostrongylus colubriformis*. *International Journal for Parasitology* **19 (3)** pp327-335.

Prichard, R.K. (1990). Anthelmintic resistance in nematodes: Extent, recent understanding and future directions for control and research. *International Journal for* Parasitology **20 (4)** pp515- 523.

Sutherland, L.A., Lee, D.L. and Lewis, D. (1988). Detection of benzimidazole resistance in trichostrongyloid nematodes. *Parasitology Today* **4:** 22- 24.

Windon, R.G. (1990). Selective breeding for the control of nematodiriasis in sheep. *Rev. Sci. Tech. Off. Int. Epiz* 9 (2) pp555-576.

Yue, C., Coles, G., and Blake, N. (2003). Multiresistant nematodes on a Devon farm. *Veterinary Record* **153 (19)** p.604.

The main export markets for Irish lamb

Michael Walsh
Scargo, France

Introduction
Since Foot and Mouth, the market in France is characterised by relatively low consumption of lamb, and relatively high prices. In 2001 with the UK out of the picture for most of the year, prices were excellent, with Ireland having the highest market share at 18%.

In 2002, the UK was again back in action, putting downward pressure on prices and regained their leader position in terms of market share. New Zealand displaced Ireland as No. 2 exporter to France. Since prices were still relatively higher than pre Foot and Mouth, the door was wide open for NZ and Australian products. In 2002, NZ accounted for 15% of market share.

Consumption of lamb in 2003, was lower than 2002. Aside from price and availability factors, this was largely due to the exceptionally hot summer, which saw prices slump by 20% during the months of July and August. However, despite reduced levels of demand, UK imports into France increased by 12% on 2002. In terms of market share, NZ retained No. 2 position.

How is Irish lamb perceived on the French market in relation to competition?

United Kingdom
Since 2001, Irish lamb is perceived to have a quality premium over UK lamb between April to early September. Outside this period, buyers tend to prefer UK product because their lambs are more regular in terms of weights, conformation and prices. Obviously currency has an important factor on the price, and compared to the pre foot and mouth era when Irish lamb was systemically 10-15 pence lower in price, that situation has now been reversed.

It is an important psychological advantage to have a quality premium perception, and is something that Ireland will need to maintain in the future if Irish lamb is to continue to enjoy a superior price over our UK competitors.

New Zealand
As a competitor, NZ has made serious inroads into the French market, mainly because of competitive pricing. Offering a 3-month shelf-life to fresh vac packed lamb cuts, and a standardised product has enabled them to enjoy considerable growth in fresh lamb sales, e.g. French industrial meat processors producing lamb kebabs ("brochette d'agneau") have switched from the European product to NZ legs of lamb or shoulders. Supermarkets have also demonstrated a willingness to increase their orders with NZ for festive periods (Christmas and Easter) in order to cater for extra demand.

Given advantages in price competitiveness, standardisation of product and other technological advances, NZ sheep farmers can expect several good years to come. Although not a direct competitor on carcase lamb sales, the relatively high prices of the

European product since 2001 will ensure that NZ continues to enjoy increased market share penetration.

Spain

SPANISH LAMB IS MAINLY SOLD IN THE SOUTH OF FRANCE (PROVENCES:- ALPES CÔTE D'AZUR, RHONE ALPES, LANGUEDOC ROUSILLON), BUT THIS LAMB HAS MADE ITS WAY UP TO THE PARIS REGION BECAUSE OF PRICE DIFFERENCE. IT IS PERCEIVED AS A LESSER QUALITY PRODUCT THAN IRISH LAMB BECAUSE IT LACKS CONFORMATION AND QUALITY, AND IS GENERALLY A LIGHTER CARCAS (14-15KG).

How is lamb from Ireland marketed in France?

Customers and Channels of Distribution

PRODUCER ⇨ WHOLESALER ⇨ RETAILER ⇨ CONSUMER

FACTORY	ABATTOIR	SUPERMARKET
	CUTTING PLANT	BUTCHERS
	INDUSTRY	RESTAURANTS

Wholesalers

The vast majority of lamb is sold through the wholesale network, a step before the retail customer. The wholesaler provides the functions of distribution (to retailers), cutting of carcasses and price negotiation. The wholesalers are an important link in the chain, as they also have greater flexibility out of season when retailers swap over to UK lamb. During this period the wholesaler still service a small butcher clientele, and restaurant base.

Retailers

Supermarkets account for approx 60% of retail lamb sales, butchers for 40%. During the season from April to May, Irish lamb has an excellent image in terms of quality and is preferred by the supermarkets over product supplied by our UK counterparts. Price is the essential motivating factor for a supermarket buyer once product/quality specifications are adhered to.

Nearly all promotional activity on lamb is centred around price, which is why New Zealand lamb is so successful.

Irish lamb needs to be competitively priced with regards to UK lamb during summer period (not more than 10 cents greater in order for the supermarkets to absorb the quantities).

Butchers

Most traditional French butchers have seen their businesses decline over the years. However, more resilient butcher chains are becoming more popular as they compete on price with supermarkets and provide a confidence link with consumers who need to be reassured on safety etc.

Muslim butchers deserve a mention for lamb sales, as they are a very big segment of the market. There are 6-7 million Muslims in France (over 10% of the population of France) and they are big lamb eaters. It is estimated that they account for 30% of overall lamb consumption.

How to improve links with the various players in the market place?
The common denominator between all the customers (be it retailers or wholesalers) is that product specification is the same throughout.

Product Specification - LAMB CARCASS

- **TRACABILITY**
- **WEIGHT (16 –19 kg)**
- **CONFORMATION - U2
U3
R2
R3**
- **QUALITY - NOT FAT**

In practice what happens when product specification is not respected?

1. lambs rejected by the customer;
2. no repeat or less frequent orders;
3. easier competition for the opposition;

The result:- e.g. fat lambs used to fetch 30 cents less than No 1 lambs, today the difference is more like 60 to 80 cents!

What is your Industry doing to enhance links with customers?
S.C.A.G.R.O (subsidy of Dawn Meats) in France has invested heavily in marketing over the years, and built strong relationships with retailers in what is a fairly volatile market. Currently they are producing a 'Consumer Retail Pack' with an Irish label, which will be available to the major retail groups in France. The future for these products is encouraging.

Moving from 50 – 100 cows

John Hannon
Kiltemplan, Clarina, Co Limerick

Introduction
The Hannon Family home farm is in the townland of Kiltemplan, in the parish of Patrickswell. A busy minor road divides the farm of 130 adjusted acres. 90 acres is dry limestone type land, and can be grazed most days of the year (the farmyard is within this portion). The remaining 40 acres is a heavier soil type, known locally as 'Corcas' and lies at the other side of the public road. This is excellent grass growing land but would not usually be suitable for grazing in the period mid November to early March.

In 1980 and 1982 John and Charles Hannon, two brothers who now farm together completed the then ACOT 100 hour course and assumed full management of the farm in the mid 1980's. The farm milk quota was set at 45,000 gallons and in addition, 15,000 gallons of milk quota was leased privately. Neither Mitchelstown Co-Op or later Dairygold had available quota to lease or buy.

Table 1. Kiltemplan farm 1985

	Acres	Cows	Gallons
Owned	130 adjusted	50	45,000
Leased			15,000

Developments on the farm

- **1985**

An 8 unit-milking parlour with room for 2 extra units was built, and the entire home farm was re-seeded, including the reclamation of 15 acres of rough land. Winter accommodation was increased from 40 to 80 cow cubicles, and roadways and paddocks were put in to service part of the farm. A water supply was extended to most parts of the farm.

- **1989**

Thirty acres of land and 10,000 gallons of quota were leased 3 miles away from the home farm.

- **1990s**

In the early 1990's the farm ran a flock of over 100 ewes. This enterprise was disposed of in 1993. Subsequently a farm of 40 acres, 3 miles away was leased, and a 40-cow suckler herd established. The followers from the beef and dairy herds were finished to slaughter for a number of years.

- **1993**

Thirty-five adjusted acres of land and 10,000 gallons of milk quota were purchased 3 miles from the home-place.

- **1995**

Eighty acres of land and 25,000 gallons of milk quota were leased, 6 miles from the home-farm. This farm has winter accommodation for 50 adult cattle. In the spring of 1998 the lease of a local farm ended with the loss of 10,000 gallons of milk quota and 30 acres of land.

Table 2. Kiltemplan farm 1995

	Acres	Cows	Gallons
Owned	165 adjusted	82	55,000
Leased	30		10,000
Leased	80		25,000

At this time it was decided to sell the suckler enterprise and obtain more milk quota. After many advertisements in the local newspaper, 51,000 gallons of quota and 79 acres of land were acquired 7 miles from the home-farm. This farm had excellent paddocks, roadways, 50 cow and 50 weanling cubicles. The herd of 50 cows came as part of the deal. There was no history of tillage on the leased land, so calf to beef was the only viable option. Extra cattle were bought in from time to time when value could be got. Approximately half of the land farmed would not be suitable for serious winter grazing.

Table 3. Kiltemplan farm 1998

	Acres	Cows	Galions
Owned	165 adjusted 118 55,000		
Leased	80		25,000
Leased	79		51,000

On the morning of March 23, 1998 70 cows were milked at Kiltemplan. At the evening milking 112 were milked. It was an exciting time on a farm that for years had been starved of quota. There were now an extra 41, 000 gallons of quota to be filled and a farm quota of 131, 0000 gallons.

However, the excitement soon wore off as milking and herding in the now enlarged herd took a lot more time each day. Milking time was extended because:

- Ten milking units were not enough;
- No drafting facilities existed;
- A certain fatigue factor sets in, when one the one and half-hour milking barrier is passed.

To alleviate the pressure of work, the Farm Relief Service was employed in 1998 and 1999 to do did a good proportion of the evening milking. This allowed time for other farm work. From 1998 onwards, a contractor was employed to spread slurry and for two years topping was also contracted out.

1998 was a wet difficult year, and the shortage of roadways became obvious in poor conditions. It was also clear after a few months that improvements needed to be done to the parlour and roadways. However, it took time to get them done because of disruption to an already busy day to day routine. In addition, in order to fill the quota the parlour was almost in continuous use. In spite of these difficulties, 500 meters of extra roadway was added in 1998, as well as resurfacing most of the existing roadway.

- **1999**

400 m of additional roadway were added.

- **2001**

Work on the roadways was completed with the addition of a final 300 m section. The blinding material for the surface of the roads was the only material that had to be purchased. Red soft shale was levelled and received several passes of an industrial vibrating roller, which produced a cow friendly surface. Roadways now extend to over 2 km. The Farm Relief Service fenced the paddocks.

In warm weather water in some of the paddocks became a problem due to piping and troughs being too small. By fitting large concrete troughs 300/350 gallons it solved the water shortages and the existing piping was retained. Costs associated with this work are shown in Table 4. No grants were available for this work.

Table 4. Costs incurred (€)

	Cost (€)
Roadways	19,744
Fencing	6,088
Water supply	4,300
Total	30,132

Since the increase in numbers in 1998 no investments were made in buildings, surplus cows being transported to winter accommodation on the leased farms. Also, with the exception of a double cow box and a disc mower (items, which were required regardless of the increase in stock), no investment was made in machinery.

Sufficient cows were milked in the summer of 2000 to enable the parlour to be closed down and improvements made to the facilities. Improvements made included:

- Extending the milking shed - 6 units were added to the existing 10-unit machine;
- The pit was made narrower;
- The existing feed system was extended and a bulk bin installed;
- A new rectangular yard with a hydraulic backing gate was installed;
- Building a new rectangular yard and cattle crush;
- Installing a drafting gate;
- Purchasing a hoof crate.

Total cost €57,386

A new 1,600-gallon Bulk Tank (replacing a 760-gallon tank) was purchased in 1998 costing €20,950. In 2002 a quad was purchased for €5,000, which has proved to be invaluable.

One of the things that came as a surprise, was the increased amount of time required in herding cows to and from the parlour. This situation is made worse by the crossing of a very busy public road. When there were 60 cows they only crossed the road for a couple of weeks in the year for some after-grass. When not crossing the road it only took about 15–20 minutes to bring the 60 cows for milking twice a day. The cows now cross the road for about 7 months of the year and cover a distance of about 1.25 km. It takes 20 minutes in the morning to put them across the road, and approximately 40-45 minutes in the evening to bring them back to the parlour. This is an increase of 3-4 hours a week between a 60 and 120-cow herd.

A considerable amount of time is also spent travelling to outside farms. They appear to be only 15 minutes away, but include the return journey and multiply by 6 days and you have another 3 hours and only one farm covered! Adjusting cattle to grass growth can be another time consuming job, where the cattle have to be moved between farms via truck. This takes a lot of time and costs in the region of €650-700/year.

Locally there are good employment opportunities, providing options for farmers and non-farmers alike. This has brought mixed blessings since it means that farmers who had time on their hands in the past, and could be called upon to do jobs like herding, fertiliser spreading etc., are now working part or full time and so find time scarce enough to run their own farms.

The only reason land was leased was to obtain milk quota. The first leases involved milk quota only, but as time went by more and more obstacles seemed to come in the way of leasing and expansion. No allowances were made in the rules that two brothers were working in partnership. The lease in 1998 escaped the 20% clawback by 48 hours. However, every cloud has a silver lining, and the land leased with quota will put the enterprise in a favourable position post decoupling. Decisions will have to be made as regards the new environment in farming and how things will proceed in the future.

The business has substantial leasing charges and these will have to be watched carefully in order to keep a firm eye on costs. To achieve this, grazed grass forms an important part of the diet, with cows grazing from early (February as they calve) until the end of November. Regular grass budgets are done. Membership of the local Ballybrown Discussion Group (formed 1993) is a great help in maintaining an ongoing analysis of cost and efficiency. The discussion group facilitates:

- Monthly meetings;
- Annual analysis via Profit Monitor;
- Praise and criticism from the members when deserved:
- Up to the minute information from the group facilitator;
- Ready access to the local Teagasc advisor.

To help with the paper work in 2004 a computer package was purchased.

Future goals

- To produce milk for 12 c/l;
- To buy/get ownership of quota leased at present;
- If quota comes in at zero cost, to increase production to 160,000 gallons;
- To invest off farm.

Life

The family wanted to improve their lot and so expanded. They tripled output and are proud of what they have achieved. It can be a pleasant walk through their farm, which goes to show that good production and regard for the environment can go hand in hand. There can be dark days too - especially in springtime when keeping all the balls in the air at the one time can take its toll. A 75-hour working week and only a few hours off on Sunday are the reality. If you are fond of attending rugby, All Ireland league matches on Saturdays or play a couple of rounds of golf each week, this is not the career move for you. The time factor involved in running a dairy enterprise and running a beef enterprise in three different farms has to be experienced to be believed! With some adjustments in the future the Hannons are confident that working hours can be reduced. However, if you like working for yourself and are prepared to take on a challenge, there is a reward in the job satisfaction of growing a dairy enterprise.

Quota

Appendix 1. 1984 - 346 gallons to the acre on the home farm

Year	Gallons	Owned	Leased
1984	45,000	Home Farm	
1986 – 1989	15,000		Leased
1989 – 1998	10,000		Leased
1993	10,000	Bought with Land	
1995 – 2006	25,000		Leased
1998 – 2005	51,000		Leased

Leased 76,000
Owned 55,000
That is 1,007 gallons to the acre on the home farm.
€239,334 spent on leased quota over the last 20 years.

High quota prices were never entertained and 8 c/l and lower would be the normal.

Appendix 2. Stock as at 30/05/2004

Cows	Dry cows	0-1 years	1-2 cattle	Rep heifers	Bulls
115	12	85	52	45	2

Milk Yield 1,187 Gallons/cow
Butterfat: 3.71%
Protein: 3.36%

Appendix 3. Expenditure

Year		Cost (€)
1985	8 Unit milking parlour & slatted collection tank	42,000
1988	Slatted beef shed & 20 extra cow cubicle	46,000
1993	38 acres of Land and 10,000 gallons of milk quota	80,000
1994/1995	Reseeding, fencing, cattle handing facilities and general tidy up for above	22,800
1994	Conversion of an existing shed to calving boxes that could be cleaned with a tractor	4,300
1995	2 units added to parlour	2,200
1998	Bulk tank 1600 gallons replaced 760 gallons Upgrade and alterations to dairy	20,950 3,750
2000/2001	Parlour upgrade	57,386
1998,1999	1.2 km of new roadways and resurface existing road	
2001	Fencing and new paddocks	6,088
2001	New water troughs	4,300
	Disc mower	5,777
2002	Quad	
	36 teat mobile calf feed	5,000
2003	Spinner for Quad	600
	Land drainage (for extra early grazing)	4,300
2004	Up-grade fencing in all grazing paddocks to accommodate calves	1,350

Is there a future for Irish milk?

Jerry Hinchy
Dairygold

Introduction

Based in Munster, Dairygold is Ireland's largest Co-Operative milk processor, processing a milk pool of 190 million gallons, from a geographic supply area incorporating counties Cork, Tipperary, Limerick and Clare.

In the last year, management at Dairygold responded to the challenges presented by the changing dairy industry (both domestic and global), in a drive to build a strong business capable of competing successfully on an international stage. This has been, and remains the core objective of Dairygolds consolidation and restructuring program. To this end, the past year has witnessed the Co-Op exit certain non-profitable and/or non-core aspects of its traditional business, so as to strengthen and re-focus the business for survival, and growth into a world-class consumer foods business.

Whilst there has been successful implementation of many aspects of this program in some areas, there is a need to re-structure the Consumer Foods, Agri-Services and Retail Divisions, and Milk Processing in order to realise full potential going forward. The primary focus is and will remain on milk processing. This will entail getting the cost base, product portfolio and plant configuration right so as to operate a profitable milk processing business, whilst at the same time paying a sustainable price for milk. The challenges are great, and the options many and diverse.

Dairygold is acutely aware that the Irish dairy industry is very interdependent, and needs to cooperate and work together to focus on how it might best process the entire Irish milk pool at least possible cost, and at maximum added value.

The future success of the Irish dairy industry will also depend on how the industry exploits the potential that it has invested in the Irish Dairy Board (IDB). As an industry, cooperating to secure a viable future for milk production in Ireland, it must look at how it can best harness the capability of the IDB, to support the future for Irish milk production, five and ten years from now.

Meeting the challenges

Is there a future for Irish milk? It is a question that is very relevant to those who work and earn a livelihood in the dairy industry. It is also a pertinent question for Ireland as a whole, given the strategic importance of the industry in terms of employment and contribution to GNP. In answer - YES, there is a future for Irish milk, but there are a number of key factors underpinning this belief:

- Strong and growing global demand for dairy products;
- The emerging and exciting opportunities presented by the health dimension of dairy products;
- That the grass based production systems prevalent in Ireland maintain a competitive advantage with regard to costs.

Growing global demand

There has been strong growth in global demand for dairy products from late 2003 and into 2004 with the forecasts for the remainder of 2004 continuing to be positive. World demand for dairy products is growing at around 2% per annum. This demand is higher than the total annual production of Australia (around 10.5 million tones). The key fundamental driving this growth has been the strong growth in world gross domestic product (GDP), which is expected to moderate from the 6% annualised growth experienced in the second half of 2003, to a respectable 4% plus rate in 2004. More importantly for the dairy industry, has been the growth in the key import markets of Asia and China - especially in relation to GDP growth, which in 2004 ranged from around 9% in China to 5.4% for the ASEAN-4 [*Indonesia, Malaysia, Philippines & Thailand*] countries. Consequently, global import demand for dairy products is expected to remain strong.

Increasing affluence in these countries leads to an increase in the consumption of dairy products. The local dairy industries cannot cope effectively with this increase in demand (be it for reasons of infrastructure, capacity or technology). A clear lag develops between growing consumption and under-supply by the local dairy sector, which has to be met by imported product.

Increasing New Zealand exports to China

An example of the impact of this increased demand is the fact that China is now Fonterra's fourth largest market by value, generating in excess of NZ $300 million (Å162 million) in 2003. Two years earlier (in 2001), China was not in Fonterra's top 10 export markets. In 2002, Fonterra supplied 70% of China's dairy imports (excluding whey, where the USA is the major supplier). The bulk of Fonterra's sales to China are generated from the supply of ingredients to companies manufacturing dairy products. In the three years from 2001 to 2003, New Zealand's exports of whole milk powder to China increased by 166%, from 29,638 tons to 78,806 tons. Its exports of non-fat dry milk increased by 199%, from 7,061 tons to 21,086 tons. Exports of butter increased by over 600% from 1,346 tons to 9,543 tons, while cheese exports to China over this period grew by 530%, from a relatively low base of 390 tons to 2,458 tons.

China's consumption of dairy products and demand for dairy ingredients is continuing to grow as a result of increased urbanisation, rising incomes and growing consumer sophistication. This is backed with support from the Chinese State Commission for Food and Nutrition, who are promoting the benefits of dairy products with initiatives such as the school milk scheme [*The school milk program aims to provide 600,000kg of milk to 3 million students over three years. The program has already provided 380,000kg of milk to 1.9 million students*]. According to figures published by the Chinese Ministry of Agriculture, dairy consumption has grown by 10% for the past three years. All indications suggest that that consumer and ingredients demand will continue to increase beyond the capacity of the local Chinese industry to supply, creating market opportunities for companies like Fonterra in China [*The New Zealand and Chinese governments are in advanced discussions regarding the creation of a free trade agreement between the two countries, which they hope to have in place by 2005. Such an agreement would significantly benefit Fonterra's exports to China. Fonterra is also currently completing negotiations with the Chinese government and China's third largest dairy company - Sanlu to purchase a 39% stake*].

The health dimension of milk and the demand for higher value products
Society has become increasingly body conscious, and actively seeks foods that promote good general health, as well as good specific health in areas such as strong bones, a healthy digestive system or a healthy weight. Dairy ingredients are being used across a huge array of products from weight management systems to protein drinks and bars for athletes. Ongoing nutrition and health studies are rapidly expanding our understanding of the enormous health benefits of the vitamins, minerals, proteins, peptides, amino acids and various lipid fractions in dairy products and ingredients, as well as the probiotic benefits of cultured dairy products.

There are significant growth opportunities in developing health and nutritional solutions in immune health, gastrointestinal health, infant nutrition, sports health, bone health and animal health. With all this health potential from dairy products we are seeing non-dairy companies trying to get in on the act. This year, Coca-Cola purchased Israel's third largest dairy - Tara, for $39m. Coca-Cola explained its decision by saying that it needed to extend its product range and to gain access to the growing market for drinkable dairy products. Last year Coca-Cola launched a range of milk drinks in the US and is planning a similar launch in Australia in 2005.

Cost of production advantage from grass based feeding system
Ireland enjoys a competitive advantage in the production of milk over most northern European countries. This competitive advantage is due to our grass-based feeding system for dairy herds, and is facilitated by the country 's moderate climate, which makes it very suitable for grass production. The grass-based feeding system has proven to be more cost-efficient for producing milk than the mainly grain-fed systems used in continental EU countries. The pasture-based feeding system also has the advantage of being more environmental and welfare friendly for dairy cows and milk production.

However, while there are a number of very positive factors, which should help secure a viable future for Irish milk, this won't happen just because there are reasonably favourable market conditions. To secure this future, the industry will have to be market focused, agile, responsive and efficient so as to deliver value throughout the supply chain from the dairy farmer, right through to the end consumer. There are fundamental changes and improvements that have to happen in the industry in Ireland is to survive the changing market environment, and benefit from an increasing demand for dairy products.

Seasonal milk supply
In this era of decoupled direct payments, Ireland will have to arrive at a situation, whereby milk is produced as far as possible in response to market needs. Milk supply will have to be matched with demand without discounting the advantages of milk from grass. The current supply cycle results in huge seasonal supply peaks. The responsibility for collecting this milk, processing and the development of new products rests with the dairy processors.

While it makes economic sense for the dairy farmer to maximise milk output in the lowest cost production periods, it is not without its costs to the industry as whole. The seasonal supply glut of raw milk forces the processors to look at converting this milk into longer life commodity type products, which have low returns. The seasonality peak also results in costs associated with under utilised plant capacity in the off peak periods. The industry must re-examine these issues, as there are enormous capital costs involved.

There is a need to tackle the seasonal peak supply issue. Ways of shifting some of this peak onto the shoulder periods at either side of the peak must be investigated. This may involve some system of differential pricing, or price penalties for excess milk supplies at the peak, with bonuses for suppliers who follow an extended grass production model of spring and autumn calving. A means of ensuring that whatever is put in place is fair to the farmer will obviously be required.

Dairy farmers

Starting with the first link in the supply chain - the dairy farmer. The policy environment going forward will be very different from the one in which dairy farming has operated over the last 30 years. The new era is one where the value of EU export refunds and market supports are falling and may eventually disappear altogether.

Product mix choices

Irish dairy processors have to process around 5.3 million tones of milk each year. They have to decide which products can turn this delivered raw milk into a profitable return, however modest. The product type choices available to processors are to produce a range of commodity type products or specialist products.

Product evolution

To be a successful commodity product provider in the future, in a market environment of reduced or eliminated EU supports and protections, the processor will need to be very efficient and price competitive. A low cost milk production advantage will be beneficial compared to some of our EU competitors who have to operate in higher cost environments. However, a lower cost of milk production advantage alone, will not be sufficient to survive and compete successfully as a supplier of commodity dairy products. Processors will have to be ruthlessly efficient in all aspects of their business from raw milk collection, to the delivery of product to the end customer. Processors will have to maximise the utilization and productivity of their resources and to minimise their costs. All resources; capital, plant, labour, energy, environmental and transport will have to be utilised and managed effectively and efficiently. Large scale is less of an issue for the production of specialist products, but the requirements for efficient use of resources certainly applies.

For specialist producers, the ability to flexibly and competitively deliver product in the quantities and specifications required by their customers are the key factors for success. They need to develop strong long-term relationships and supply partnerships. They need to work with their customers to improve the quality, functionality and value of the products delivered. To achieve this, they need to be close to their customers to understand and anticipate current and future requirements. They need to build supply relationships that make it difficult or costly for competitors break into.

Customers

We have seen the retail multiples exercising a lot of power in the market place, pushing down prices, rationalising the number of suppliers, and putting additional supply requirement costs on dairy companies. Other key customers of dairy companies are imposing similar type demands and disciplines. They require their suppliers to be proactive in improving quality and functionality, responsive and agile in meeting their needs in terms of quantity, quality, consistency, and the competitiveness of the product supplied. Dairy companies have to be close to their non-commodity customers and work with them in meeting their product requirements. In these types of supply relationships, customers want to deal and communicate directly with their suppliers and there is no role or value for middlemen in the supply relationship.

A roadmap for the future

The old prescription for increased scale and efficiency was merger, acquisition and consolidation. This has been stated and restated regularly over the past two decades and no one in the industry has offered a different long-term solution. However, it has not been fully embraced by the industry for a variety of reasons. These reasons have as much to do with tradition, as they have to do with the structure of the industry itself. The key and central role played by local co-ops in their communities over the past century should not be underestimated. They played a highly significant role in the evolution of Irish agriculture and the ties between them and their shareholders and communities are far more than financial, they exist also at an emotional level. For the shareholders and managements of these entities to participate in a wide scale rationalisation or consolidation of the industry, is asking a lot. There is also the issue of local rivalries and simple fear of the unknown. Merger with a traditional rival may be seen by many involved as similar to asking Cork and Kilkenny to field a joint hurling team! Also existing management teams and others may fear for their own future in an enlarged and rationalised business.

Where consolidation has occurred, the parties have generally been slow to realise the potential efficiency gains, again for a variety of reasons. Chief among these has tended to be the terms of the original merger or acquisition under which all parties involved (shareholders, management, staff, suppliers and so on), were assured that nothing would change. These assurances tended to be made to smooth the merger process. Star ting from such a position it is always going to be difficult to realise the benefits of a merger - particularly in the industrial relations context. Probably the single successful exception to this rule was Kerry Group's unapologetic purchase of Golden Vale.

At Dairygold the painful process of realising the necessary efficiency gains has begun. Over the past year a root and branch review of every aspect of the business has been instigated. In each area the formula of "fix it, outsource it, sell it, or shut it" has been applied. This has resulted in approximately 1,000 redundancies; i.e. exit from pig slaughtering and red meat; rationalisation of the UK cheese operations; and the outsourcing of yogurt manufacturing and transport operations. This has resulted in a leaner more efficient business, but there is more to do. While the headline number of staff reduction was high, most of this did not apply to the milk processing division, and although numbers were reduced by 20%, it is still inefficient due to the number of sites. The scale to compete successfully on international commodity markets of the future is still not there. The resources to compete as a specialist product manufacturer are also still not there. Challenging targets for 2007 have been set and to achieve these, new models for the business will have to be examined - models that will involve a major step shift.

The Irish dairy industry is not one unit, but for the most part a series of tribes connected only by relative position in the milk price league and ownership of a trading and investment house - the IDB. This may seem a healthy attribute to those who see the world through the jaundiced eye of the perceived failure of mergers in this country. However the 'divided we stand, united we fall' mindset of the cynic cannot be allowed to flourish. Stand for a moment outside the box and imagine what would happen if a *change team* was handed a clean sheet of paper and told to forget about past failures/rivalries, forget about the power of the interest groups, just simply write down how to maximise the competitive position of those who milk cows on this green island.

The change team

The 'change team' would very likely come back with the following summary recommendations:

- The emergence of a small number of strategically placed, scale commodity sites with their own sales arm;
- The development of a number of smaller sites, strategically chosen to cluster existing volume of non-commodity products, should they not fit best alongside the commodity sites. Sales and Tech development would be aligned to ensure these businesses are positioned to extend and defend their businesses;
- Target markets for emerging products would be nominated;
  - ✔ Nutrition - U.S;
  - ✔ Cheese flavour/texture - U.K;
  - ✔ Dairy ingredients - China;
  - ✔ Medium and hard cheese - southern Mediterranean;
  - ✔ Food service - US/UK;
- Appropriate sales/R&D teams would be constructed to address each of these markets and state agency, dairy orientated, market and tech research would be absorbed by these entities.
- Non-core assets would either be sold to fund change or given back to the original stakeholders to be managed outside of the milk processing structure.
- Governance and ownership would be driven by how Dairy Ireland progresses away from commodity towards lifestyle health orientated ingredients. There is room for a stock market and farmers, if there is a path of growth. There is room for farmers only if we remain in non-growth, non-intellectual property type products.

To speak of a single strategy for the Irish dairy industry is a fine lofty topic. However, as the industry is structured today, it is a complete waste of time. You cannot develop a strategy for a series of fragmented businesses with separate ownership and management structures.

So is there reason for hope?

Management of today's processing entities are progressively attempting to examine means of working in a pragmatic, non-threatening manner with their neighboring processors, to find the lowest cost means of solving their commodity processing challenges. This is an important step. Farmers today, and the boards that represent them have moved far beyond parochial issues. They are becoming focused on ensuring that positive change occurs to mitigate the effects of reducing EU supports, and indeed trying to move Ireland into the sweet spot of leading edge technology application.

It is very early days yet, however, the Irish dairy industry is neither young nor without history and roots, and it would be unrealistic and indeed perhaps unhelpful if the evolution of the industry was to occur too quickly.

Dairygold restructuring

As the largest co-op processing milk on the island, and especially given its geographic position, Dairygold will play its role in the future developments of the Irish dairy industry. A strategy for dairy processing has only now been completed. It will deliver change, which will be robust in the face of the future evolution;

- One large efficient commodity processing site;
- Repositioning of current value-added products, either as discreet clip-ons to the commodity site or located on sites where they have a long term future.
- The creation of a speciality ingredients business to drive added-value.

To drive this change will require funds; the intention is that these funds would be put in place in a manner that would prevent Dairygold from becoming a brake on Irish milk price over the course of the change period - the next 2 to 3 years. It is therefore vital that non-agri foods are managed in a manner that ensures they maximise their value for the business, and that the assets built up outside of the Dairygold balance sheet are unlocked e.g. in businesses that are part owned (such as IAWS and the IDB).

From a Dairygold perspective, it is perfectly reasonable to suggest the IDB can best serve Irish dairy farmers by going back to what it was put in place to do 'Market Irish Dairy Products', and release the extensive value it has built up outside this remit to act as a catalyst in the forward development of the Irish dairy industry. A good business case can be made for having a centralised commodity clearing house to dispose of Irish dairy commodity products, but it does not need to have a large and expensive infrastructure and overheads. It has to be lean and efficient in every aspect of its operations. This requirement is no different for the dairy farmer or the dairy processor.

There has been only limited development of the Kerrygold brand in recent years. There is a need to examine if a different organisational structure, and marketing focus is required to successfully develop and expand the range and quantity of branded Irish dairy products sold on international markets, at higher margins.

The IDB going forward

The new go-forward structure of the IDB should aim to;

- become a low cost commodity sales management operation;
- separate out it's 'value added' branded business, and drive it forward;
- give up on being a speciality ingredients player, it 's not the role for a trader.

From a Dairygold perspective, it is reasonable to suggest that the IDB can best serve Irish dairy farmers by going back to what it was put in place to do - 'market Irish dairy products' and release the extensive value it has built up outside this remit, to act as a catalyst in the forward development of the Irish dairy industry. A good business case can be made for having a centralised commodity clearing house to dispose of Irish dairy commodity products, but it does not need to have a large and expensive infrastructure and overheads. It has to be lean and efficient in every aspect of its operations. This requirement is no different for the dairy farmer or the dairy processor.

Conclusions

A challenging transition period is now upon the Irish dairy industry as it leaves behind the era of EU supports. This paper has identified a number of key industry strategies that must be addressed if further progress is to be made;

- At farm level, the milk supply curve has to be better managed.
- At the processing stage, the asset-sharing model must be embraced as a realistic and viable means of ensuring low cost commodity production.

At the sales end, the IDB (which has served the nation well), needs to look at radically transforming its structures to ensure it focuses on being the most cost efficient commodity seller and the best manager under the Kerrygold brand.

There is a future for Irish milk, but this future is by no means guaranteed. As an industry 'Ireland Inc.' may not have prepared as well as possible for an environment of significantly reduced EU supports and increased international competition. To secure a viable future, tough but necessary actions will have to be taken. The prize is worth fighting for, - is the resolve there?

Strategic use of nitrogen in a new environment

J. Humphreys, K. O'Connell, A. Lawless and K. McNamara
Teagasc, Moorepark, Solohead and Johnstown Castle

Introduction

In recent times, the control of nitrate losses from agriculture to surface and ground waters have been the focus of attention pending the instigation of a National Action Programme under the Nitrates Directive (91/676/EEC). The objective of this Directive is "to reduce water pollution caused or induced by nitrates from agricultural sources and to prevent further such pollution". Pollution by nitrates is defined as concentrations exceeding 50 mg nitrate/l, known as the Maximum Allowable Concentration (MAC). However, concentrations of less than 25 mg/l (the guide level) are considered desirable.

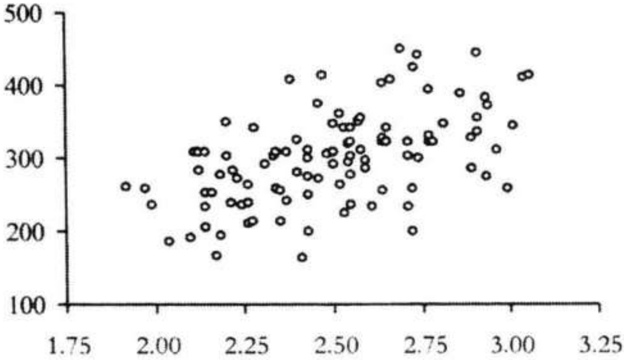
In Ireland the whole country has been designated as subject to controls under this directive, which seeks to limit soil amendments by N contained in organic manures to 170 kg/ha/year. Such amendments include the direct deposition of excreta by grazing livestock and land spreading of organic manures. These manures include that generated by ruminant livestock housed on the farm, by intensively managed livestock such as pigs and poultry, and others, such as spent composts, sludges etc. Restrictions are also placed on periods during which these manures can be applied, ranging from mid-October to early January in the south and east, and the beginning of October and the end of January in the north. The main impact of the limit of 170 kg organic N/ha is to restrict stocking rates on farms to around 2.0 LSU/ha (0.8 cow/acre).

These limits are not yet 'set in stone' and will be the subject of intense negotiation between Irish government departments of agriculture and environment and the EU commission. However, this is not an issue that will be dealt with in this paper, but rather the objective is to outline some of the factors that influence the efficiency of N use on grassland farms. Improving efficiency of N-use is necessary to maintain production under restricted fertilizer N regimes, and also to reduce losses to the environment. This will also strengthen Ireland's case for derogation in future. Improving efficiency of N-use is also important from the perspective of lowering costs on farms where incomes are coming under increasing pressure following the recent reforms of the Common Agricultural Policy (CAP).

Fertilizer N use on intensive dairy farms

Surveys of fertilizer N use on intensive dairy farms indicate that at similar stocking rates, there is considerable variation in the quantities used (Figure 1). There are a number of reasons for this including differences in soil-type and natural background fertility (see below), differences in the type of stock being carried and the extent to which maize and whole-crop are grown, and the extent to which concentrates and other feeds are imported onto farms. The latter will tend to lower fertilizer N use on farms. Nevertheless it is clear that some farmers are using N more efficiently on their farms, than others. It can be seen in Figure 1 that fertilizer N use on farms stocked at 2.5 LSU/ha ranges between 225 and 400 kg/ha. Obviously the farmer operating at 225 kg/ha will be better able to meet the future requirements of the Nitrates Directive compared to the farmer using 400 kg/ha. The question is why is one farmer so much more efficient than the other?

Figure 1. Fertilizer N use on intensive dairy farmers in the south west of Ireland.



Factors influencing losses of N

Available N for uptake by the sward

Efficient management of N on farms requires that N is supplied to the soil at a time and in a manner that ensures that as much of that N as possible is taken up by the sward and used to grow grass to feed livestock. This requires that losses between application to the soil and uptake by the sward be minimised.

Nitrogen is available in the soil in two forms: nitrate and ammonium, both of which can be taken up and used by the sward. Fertilizers supply both nitrate and ammonium, for example, CAN is calcium ammonium nitrate. Urea, on the other hand, is broken down to ammonium once it is applied to the soil. Any ammonium that is not readily taken up by the grass roots accumulates in the soil where it is converted to nitrate. This is unfortunate because nitrate is prone to being lost from the soil.

Soil particles are negatively charged. Ammonium in the soil is positively charged and therefore ammonium is held quite well in the soil. In contrast, nitrate is negatively charged and is therefore repelled from soil particles. Thus nitrate in the soil moves easily with the flow of soil water, which facilitates the transport of nitrate to plant roots when the sward is taking up soil water. The soil water is drawn to the plant roots by a process called evapotranspiration. Approximately 4,500 m^3 of water/ha/year (a little less than 400,000 gals/acre) is drawn out of the ground by this process.

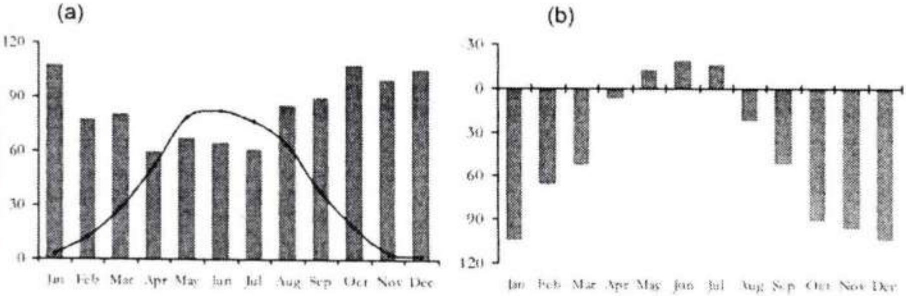
Nitrate leaching and denitrification

The mobility of nitrate is a disadvantage under conditions of high rainfall because it leads to leaching. This is a mechanism by which nitrate is washed out of the topsoil as water passes down through the soil profile. Leaching of nitrate is mostly associated with sandy, free-draining soils. In heavy soils with impeded drainage, nitrate is lost by an alternative mechanism that is also dependant on the soil water status. Under high rainfall, the soil pores of heavier soils get increasingly saturated with water, which depletes the soil of oxygen. Under such circumstances certain bacteria in the soil are able to take the nitrate (NO_3) and detach the oxygen (O_2) and use it to survive the waterlogged conditions. This process is called denitrification and leads to the release of N_2O and N_2 gasses into the atmosphere.

In Ireland, there are high rates of rainfall during the autumn, winter and spring (Figure 2a). In contrast, rates of evapotranspiration are highest during late spring, summer and early autumn. Average rainfall in Ireland is around 1000 mm per year, whereas evapotranspiration is around 450 mm per year. The difference is known as surplus rainfall, which either drains down through the soil or runs off the soil surface into drains etc. This surplus rainfall amounts to around 5,500 m^3 of water/ha or around 500,000 gals/acre).

As can be seen in Figure 2b, most of this surplus rainfall occurs between October and January. These huge volumes of surplus rainfall can cause considerable losses of nutrients either by denitrification of nitrate, nitrate leaching or run-off etc., and this has implications for the timing of fertilisers and slurry.

Figure 2. a) Average monthly rainfall (bars) and potential evapotranspiration (line) (mm/month), and (b) surplus rainfall (mm/month)



Volatilisation of ammonia

The opposing influences of rainfall and evapotranspiration also influence the other important mechanism of N loss from grassland, i.e. volatilisation of ammonium (NH_4) to ammonia (NH_3) gas. This loss of N is generally associated with the application of urea fertilizer. Once urea is applied to the soil it is broken down into ammonium and dissolves in the soil water. Ideally this soil water seeps down to the grass roots. However, under good drying conditions, the water containing the ammonium can be evaporated off into the air as water vapour. The ammonium dissolved in this water is like-wise volatilised off as ammonia gas. It can be seen in Figure 2b that evapotranspiration exceeds rainfall during May, June and July. Hence, these are the months when there is greatest risk of volatilisation. For this reason it is not generally recommended that urea fertilizer be used after the beginning of May.

The greatest loss of N by volatilisation occurs during the application of slurry. The N in slurry exists in two main forms: (1) ammonium and (2) organic material, which is the solid fraction of the slurry (e.g. the fibrous residue of digested silage etc.). Ammonium accounts for around 50% of the N in slurry and the solid fraction accounts for the other 50%. Once the slurry is applied the ammonium is immediately available for uptake by the sward. The N in the solid material only becomes available as the organic material rots away over time.

However, ammonium in slurry can easily be lost by volatilisation, in the same manner as it is lost following the application of urea fertilizer. In fact, virtually all of the ammonium in slurry applied after the beginning of May can be lost by volatilisation, particularly where slurry is applied to bare silage stubble under dry conditions during the summer. This is partly because of weather conditions, but it is also due to the method of application. Spraying slurry into the air via splash-plate, promotes the process of volatilisation. These losses occur during and immediately after application and virtually all of the ammonium in the slurry can be lost within a few hours of the slurry being applied. The application of 33 m^3/ha (3000 gals/acre) of slurry can contain around 100 kg N/ha, half of which is ammonium dissolved in the liquid fraction. Hence, around 50 kg N/ha is rapidly lost by volatilisation when the slurry is applied under the wrong conditions. This represents a significant loss of N when it is considered that average fertilizer use by the group of intensive dairy farms presented in Figure 1 is 300 kg fertilizer N/ha.

Volatilisation losses can be minimised by applying slurry under conditions that promote the rapid infiltration of the slurry into the soil. Two factors facilitate the achievement of this objective; (1) applying slurry under damp misty conditions and (2) applying fairly dilute slurry.

Damp conditions

To get the best response to slurry, it is necessary to apply slurry under cool damp misty conditions, preceding or coinciding with active grass growth and rapid uptake of nutrients from the soil. The most ideal concurrence of these conditions is during the spring months of February, March and April, and to a lesser extent the autumn months of September and October. However, when slurry is applied in October, it is being applied just prior to the four wettest months of the year (Figure 2a) and at a time of declining grass growth. Hence, while applying slurry in October might lower ammonia losses, there is increased risk of P loss in runoff and nitrate loss by denitrification and leaching over the winter.

The greatest responses to applied slurry is during the spring, when infiltration is high, and there is a huge increase in grass growth; going from around 5 kg DM/ha/day in January to around 80 kg DM/ha/day by the end of April. This generates a huge demand for the nutrients ensuring rapid uptake and efficient utilization of the nutrients in the slurry. Furthermore, when slurry is applied during the spring, the solid material gets washed down into the soil where it rots away slowly during the summer months, releasing nutrients for uptake by the sward. In contrast, when slurry is applied during October, the solid fraction rots away during the winter months, when uptake by the sward is low and there is high rainfall causing the loss of these newly released nutrients by run-off, denitrification or leaching.

Application of dilute slurry

In Ireland, the solid fraction of slurry generally accounts for between 2 - 10% of the total volume of slurry. As this becomes more dilute due to rainwater or mixing with dirty water, there is a dilution of the nutrients contained in the slurry. This creates greater volumes of slurry. As slurry gets more dilute, the relative efficiency of utilization of the ammonium-N increases, because more dilute slurry infiltrates into the soil much more quickly that higher DM slurry. This is particularly the case for slurry applied during the summer months when the likelihood of volatilisation is greatest. With high DM slurry, a greater proportion of the nutrient value adheres to grass or the soil surface, where it remains exposed to the air for longer, leading to greater losses through volatilisation.

Grass growth and N uptake from the soil

Factors influencing grass growth

Sunlight (day length and intensity), soil temperature and soil moisture are the three primary determinants of grass growth. Sunlight provides the energy that fuels grass growth through the process of photosynthesis. The extent of sunlight depends on the combination of daylength and the intensity of the sunlight. Daylength varies from around 8 hours/day in mid-winter to 16 hours/day in mid-summer. However, the incidence of sunlight is about 10-times higher in mid-summer than mid-winter. This is because the intensity of sunlight is about 5-times higher in mid-summer than in mid-winter.

During the winter and early spring, low soil temperatures limit grass growth. At soil temperatures of less than 4.5°C there is no net accumulation of new pasture. Between 4.5°C and 6.0°C there are small amounts of pasture accumulation. It is only when soil temperatures increase above 6.0°C that there are substantial amounts of grass growth. Grass growth increases rapidly with increasing soil temperatures above 6.0°C. Winter/spring temperatures vary widely across the country, with grass growing virtually all year round at Valentia (Co. Kerry), but limited by low soil temperatures during December, January and February at Clones (Co. Monaghan).

Soil temperatures generally place a greater constraint on grass growth during the spring than during the autumn. In the autumn grass growth is constrained more by decreasing sunlight and by changes in the physiology of the sward. During the late autumn the sward begins to accumulate resources in the stubble rather than producing new leaves that might be burned off by frost. Also, grass leaves are the machinery that absorbs sunlight for photosynthesis. The cost of running this machinery is respiration, which describes the energy used to maintain the internal workings of the grass sward. As sunlight declines during the autumn the respiration cost associated with a large amount of leaf material can begin to exceed the level of photosynthesis that can be maintained on the declining sunlight. Hence for the plant, having a large amount of leaf material starts to become a liability. Under such circumstances, energy loss by respiration can exceed the energy absorbed from sunlight, and grass starts to shed some of its leaf material, which is often manifested as white-tips on the leaves of grass. This process also leads to a loss of DM when heavy covers are carried into the winter.

A soil temperature of 6.0°C is generally considered an important threshold for grass growth during the spring. It has occasionally been suggested that, because soil temperatures remain above 6.0°C until as late as November, that this justifies the application of fertilizer N during November. This is nonsense. Applying fertilizer N during November is a complete waste of money, since the possibility of getting a worthwhile response in grass growth is long gone!. Furthermore, high rates of surplus rainfall will be entering the soil during November, December and January during a period when uptake by the sward will be virtually zero. Under such conditions, fertilizer N will not remain for long in the soil.

In general, soil temperatures in coastal areas of the south and west are relatively high during the winter and spring, and lower in inland areas of the north and east. This has implications for the application of fertilizer N during the spring. In contrast to soil temperatures, the incidence of sunlight varies relatively little in different parts of the country. Therefore, while higher soil temperatures during the winter favour a longer grass-growing season in the south, there can be much less of a difference in the amount of grass grown during the year. As can be seen in Table 1, there is little difference in the amount of grass grown in Moorepark, Co. Cork compared to Ballyhaise, Co. Cavan, although Ballyhaise is much further to the north. The implication is that at colder locations, there is much the same potential to grow grass except that it will be grown over a shorter growing season, characterised by a huge surge in grass growth during April and May.

Table 1. The productivity of permanent grassland under simulated grazing around Ireland

Site	Production (t DM/ha/yr)	SD
Moorepark, Co. Cork	14.5	1.2
Kilmaley, Co. Clare	14.2	1.8
Solohead, Co. Tipperary	15.8	1.9
Ballyhaise, Co. Cavan	14.4	1.5
Grange, Co. Meath	13.6	1.0

There are clear relationships between the factors that influence grass growth and hence requirements for N from the soil, and those likely to result in losses of N from the soil. During the main growing season there is a huge demand for N from the soil, whereas the risk of loss is limited to volatilisation of ammonia. During the winter the demand for N is low whereas the risk of denitrification and leaching is high. The important questions are (1) when to start applying fertilizer N in the late winter or spring and how much to apply; and (2) when to stop applying fertilizer N during the autumn?

Fertilizer N recommendations for grassland

The requirement for available soil N

Annual grass production rarely exceeds 15 t DM/ha (Table 1), and is dependant on the uptake of at least 450 kg N/ha from the soil. The availability of at least 450 kg N/ha from the soil supplies 30 g/kg N in the grass DM - the minimum required for optimum photosynthesis. However, it is not necessary to supply all of this as fertilizer N. This is because soils have the capacity to supply a certain amount of N, known as background N, each year (Figure 3a).

Background availability of N in the soil

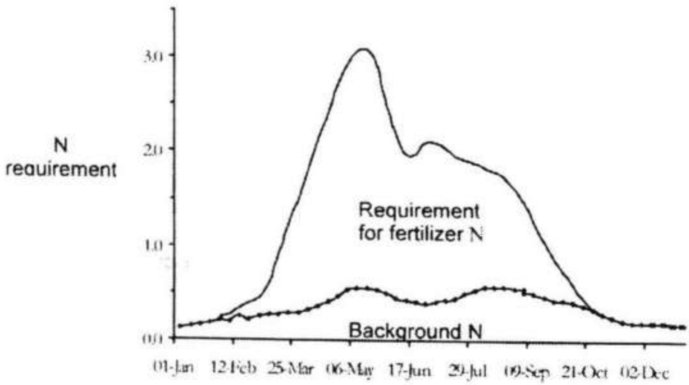
Mineral soils (as opposed to peat soils) in Ireland contain around 8.5% organic matter (ranging between 5 and 20%) mixed in with the sand, silt and clay particles. This organic matter has accumulated in the soil over thousands of years, and is made up of decaying grass, roots and other herbage, organic material deposited in dung and slurry etc. Organic matter is the glue that holds soil together, and plays an important role in water retention and availability. It is also an important component of soil fertility, regulating the availability of many nutrients in the soil. The soil organic matter (SOM) contains around 7,000 kg of N/ha. Most of this N (SOM-N) (98%) is in a form that is not available for plant uptake. However, the SOM is constantly being turned over by earthworms and other soil organisms, and this turnover makes a small amount of N available for uptake by the sward each year (Table 2).

The background availability of N from Irish grassland soils is the subject of an on-going study by Teagasc. Early results indicate that average background availability during the growing season (mid-February to the end of October), is around 140 kg N/ha/year, ranging between 56 kg/ha and 220 kg/ha (Table 2). These results are preliminary; nevertheless they indicate the range in background availability of N that can be expected from Irish grassland soils. Lower quantities are associated with lighter soils with shallow topsoil. Higher quantities are associated with heavier soils and soils with deeper topsoil. Soil organic matter content and drainage status are also important characteristics.

The wide range in the amount of fertilizer N being used on intensive dairy farms (225 to 400 kg N/ha for farms stocked at 2.5 LSU/ha – Figure 1), is largely a reflection of differences in the background release of N on different farms. On otherwise fertile sites, there can be a difference of 100 kg N/ha in background availability of N during the growing season (e.g. Clonroche and Johnstown Castle, both in Co. Wexford). This clearly has implications for fertilizer recommendations and for the requirement of fertilizer N on farms.

Figure 3. The annual requirement for available soil N by a sward producing 15 t DM/ha/year, and meeting that requirement from background availability of N in the soil and applied fertilizer N

(a) Requirement for available soil N



(b) Meeting the requirement with fertilizer N

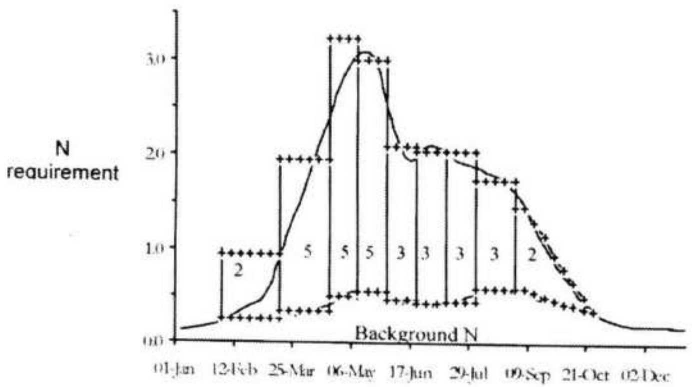


Table 2. Background availability of N from grassland soils in Ireland[1]

Location		Background availability (kg N/ha/year)
Ballinamore	Co. Leitrim	56
Kilmaley	Co. Clare	82
Clonroche	Co. Wexford	102
Oakpark	Co. Carlow	112
Kildalton	Co. Kilkenny	113
Gurteen	Co. Tipperary	113
Moorepark	Co. Cork	120
Athenry	Co. Galway	136
Clonakilty	Co. Cork	141
Solohead	Co. Tipperary	142
Tullamore	Co. Offaly	162
Grange	Co. Meath	190
Johnstown Castle	Co. Wexford	200
Pallaskenry	Co. Limerick	205
Ballyhaise	Co. Cavan	220
	Average	140

[1]*K. O'Connell, unpublished data*)

The requirement for fertilizer N during the spring

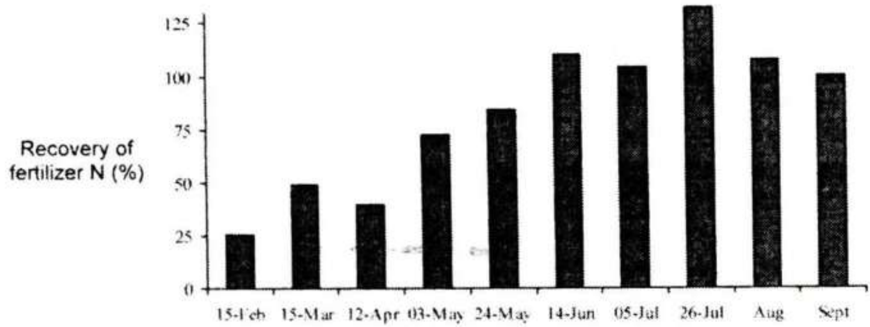
The release of background N continues throughout the year, and is influenced by soil temperature and moisture status. Highest rates of availability are associated with high soil temperatures during August and September combined with a plentiful supply of water. Availability is impeded by drought conditions. Lowest rates of availability occur during the winter months, due to low soil temperatures and waterlogging. Nevertheless, substantial quantities of background N can become available during the winter, e.g. between late October and the middle of March the background release of 43 kg N/ha has been recorded at Moorepark (O'Donovan *et al.*, 2004). This is the equivalent of 270 g N/ha/day. More generally, estimates of N release during November, December and January at Solohead and Moorepark, range between 200 and 250 g N/ha/day.

In Figure 3a, the background availability of N based on data from Solohead and Moorepark is presented in comparison with the requirement for 450 kg fertilizer N/ha by a sward producing 15 t DM/ha/year (close to maximum potential production). It can be seen that the background release of N is able to meet the requirements of the sward during November, December and January. The release of 200 to 250 g N/ha/day during this period is sufficient to support the production of 600 to 700 kg grass DM/ha (or a growth rate between 6.5 and 7.5 kg DM/ha/day).

At some stage during January and February, sward demand for available N from the soil begins to exceed the background supply. At this point there is likely to be a response to fertilizer N. This can happen as early as mid-January in the southwest and as late as mid March in the north. Over large parts of the country the point where requirement for fertilizer N begins to exceed background supply is likely to be in mid-February.

The next question that arises is how much fertilizer N to apply during the early spring? At Moorepark, O'Donovan *et al.*, (2004) showed very high production responses in terms of grass grown by 18 March to fertilizer N input of 90 kg N/ha. For experimental reasons all of this fertilizer was applied in one application. When this fertilizer was applied between mid-January and early February, recovery in the sward was around 50%. Earlier application resulted in lower rates of recovery, due to high levels of surplus rain coinciding with low rates of N uptake from the soil (Figure 4). In this example, around 45 kg N/ha is lost before it ever contributed to grass production. Some losses will be unavoidable, but by splitting the application; i.e. 30 kg/ha applied in mid-January and the remaining 60 kg/ha applied in mid-February, the risk of loss will be lowered because the bulk of the fertilizer will be applied closer to the time of high uptake by the sward. This will vary with location. Accordingly, it is generally recommended that 29 kg N/ha (23 units/acre) is applied in the first application, and that this is followed four to six weeks later by around 58 kg/ha (46 units/acre) depending on growing conditions (Fig. 3b). The initial application may need to be as early as mid-January in the southwest, mid-February in the midlands and the end of February in the northeast. This strategy will result in higher recovery of N by the sward resulting in more efficient use of N on the farm.

Figure 4. Recovery of fertiliser N (%) during the grazing season (O'Connell *et al.*, 2004)



In Figure 3b, a fertilizer N application strategy to meet the demand for fertilizer N is outlined. This is based on a fairly typical approach where a 0.5 bag of urea/acre is applied in February, followed by 1 bag urea/acre during March and April. Subsequently during early May, 1.5 bags CAN/acre are applied, followed by 1 bag of CAN/acre at four-week intervals during late May, June, July and August. A bag or 0.5 bags CAN/acre is applied during early to mid-September. The total quantity of fertilizer N applied is around 350 kg N/ha.

Strategies to lower fertilizer N requirements on farms

Matching fertilizer N use to stocking rate

Recent work at Solohead has shown that, with grass-only swards, around 170 kg fertilizer N/ha is required to support a stocking rate of around 2.0 LSU/ha. Average fertilizer N use on Irish dairy farms stocked at 2.0 LSU/ha is 175 kg/ha (Coulter *et al.*, 2002). Therefore there is good conformity between the rate of fertilizer N being used on farms, generally, and that found to be necessary to support this stocking rate at Solohead. Furthermore, at Solohead, it was found that for every increase in stocking rate by 0.1 LSU/ha, an additional 30 kg N/ha was required (Humphreys *et al.*, 2004). These results have been incorporated into the Teagasc fertilizer recommendations.

It can be seen in Table 2 that the soil at Solohead has the capacity to supply around 140 kg background N/ha during the main growing season (mid-February to late October; a further 25 kg/ha is released during the winter period). This is similar to the national average. Taking into account the range in background availability of N from different soils, it is clear that these fertilizer N recommendations are likely to be too low on farms with soils with low levels of background availability, and too high on farms with high levels of background availability. Therefore the Teagasc recommendations serve to indicate the quantities of fertilizer N that are likely to be required in an average situation. It is not possible at the present time to be able to accurately delineate the extent to which the soil on a particular farm is able to supply background N.

Most farmers have a fair idea of the background fertility and production capacity of their farms. It is fairly obvious when not enough fertilizer is being applied on the farm; not enough grass is being grown. It is also fairly obvious when too much fertilizer is being used; when excessive quantities of surplus grass is being baled as wrapped silage. Under such circumstances it pays to cut back on fertilizer N. The saving in fertilizer N is small compared to the saving of not making bales.

Matching fertilizer applications to 'responsiveness' to fertilizer N and demand for grass

The best response to fertilizer N will be achieved by applications made during late March, April and May. During this time of the year, it pays to apply optimum rates of fertilizer N on the grazing area and maximise stocking rates, thus making as much ground as possible available for first cut silage. Given the high rates of grass growth during late April and May, it is possible to make around 20% more silage per ha for more-or-less the same inputs costs compared to second-cut silage. Thus making a large first-cut lowers the need for second-cut silage (the economics of which is becoming increasingly questionable). Therefore a smaller area needs to be closed for second cut. This makes a greater area available for grazing providing substantial scope to lower fertilizer N inputs onto the grazing area from June onwards.

When it comes to lowering fertilizer N input to the grazing area from mid-summer onwards, a question that often arises, is whether to make a large application of fertiliser at long intervals (e.g. 40 kg N/ha applied once every eight weeks), or a smaller application at shorter intervals (e.g. 20 kg/ha every four weeks). Experience todate is that small but regular applications help to maintain a steady supply of high quality pasture. Large applications at long intervals result in a boom-and-bust situation where grass starts to run out of control, often triggering the decision to harvest bales, and then the grass begins to disappear because there is not enough N available in the soil. Applying rates of 15 to 25 kg N/ha at four to six-week intervals during the summer is recommended on moderately stocked farms (Table 3).

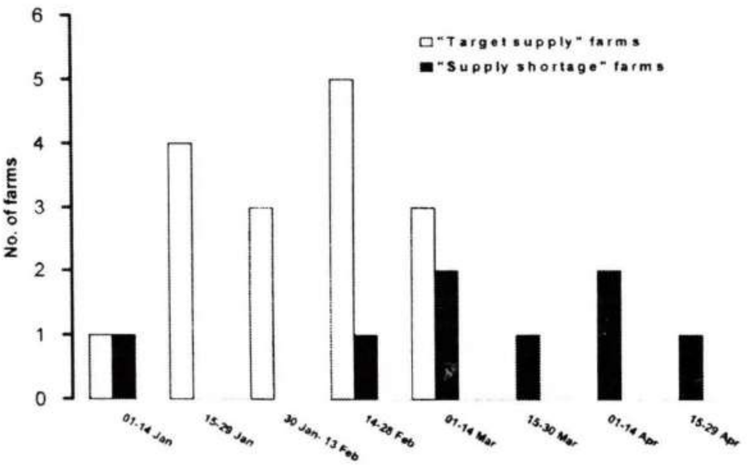
Teagasc has suggested a general approach to fertilizer N applications for farms, where first-cut silage is maximised and second cut silage is minimised (Table 4). The basis of these recommendations is to apply fertilizer in a way that maximises response in terms of grass grown, and that this grass is supplied in line with demand on the farm. On farm applicability can vary because of issues relating to farm fragmentation etc., and also because of different soil capabilities to supply background N. An approach that has worked well at Solohead, is to link the application of fertilizer N from June onwards, with achieving target pasture covers. At high stocking rates, if grass supply remains above target, the application of fertilizer N is halved, for example from 35 kg/ha to 17 kg/ha.

Table 3. Suggested approach to fertiliser N applications on the grazing area of farms with different stocking rates during the growing season

Over-all farm stocking rate (LSU/ha)	Jan/ Feb	March	April	May	June	July	Aug.	Sept.	Total
	(kg N/ha)								
1.8		29	29	17		17		17	110
1.9		29	58	19		17		17	140
2.0	29	29	58	20		17		17	170
2.1	29	50	58	29		17		17	200
2.2	29	50	58	35	24		17	17	230
2.3	29	58	58	35	23	23	17	17	260
2.4	29	58	58	52	35	24	17	17	290
2.5	29	58	58	52	35	35	35	17	320
2.6	29	58	58	52	52	35	35	31	350

Under moderate stocking rates, where small amounts of N are being applied at each application, if grass supply remains above target, the application of fertilizer N is delayed for a week. If supply again remains above target, fertilizer N application is again delayed etc. This approach makes maximum use of background N and can result in savings in fertilizer N. More importantly it avoids the need to make baled silage. The pasture cover targets used at Solohead for moderate and high stocking rates (2.0 and 2.5 LSU/ha respectively) are presented in Figure 5.

Figure 5. Target pasture covers at various stages during the grazing season



Fertilizer N application in spring and autumn

A question that often arises is whether it is better to apply CAN or urea during the spring. Numerous experiments have been conducted comparing the two. In no cases was CAN ever found to be better than urea under Irish conditions, but urea was sometimes better than CAN. The reason for this is that once urea is applied to the soil during the spring, it is converted to ammonium, and is held reasonably well by the soil particles. In contrast, CAN contains both nitrate and ammonium, and the nitrate is immediately at risk of being leached or denitrified. Furthermore, some recent research has shown that ammonium is more easily taken up than nitrate under cold soil conditions. Urea is cheaper than CAN in terms of Euro/kg N applied in the fertilizer. Taking into account that the N in urea is used as efficiently as the N in CAN during the spring, urea is clearly the more cost-effective fertiliser to apply during the spring.

It must be noted that while it takes time for urea to break down to ammonium, and that the ammonium adheres reasonably well to soil particles, any ammonium that is not taken up by the sward will eventually be converted to nitrate in the soil. Therefore the application of urea fertilizer does not prevent nitrate leaching or denitrification during the spring. It just means that the N in urea is likely to be safely held in the soil for longer than the N from a similar application of CAN during the early spring.

As indicated earlier, the responsiveness to fertilizer N declines during the autumn. In general, research has shown that there is no worthwhile response to fertilizer N from around mid-September onwards in the southwest and from around the end of august in the north. Fertilizer applied in mid-September will be taken up at a rate of around 0.5 kg N/ha/day during the remainder of September and October. Therefore, it takes around 60 days for 30 kg N/ha to be taken up from the soil. By mid-November, the requirement for fertilizer N will be very low and will be within the supply capacity of background N.

The application of slurry

On most farms, slurry management is a headache, and is usually seen as a non-productive cost. However, when it comes to spreading slurry, it generally costs as much to 'make the best of it' as it does to 'make a mess of it'.

The best response to slurry is obtained during the spring, where half of the N is in the form of ammonium, which is not readily leached and is more easily taken up under cold conditions. The other half of the N is in the form of organic matter, which is effectively held in the soil. This material has to rot away before the N is made available for uptake by the sward. The rate of release of the N in the organic material increases with rising soil temperatures, making N available in line with increasing grass growth. Slurry can be used very effectively to replace fertilizer N for the first application in spring.

An application of slurry @ 28 m^3/ha (2500 gals/acre), is estimated to contain a total of 75 kg N/ha, around 35 kg/ha of which is readily available as ammonium N. The sward takes up around 20 kg/ha, and the remainder of the ammonium N is unavoidably lost. This application of slurry replaces the 29 kg N/ha applied as urea fertilizer (much of which will also be unavoidably lost) recommended in Table 4. This application of slurry does not seem to have any detrimental effect on the acceptability of the grass to the cows.

On intensive farms, stocked at around 2.5 cows/ha, efficient management of slurry can directly lower fertilizer N used on the farm by around 35 kg/ha (or 10%) and probably accounts for some of the difference in the efficiency of fertilizer N use between different farms outlined in Figure 1.

White Clover

White clover has the potential to make huge savings in N fertiliser costs to Irish grassland farms, but because of persistency problems, little of this potential has been realised. The use of herbicides and high rates of fertilizer N are partly responsible, but the fundamental problem is that white clover has an average life expectancy of around five years. White clover is not persistent in the same way as permanent grassland. Individual clover plants die off and need to be replaced at regular intervals, rather like bringing replacements into a herd of cows. Ongoing research at Solohead has shown that this can be achieved at very little cost by mixing pelleted white clover seed with a P & K fertilizer, and spreading onto first-cut silage stubble. Around one-fifth of the farm is over-sown on a five-year rotation, maintaining highly productive white clover swards from year to year.

At Solohead, white clover swards receiving 90 kg N/ha/year (72 units/acre) support a stocking rate of 2.2 cows/ha producing 6,250 l of milk/cow (13,750 l/ha). The equivalent stocking rate on grass-only swards requires fertilizer N input of around 230 kg/ha (Table 4). This indicates that white clover provides the potential to lower fertilizer N input by around 140 kg/ha. This N is supplied through the fixation of atmospheric N by *Rhizobium* bacteria that live in nodules in the roots of white clover. On a whole-farm basis, the annual cost of over-sowing is around €10/ha, with a saving in fertilizer N of approximately €110/ha, (an annual net saving of €100/ha). Although, this potential may not be achievable on all farms, it is realistic to expect that white clover will lower fertilizer N requirement on moderately stocked farms by around 90 to 100 kg/ha with an associated net saving of around €65/ha.

Teagasc National Farm Survey data indicates that 70% of the milk produced in Ireland is produced on farms stocked at less than 2.0 LSU/ha (Connolly *et al.*, 2001). Around 98% of beef and sheep farms are stocked at less than 2.0 LSU/ha. On a national basis, around 93% of grassland farms are stocked at less than 2.0 LSU/ha. This indicates the huge potential of white clover to lower fertilizer N inputs to grassland in Ireland.

Conclusions

The Nitrates Directive and other legislation is creating pressure to lower fertilizer N inputs and increase the efficiency of N-use on farms. Increases in efficiency are possible. Improvements can be made by;

- matching fertilizer N inputs to stocking rates;
- avoiding the need to harvest surplus grass as baled silage;
- maximising the utilization of residual N in soils;
- applying fertilizer N in the spring at rates and times that anticipate increasing demand for N by the sward;
- the use of slurry to replace fertilizer N during the spring;
- make the last N application of the season before mid-September;
- the wider adoption of white clover.

References

Connolly, L., Burke, T. and Roche, M. (2001) Teagasc National Farm Survey 2000. *Teagasc, 19 Sandymount Avenue, Dublin 4. 13 pages.* www.teagasc.ie

Coulter, B.S., Murphy, W.E., Culleton, N., Finnerty, E. and Connolly, L. (2002) A Survey of Fertiliser Use in 2000 for Grassland and Arable Crops. *Teagasc, Johnstown Castle Research Centre, Wexford.*

Humphreys, J., Lawless, A., O'Connell, K. and Darmody, P. (2004). The development of systems of milk production and grazing management based on low stocking rates and very low artificial nitrogen inputs. *End of Project Report No. 4468, Teagasc, 19 Sandymount Avenue, Dublin.*

O'Connell, K., Humphreys, J. and Watson, C.J. (2004) Apparent recovery of fertilizer nitrogen by pasture. *Agricultural Research Forum, Tullamore, 1 & 2 March 2004,* page 18.

O'Donovan, M., Delaby, L. Stakelum, G. and Dillon, P. (2004) Effect of autumn/spring nitrogen application date and level on dry matter production and nitrogen-efficiency in perennial ryegrass swards. *Irish Journal of Agricultural Research* (in press).

Grass watch – tools for profitable dairying

Jack Kennedy
Irish Farmers Journal, Irish Farm Centre, Bluebell, Dublin 12

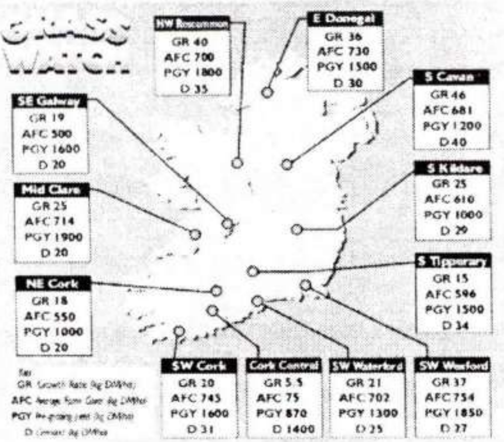
Introduction
It is not until you travel outside of Ireland that you learn to appreciate just how suitable the climate is for growing an abundance of good quality grass. In March 2003 the Irish Farmers Journal initiated Grass Watch to stimulate further interest in grass production and improve readers understanding of the measurements associated with grass production and utilisation. The aim was to track some of the best farmers in the country and establish how they manage grass throughout the grazing year. Combined with this monitoring, there is advice on the targets farmers should be reaching - given a certain stocking rate or demand on the farm.

A primary objective was to highlight the importance of grazed grass in the diet of the lactating cow, and that by increasing the intake of grazed grass in the diet, increased profit on the farm. The Grass watch program is ongoing, and the second year of measurements is just about finished. Grass watch has proven that farmers can consistently measure and manage grass throughout the grazing year, and that if they are aware of targets, can make decisions that will maintain grass quality in the ideal grazing state.

How does grass watch work?
In the first year of the program, four measurements were recorded weekly. These measurements were identified as being crucial to the farmer in helping to make educated decisions on how best to manage grass. These measurements were **stocking rate; average farm cover; pre grazing yield;** and a **calculated growth rate.**

In the second year of Grass watch, the stocking rate figure was changed to **demand**, so that farmers could better relate the demand they had on the farm with the actual growth rate they were achieving that week.

Figure 1. Details of the Grass watch as it appears in the Farmers Journal



Method of calculating weekly growth rate (GR)

Table 1 demonstrates how the growth rate is calculated for each farm on a weekly basis. Each week the farmer completes a farm cover. This is the product of the estimated paddock cover in the current week, subtracted from that recorded in the preceding week, divided by the number of days since the cover was taken. In the worked example (Table 1), it was 7 days since the cover was estimated. In the calculations, paddocks that were grazed during the week are ignored. Average growth rate is obtained by dividing the total daily growth rates by the number of paddocks.

This is a simple way of calculating growth rate, and is probably the best estimate that a farmer can make of the growth rate on his farm for the previous week.

Table 1. An example of the calculations involved in determining weekly growth rates (kg DM/day)

Week 33		Week 34					
Paddock	Estimated cover	Paddock	Estimated cover	kg DM/day			kg DM/day
1	700	1	1050	1050 - 700	=	350/7 days	50
2	700	2	1000	1000 - 700	=	300/7 days	43
3	650	3	1100	1100 - 650	=	450/7 days	64
4	450	4	650	650 - 450	=	200/7 days	29
5	450	5	700	700 - 450	=	250/7 days	36
6	1600	6	1700	1700 - 1600	=	100/7 days	14
7	1500	7	200	200 - 1500	=	-1300/7 days	Ignore*
8	300	8	450	450 - 300	=	150/7 days	21.5
9	300	9	500	500 - 300	=	200/7 days	28.6
				Average growth rate for week			**36**

*Paddocks that have been grazed during the week are not calculated in the estimation

Method of calculating average farm cover (AFC)

Average farm cover is estimated by dividing the total amount of grass in each paddock of the farm, by the total number of hectares available for grazing.

Table 2. An example of the calculations involved in determining average farm cover (kg)

[A] Paddock	[B] Paddock size (ha)	[C] Estimated cover by farmer (kg)	[D] = [B x C] Cover in paddock (kg)
1	0.99	800	792
2	1.61	300	483
3	1.78	400	712
4	1.3	2000	2600
5	1.03	600	618
6	1.75	1400	2450
7	1.37	2300	3151
8	1.24	1900	2356
9	1.29	2000	2580
10	2.31	500	1155
Total	**14.67**		**16105**
			16897 / 14.67
		Average Farm cover (AFC)	**1151**

Method of calculating pre grazing yield (PGY)
This is simply the estimated yield of grass in the paddock that the farmer is going into with his cows.

Method of calculating demand (D)
Demand is an estimate of the amount of grass required to grow on the farm in order to satisfy the needs of the grazing animal. It is expressed in kg dry matter per hectare (kg DM/ha), and can be directly related to growth rate, which is also expressed as kg DM/ha. Therefore if a farmer has a demand of 50 kg DM/ha per day then the farm needs to have a growth rate of this amount to fully feed the herd at grass. If growth rates are less than this, then cows will be eating more than the farm is growing and if no action is taken, eat into reserves of grass on the farm. Therefore demand is used as a daily tool to establish if supplementation is needed. Alternatively, when growth rates are higher than demand for prolonged periods, surpluses can arise which must also be dealt with if sward quality is to be maintained.

There may be more grazing animals than just lactating cows on the grazing area, and so an estimate of what they are consuming is necessary.

Table 3. Estimates of daily allowances of different animal classes.

	kg DM/day
Lactating cow	20
Dry cow	10
In Calf heifer	9
Weanling heifer	7
Calves	4

There are many ways to influence demand. Supplementation can be increased to the milking cows, which will lower the demand for grass on the farm. Demand will increase if dry cows and calves are on the grazing area. Depending on feeding and age, grass DM intake for calves will vary considerably.

Example calculation:
A farmer is grazing second round grass and is not feeding concentrates. All stock are out. Estimates of grass DM intake are as follows;

Animals grazing;

Milking cows (63) x 20 kg DM intake;
Dry cows (7) x 10 kg DM intake;
Bulling heifers (11) x 9 kg DM intake;
Heifer calves (21) x 4 kg DM intake.
= 1260 + 70 + 99 + 84 = 1513 kg DM/day

i.e. 1513 kg DM is required every day to feed stock. The farmer has 19.4 ha available for grazing. Therefore 1513/19.4 = 78 kg DM/ha/day are required to fully feed stock. If growth rate was estimated at 60 kg DM/ha/day, the farm is not growing enough feed to meet demand.

A one to one substitution of concentrate for grass is suggested to account for concentrate supplementation, e.g. if total DM intake is 20 kg grass, and cows are receiving 2 kg of concentrate, then the DM intake of cow is 18 kg.

Demand = [Number of cows milking x DM intake of cow / Total number of hectares available for grazing]

Lessons from Grass watch

At the outset of this program, most farmers were of the opinion "I don't think I would have the time every week", or "yes I walk the farm, but not every week and anyway I would be right most of the time". All have learned that even if they are incorrect in estimating how much grass is in a paddock (example 500 instead of 700) they will not be far out when they calculate the average farm cover. It is not the precision that is important but the estimation of an average so that it can be compared to a target.

Many farmers found that setting a time at the start of the week (say Monday or Tuesday morning), and sticking to this rigidly, was a great way of disciplining oneself to do farm covers each week. These 2 hours are set aside, and most now find it the most important 2 hours of the week - allowing them to plan for the week ahead.

There is little point in doing a farm cover if there isn't a farm budget to see where you should be. It is important to have a budget set out so that you can compare the results from your cover to where it should be and taking the necessary action. Most of the Grass watch clients have the Teagasc grass planner set up and each week compare the results that they have budgeted for with what they actually achieve.

It is good practise is to calibrate the 'eye' every now and again. Some participants in Grass watch bring a metre square and clippers, and weigh a cutting in some paddocks. More have invested in a grass meter.

Once the farm cover is completed, you can plan where the cows will graze - maybe not exactly but very close. Decision-making becomes very stressful when you have to do it every day, - when you can plan with measurement, why not?

What to remember? The Journal is just the messenger, farmers drive Grass watch.

Grass watch continued

At the outset, 10 farmers agreed to allow the *Journal* print weekly growth rates. Most of the farmers/managers were experienced, in that they had been doing grass measurement for a number of years. At the start some were sceptical about doing 'Grass watch' because of the work involved. Most thought they would not be able to furnish the *Journal* with results on a weekly basis. In 2004 there were 12 committed and dedicated farms in the system, and it is hoped with the help of the participating farmers to continue with Grass watch for the foreseeable future. Anyone measuring grass on a weekly basis and would like to furnish results to the *Journal* is asked to contact jkennedy@farmersjournal.ie.

Conclusions

Reality: Most of out European neighbours are jealous of the profits that a good Irish dairy farmer can attain simply by making the most of grazed grass. Are you achieving these profits? Our climate is changing every year, making the grazing year longer and more adaptive to high utilisation of grazed grass.

Without measurement you are planning in the dark. However without budgeting there is no point in measurement. Measurement and budgeting go hand in hand. Set up your budget at the start of each main grazing period and do a weekly grass cover to monitor progress.

In the post Fischler era, the hidden costs associated with intensification are in danger of pulling Irish dairy farmers down. This becomes especially apparent in the low payout years. The hidden costs associated with feeding include: production costs, wastage at feed out, machinery running costs and capital costs where feeding. These hidden costs do less damage when the payout is high, but when the payout is low and fluctuating, IRELAND BEWARE.

Quota purchasing - what can dairy farmers afford to pay?

L. Shalloo[1], P. Dillon[1], T. Dwyer[2], D. McCarthy[3] and B. Fingleton[4]
[1]*Moorepark Production Research Centre, Fermoy, Co. Cork.*
[2]*Teagasc, Moorepark, Fermoy, Co. Cork.*
[3]*Teagasc, Kildalton.*
[4]*Rural Economy Research Centre, Teagasc, Dublin.*

Introduction
Since joining the European Community in 1973, Irish milk producers have enjoyed relatively high milk prices due to the support system of the Common Agricultural Policy (CAP). However, dairy farmers are now facing important changes to their economic environment. In particular, the Luxembourg agreement on the reform of the CAP (Mid Term Review) entails a fundamental change in agricultural policy with the decoupling of support measures from production. In Ireland, full decoupling will be introduced from 2005 and milk price is projected to fall by 5 to 5.5 cent per litre (c/l) due to reduced price support for butter and skimmed milk powder. These changes mean that many dairy farmers need to reappraise their business strategy and consider necessary adjustments that will ensure viability in the longer term. The objectives of this paper are to examine key factors that will need consideration for a future in dairy farming, and in particular, what might be more appropriate milk quota exchange values in a new era of decoupled production.

A number of issues are addressed in this paper and are structured in the following manner:
(1) Cost efficiency at farm level.
(2) Expanding production – quota acquisition and costs.
(3) Scenario results and sensitivities
(4) Implications and conclusions

1. Cost efficiency at farm level
Table 1 shows the evolution of input costs, gross outputs and margins from 1990 to 2002 for specialist dairy farms in Ireland. The results show that total input costs have increased on average by 1.75 c/l or less than 1% per annum from 1990/91 to 2001/02. Direct costs increased by 1.16 c/l and overhead costs by 0.6 c/l over the period. The CSO Agricultural price index for total agricultural inputs rose by 13.6% between 1990 and 2002 whereas total costs for specialist milk production (Table 1) showed an increase of 11%. This indicates a real decrease in unit costs or an efficiency gain of 2.6% over an eleven-year period. The results also indicate that direct costs (+1.16 c/l) increased at twice the rate of overhead costs (+0.59 c/l). The cost: price squeeze in 2002, mainly due to reduced milk prices, has resulted in a major fall in net margins per litre.

Table 1. Itemised costs, outputs and net margin (c/l) of milk production for specialist manufacturing milk herds 1990-2001

Year	Direct Costs	Overhead Costs	Total Costs	Gross Output	Net Margin	Cost / Output Ratio
1990	8.34	8.21	16.55	27.72	11.17	0.60
1991	8.09	7.93	16.02	25.60	9.58	0.63
1992	8.27	7.80	16.07	27.43	11.65	0.59
1993	8.87	8.23	17.10	29.80	12.70	0.57
1994	9.36	7.86	17.22	29.63	12.41	0.58
1995	9.87	8.50	18.37	31.02	12.65	0.59
1996	9.84	8.63	18.47	30.00	11.53	0.62
1997	8.62	8.20	16.82	28.50	11.67	0.59
1998	9.12	8.30	17.42	29.30	11.88	0.59
1999	9.08	8.22	17.30	27.85	10.56	0.62
2000	8.83	8.65	17.49	29.49	12.01	0.59
2001	9.11	8.76	17.88	30.73	12.85	0.58
2002	9.63	8.56	18.19	28.47	10.27	0.64

Source: W. Fingleton (2003), Rural Economy, Teagasc. Derived from NFS records

Variation in input costs

Table 2 shows the gross output, total input costs, direct costs, overhead costs and net margin (c/l) for the five cost quintiles and for the average specialist dairy farms in 2002. The total cost of production for the lowest quintile (20%) was 13.6 c/l, compared to 23.4 c/l for the highest quintile, or a difference of 9.8 c/l; while the average cost of production was 18.2 c/l. The high cost group was effectively producing a litre of milk at 72% higher input costs than their more efficient counterparts and almost 30% above the overall average. This difference in cost of production between the lowest and highest quintiles represents a difference of 9.2 c/l (14.9 c/l vs. 5.7 c/l) in net margin, while the net margin of the average producer was 10.3 c/l. In 2002, differences in total direct costs and total overhead costs contributed 48 and 52% respectively, to the total difference in unit costs between the highest and lowest cost quintiles. Differences in feed costs (mainly concentrate costs) were responsible for one-third of the total cost difference. Of the overhead cost items, the major contributors to overall variation in unit input costs were – hired labour (10%), machinery operating and depreciation charges (14%), land rental charges (9%) and interest payments on loans (9%).

Table 2. Variation in unit costs by quintile for specialist dairy farms in 2002 (population results).

Quintile	Q1 (c/l)	Q2 (c/l)	Q3 (c/l)	Q4 (c/l)	Q5 (c/l)	Average (c/l)
Gross output	28.56	27.75	28.46	28.34	28.50	27.82
Total costs	13.58	16.16	17.68	19.35	23.40	18.18
Direct costs	7.61	8.30	9.28	10.24	12.31	9.63
Overhead costs	5.97	7.86	8.40	9.11	11.10	8.55
Net margin	14.91	11.59	10.79	8.99	5.67	10.27

Source: W. Fingleton (2003), Rural Economy, Teagasc. Derived from NFS records.

Dairy Farmers can increase their efficiency (i.e. reduce their costs) by following the principles set out at the Teagasc National Dairy Conference (Dillon *et al.*, 2003), i.e.

Selection of high EBI pasture based genetics

- Maximise utilisation and performance from grazed grass;
- Developing labour efficient systems of milk production;
- Expanding milk production using low fixed costs systems.

2. Expanding of production - quota acquisition and costs

Currently, milk quota transfer in Ireland takes place through an administrated system with a fixed price and reallocation based on a priority system, which favours smaller milk producers. Therefore the true market value of milk quota is unknown in Ireland. The Minister for Agriculture sets the price of milk quota with advice from the Milk Quota Review Group. Traditionally the quantity of milk quota available for restructuring in Ireland has been limited. FAPRI-Ireland farm level research, suggests that post-decoupling (2005) a larger amount of milk will be available for restructuring when the dairy premium is decoupled. In a market-based system, the price that a producer should pay for quota should be related to the additional farm profit he/she expects to earn in the future from that additional quota acquired.

How much can dairy farmers afford to pay for milk quota?

The amount any individual farmer can pay for milk quota will depend mainly on the expected milk price and the expected cost of milk production for every year that the quota remains binding. To allow for future inflation the future farm profit must be discounted (adjusted) to present day values. Apart from the variable costs of producing the additional milk, the cost of farm expansion to produce the additional quota must also be considered.

Three distinct stages of expansion have been defined:

Stage 1: Increase deliveries per cow through longer lactation and better feeding/management.

Stage 2: Replace alternative grazing livestock with dairy cows and increase the specialisation in milk production.

Stage 3: Expand production using additional animals, housing, land and labour.

Stage 1 expansion requires no capital investment, as cow numbers remain unchanged. However variable costs of production (mainly feed costs) increase in line with increased milk production. At this stage of development dairy farmers can afford to pay a relatively high price for milk quota. However, for the purpose of this analysis it was not considered as a separate expansion scenario but as part of any expansion plan. It is estimated that milk production could be increased by 10% in Stage 1, which is composed of a 6 to 7% increase through longer lactations, and a 3 to 4% increase through better feeding/management.

Methodology used in the economic analysis

The three expansion scenarios are considered over the period 2004 to 2008. As there is no guarantee of milk quotas beyond 2014, the additional milk quota purchased in all three scenarios was depreciated in value to zero by 2014. In all three scenarios there is a 10% increase in milk production in 2005 as outlined above and 1% in yield per cow in each year thereafter. Based on the Moorepark Dairy Systems Model (MDSM) (Shalloo *et al.*, 2004), the additional cost associated with this increase in milk production is 5 c/l in 2005 (variable feed cost of production). The farm used in this analysis is based on the average specialist dairy farm from the NFS sample in 2002. In the analysis, all three scenarios are investigated for low cost producers (LC), average cost producer (AC) and high cost producers (HC). The LC is the average of the 40% lowest cost producers (average of Quintiles 1 and 2), the AC is the overall average of specialist producers, while the HC are the average of the 40% highest cost producers (average of Quintiles 4 and 5).

Table 3 shows the key herd parameters used in the economic analysis. The average farm size (total forage area) is 52.2 ha, with an EU milk quota of 243,470 litres and 54 dairy cows. The average milk production delivered per cow is 4643 litres, with a further 310 litres per cow retained on the farm. The average number of livestock units of cattle (excluding cows and dairy replacements) is 32.

Table 3. Key herd parameters used in the analysis

	Average cost (AC)	Low cost (LC)	High cost (HC)
Land Area (ha)	52.2	52.2	52.2
Cow number	54	54	54
Quota size (l)	243,400	243,400	243,400
Milk sold per cow (l)	4643	4643	4643
Average number of beef units	32	32	32
Variable costs (c/l)	9.63	7.96	11.28
Fixed costs (c/l)	8.56	6.92	10.11

Inflation over the period of analysis is based on FAPRI projections (i.e. 1.25 and 2.5 % per year for variable and fixed costs respectively). All purchase of milk quota is financed up to 2014 at 6% interest rate. The length of the loan depended on year of purchase. All price projections are based on the analysis carried out by FAPRI-Ireland (Binfield *et al.*, 2003). Over the period 2004 to 2013, milk price is projected to fall from 27c/l to 22c/l, cull cows from €390 to €290, and male calves from €190 to €108. The opportunity cost of land is considered to decrease from €471/ha to €268/ha. The decoupled farm payment was estimated on the basis of the average premia drawn on the specialist dairy farms over the period 2000, 2001 and 2002. Dairy entitlements established in 2005 are also included.

It is assumed that the average specialist dairy farmer had no additional free labour available, therefore labour cost increased in line with increased cow numbers. Data from the Moorepark labour study (O'Donovan, 2003) has shown that as the cow numbers in a herd increase, the overall time required per cow decreases. Based on these findings, an increase of 35 hours per year for each additional cow is assumed, at a cost of €12.50/hour.

In all three scenarios, the breakeven cost of quota purchased is calculated for years 2004, 2005, 2006, 2007 and 2008 for the LC, AC and HC producers, using total discounted net farm profit over a 10-year period. Since it is possible to receive capital allowances for the construction of farm buildings, machinery and milk quota the three scenarios investigated are compared net of tax. Capital allowances for milk quota purchase, construction of housing and improvement in milking facilities are included at 15% for the first 6 years and 10% for the seventh year (Teagasc, 2003). The 6% interest rate for quota purchase corresponds to an opportunity cost of having additional money tied up in milk quota.

Scenarios investigated

Table 4 shows the key parameters associated with the baseline and the three expansion scenarios. The baseline situation is where the farm remained static over the 10-year period.

Scenario 1(S1):

- 25 dairy cows and 7 replacement units replace the 32 Cattle units;
- The sale of the cattle financed the purchase of the dairy stock;
- There is an additional housing cost of €200/cow for modification of beef housing for dairy cows;
- There is no additional cost in milking facilities;
- A new milk bulk tank is purchased at a net cost of €10,000, financed over 10-years at 6%, with both interest and depreciation (15-years) considered an expense;
- Labour requirement is increased by 1,000 hours for the dairy herd (40 hours* 25), while labour for the beef operation is reduced by 250 hours (10 hours* 25).

Scenario 2 (S2):

- S2 is similar to S1 in that 25 dairy cows and their replacements, replaced the 32 beef units and the sale of the beef cattle finance the purchase of the dairy stock;
- However cow numbers are further increased by 21, purchased at a unit cost of €1320, financed over 10-years at 6%, where the interest portion is considered an expense;
- Milking facility is expanded at a cost of €9,600 (an additional unit per 7 cows) and more housing added at a cost of €33,600 (€1,600/cow), both investments are financed over 20-years at 6%;
- An additional 10 ha of land is needed and is rented at a cost of €268/ha;
- Labour is increased by 735 hours (35 hours/cow).

Scenario 3 (S3):

- S3 is similar to S2 in all respects except that a low cost housing system. This includes a standoff pad and earthen bank to contain slurry and soiled water, at a cost of €262/cow instead of conventional housing for the additional cows in the herd.

Each scenario is compared to the Baseline Scenario where no expansion took place. A computer program called 'Solver' (Microsoft Excel) is used to calculate the milk quota purchase price where the calculated total discounted farm profit over the 10-year period is equal to the baseline farm profit (See Appendix 1).

Table 4. Key physical data used in the scenarios investigated

	Baseline	Scenario 1	Scenario 2	Scenario 3
Land area (ha)	52.2	52.2	62.2	62.2
Cow number	54	79	100	100
Original milk quota size (l)	243400	243400	243400	243400
Additional milk supplied (l)	-	152760	260010	260010
New milk quota size (l)	243400	396200	503400	503400
Milk sold per cow (l)	4643	5107	5107	5107
Beef cattle units (number)	32	-	-	-

3. Scenario results and sensitivities

Table 5 shows the baseline 10-year total discounted farm profit for the LC, AC and HC producers from the NFS for years 2004 to 2008. The baseline total discounted net farm profit is derived by adding 10 years of farm net profit together with each year discounted for inflation. Therefore the baseline for 2004 is the 10 subsequent years with each year discounted to correct for inflation (see Appendix 1). On average over the 10-year period the difference in farm profit between LC and AC cost producers is €41,944, while that between the LC and HC is €92,565.

Table 5. Baseline scenario 10-year total discounted farm net profit (≠) by production cost variation.

	2004	2005	2006	2007	2008
Low cost (LC)	327,415	307,346	291,301	276,630	262,868
Average cost (AC)	286,500	266,367	249,365	233,878	219,730
High cost (HC)	236,257	214,056	197,618	183,420	171,038

Table 6 shows the breakeven price is 86, 52 and 22 c/l (3.90, 2.36 and 1.00 €/gal) for the LC, AC and HC producers in 2004 respectively. The corresponding values in 2005 are 51 and 12 c/l (2.31 and 0.54 €/gal) for the LC and AC producers respectively. However in 2005, the HC producers did not achieve the baseline profit in S1 and would have to receive 9.0 c/l with the quota to reach the breakeven farm profit. The results also indicate that the breakeven price that a farmer could pay for additional quota decreases over the period. This is because of declining milk prices and increasing production costs. Additional milk quota will also have to be financed over a shorter time period. The high cost producers would have to get money when they bought quota to reach the breakeven level.

Table 6. Breakeven quota purchase price (c/l) by year of purchase and by production cost level for Scenario 1

	2004	2005	2006	2007	2008
Low cost (LC)	86.0	51.0	43.0	37.0	33.0
Average cost (LC)	52.0	12.0	5.0	1.0	*-1.0
High cost (HC)	22.0	*-9.0	*-12.0	*-15.0	*-19.0

*Base farm profit could not be reached therefore quota could not be purchased economically

Table 7 shows that the breakeven price for additional milk quota is much reduced where the costs of expansion are high. For both the AC and HC producers the breakeven price is not achieved from 2005 onwards. There is a large reduction in discounted farm profit with the HC producers.

Table 7. Breakeven quota purchase price (c/l) by year of purchase and by production cost level for Scenario 2

	2004	2005	2006	2007	2008
Low cost (LC)	45.0	14.0	7.0	3.0	*-0.5
Average cost (LC)	15.0	*-14.0	*-18.0	*-20.0	*-22.0
High cost (HC)	*-11.0	*-41.0	*-45.0	*-48.0	*-50.0

*Base farm profit could not be reached therefore quota could not be purchased economically

Table 8 shows the influence of quota purchase year and producer cost variation on the breakeven quota price for scenario 3. Using a low cost housing system (€262/cow) as compared to traditional higher cost housing (€1,600/cow) the breakeven price was increased by 5 to 7 c/l.

Table 8. Breakeven quota purchase price (c/l) by year of purchase and by production cost level for Scenario 3

	2004	2005	2006	2007	2008
Low cost (LC)	51.0	19.0	12.0	8.0	4.0
Average cost (LC)	21.0	*-11.0	*-14.0	*-16.0	*-17.0
High cost (HC)	*-6.0	*-34.0	*-39.0	*-41.0	*-44.0

*Base farm profit could not be reached therefore quota could not be purchased economically

Sensitivity analysis

Milk price, cost of additional labour and inflation are shown to have a large effect on the breakeven milk quota purchase price. Table 9 shows the influence of variation in milk price and year of quota purchase on the breakeven quota price for S1 for the average cost producers. It indicates that for every one c/l increase in milk price the breakeven price of quota will increase by 13.5 cent in 2004 and 16.5 cent from 2005 to 2008. Similarly for a reduction of 1 cent in milk price, the breakeven price of milk quota will reduce by 10 c/l in 2004, and from 2005 to 2008 will be impossible to meet.

Table 9. Effects of variation milk price on breakeven quota purchase price (c/l) by year of purchase for average cost producers Scenario 1

	2004	2005	2006	2007	2008
FAPRI projected milk price (c/l)	52.0	12.0	5.0	1.0	*-1.0
Increase of 2 c/	79.0	45.0	38.0	34.0	30.0
Reduction of 2 c/	33.0	*-2.0	*-5.0	*-6.0	*-8.0

*Base farm profit could not be reached therefore quota could not be purchased economically

Table 10 shows the effect of additional labour cost by year of quota purchase price, on the breakeven quota purchase price for S1 for the average cost producers. In a scenario where no additional labour is required, the breakeven price increased by 37 c/l when purchased in 2004 and by approximately 47 c/l when purchased from 2005 to 2008 for the average cost producer.

Table 10. Effects of variation in labour efficiency on breakeven quota purchase price (c/l) by year of purchase for average cost producers Scenario 1

	2004	2005	2006	2007	2008
Addition labour cost	52.0	12.0	5.0	1.0	*-1.0
No additional labour cost	89.0	58.0	52.0	48.0	44.0

*Base Farm Profit could not be reached therefore quota could not be purchased economically

Table 11 shows the influences of rate of inflation and year of quota purchase on the breakeven quota price S1 for the average cost producers. When the rate of increase in inflation for fixed costs is reduced from 2.5 to 1.5%, the breakeven quota purchase price increased by 2, 4, 4 and 5 c/l when the quota was purchased from 2004 to 2007 respectively. However, when quota is purchased in 2008, a maximum of 3 c/l could be paid while at the higher inflation rate the breakeven quota purchase cost could not be met.

Table 11. Effects of variation in inflation on fixed costs, on the breakeven quota purchase price (c/l) by year of purchase for average cost producers Scenario 1

	2004	2005	2006	2007	2008
Inflation at 2.5% (FAPRI)	52.0	12.0	5.0	1.0	*-1.0
Inflation at 1.5% (lower)	54.0	16.0	9.0	6.0	3.0

*Base Farm Profit could not be reached therefore quota could not be purchased economically

Therefore milk price, inflation associated with fixed costs and the additional labour required would have a large influence on the price that dairy farmers can afford to pay for milk quota. If dairy farmers can achieve expansion at farm level without additional labour requirements (through increased efficiency), this increases the price they can pay considerably.

4. Implications and conclusions

Dairy farmers that opt to remain static under the Fischler regime can expect a reduction of 15% in nominal terms in net farm income (Shalloo *et al.*, 2004). The Fischler Reforms have made retirement and exit from dairy farming more attractive than before as the decoupled compensation can be retained even if milk is not produced. For this reason, significant restructuring is expected with dairy farm numbers projected to fall very substantially over the next number of years. The results of the present study indicate that:

- A reduced quota acquisition price is necessary to facilitate expansion from 2004 onwards;
- The price that individual dairy farmers can afford to pay for milk quota from 2004 onwards will vary greatly depending on farm cost base, milk price, and the level of increased cost incurred on the farm to facilitate the increased production;
- The results indicate that the average supplier could pay up to 12 c/l (55 c/gal) for restructuring milk in 2005, but that the more cost efficient dairy farmers could pay up to 51 c/l (€2.37/gal);
- Where major additional expenditures on extra facilities and labour are required, the economic value of milk quota rapidly diminishes.

Conclusion

Over the next number of years, policies to facilitate change will be important in building a strong viable dairy industry. For many dairy farmers, expansion alone will not solve the problem of falling income caused by a decline in milk price. Sustaining real incomes will come from a combination of reducing production costs and an increase in scale. For scale increase to pay dividends, dairy farmers will need to have below average production costs, to continue productivity gains, to pursue a low cost housing option, and to have access to quota at an affordable and progressively declining price.

The purchase of quota will be financially much more difficult for above average cost producers. Increased labour costs will have a large effect on the breakeven purchase price for milk quota. The productivity, availability and cost of labour will be one of the major restrictions to expansion over the coming years. High cost housing and slurry storage facilities likewise reduce the breakeven purchase price of milk quota. Finally quota transaction costs influence profit and therefore the viability of expansion. Quota depreciation and interest charges rise rapidly as quota purchase price increases.

Low cost operations need to increase in scale by over 40% by 2010 to maintain or increase income in real terms (Dillon *et al.*, 2003). However, this is a static model and does not adequately reflect expansion costs. A study carried out by Shalloo *et al.*, (2004) showed that approximately 50% of an increase in scale over the period 2004 to 2008 and some efficiency gains were required to maintain real incomes in the period 2004 to 2013 for the average specialist dairy farmers. For this to take place the quantity of milk restructured will need to increase from the current 3% of the national milk pool per annum to over 4% per annum in the years ahead.

References

Binfield, J., Donnellan, T., Hanrahan, K. and Westhoff, P. (2003). The Luxembourg CAP reform agreement: - implications for EU and Irish Agriculture. *Medium Term Analysis for the Agri-Food Sector. Teagasc, Rural Economy Research Centre Dublin* Pp. 1-69

Dillon, P., Horan, B. and Shalloo, L. (2003). Pathways to increase profit. In. *Proceedings of the Teagasc National Dairy Conference* 12th and 13th of November.

Fingleton, W. (2003). The situation and outlook for dairying 2002/2003. In: *Proceedings Teagasc Situation and Outlook in Irish Agriculture 10th December 2002, Teagasc, Dublin* pp.1-11.

O'Donovan, K., O' Brien, B., Ruane, D., Kinsella, J. and Gleeson, D. (2003). Labor consumption on Irish dairy farms and the effects of scale and seasonality. *Irish. Journal of Agricultural Research* (Submitted).

Shalloo, L., Dillon, P., Rath, M. and Wallace, M. (2004). Description and validation of the Moorepark Dairy Systems Model. *Journal of Dairy Science* **87** 1945-1959.

Shalloo, L., Dillon, P., Rath, M. and Wallace, M. (2004). The Luxembourg Common Agricultural Policy Reform Agreement: Irish Dairy Farmers Development options. *Farm Management Journal* (Accepted).

Teagasc (2003). Management Data for Farm Planning

Appendix 1

Baseline for 2004 for the low cost producers

	Farm net Profit nominal	Discount factor	Real Income
2004	41346	1	41346
2005	38997	0.97	37827
2006	39214	0.94	36861
2007	37921	0.91	34508
2008	37443	0.88	32950
2009	37234	0.85	31649
2010	36723	0.82	30113
2011	36255	0.79	28642
2012	36033	0.76	27385
2013	35801	0.73	26135
Total discounted net farm profit			327415

Baseline for 2005 is similar except that the start year is 2005 and therefore the start discount rate is at 0.97 and so on for 2006, 2007 and 2008. The baseline farm profit is therefore different for each year and for each cost level. The breakeven milk quota purchase price is calculated by setting the target cell in the Solver function on Microsoft Excel to calculate the farm profit when quota is purchased the same as the baseline farm net profit. The quota purchase price is set at the changeable cell and therefore the milk quota price is altered in order to reach the breakeven farm net profit.

Post Fischler options analysis for the farm of Tim & Shauna Meagher

Pearse Kelly[1], Michael Gottstein[2] and John Crosse[3].
[1]Teagasc Kildalton, [22]Teagasc Moorepark, [3]Teagasc Thurles

Introduction

The Meagher family farm comprises a beef and tillage enterprise together with a small flock of mid season lambing ewes. The beef enterprise is made up of 35 suckler cows finishing all of the calves for the under 12 month system, and buying in 115 weanlings each year to finish as steers at 22 to 24 months of age. The Teagasc eProfit Monitor (ePM) was completed for the farm for the last full financial year, 2003. Table 1 outlines the amount of land that was used in 2003. Thirty-eight hectares (ha) are owned with a further 57 ha leased from within the overall Meagher family. In 2003 another 53 ha was leased bringing the total land area farmed to 148 ha.

Table 1. Land used in 2003

	Hectares
Owned Land	38
Land Leased Within Family	57
Land Leased Outside Family	53
Total	148

Current position

Table 2 shows the ePM enterprise analysis generated for 2003. The gross margins excluding all premia for each enterprise are given, and expressed as GM/ha (excl. premia). For comparison purposes the average gross margin (excl. premia) per ha which were collected on 176 beef farms and 41 sheep flocks in 2003 are also shown.

Table 2. Tim Meagher *eProfit Monitor* analysis 2003

Enterprise	Area (ha)	Gross Margin (€) (excl. Premia)	GM/ha (€) (excl. (excl. Premia)	2003 ePM Av. GM/ha
Beef	83.1	34,487	415	185*
Sheep	8.7	8,491	976	420**
Tillage	56.4	17,653	313	-
Total	**148.2**	**60,631**	**409**	-

* Combining average beef gross margin (excl. premia) from 108 suckler farms and 68 non-breeding farms.

** Average sheep gross margin (excl. premia) from 41 flocks.

As can been seen from the above analysis, the Meagher farm compares favourably to other farms analysed in 2003 ePM. The beef enterprise generated more than double the gross margin (excl. premia) that was generated on the 176 beef farms also analysed. In order to get a clearer picture of whether this margin was coming from the suckler enterprise or the weanling to beef enterprise, a separate financial analysis (using the Teagasc Batch Analysis Package) was carried out on the weanlings that were finished in the weanling to beef enterprise in 2004 (bought in autumn 2002). This analysis showed that the weanling enterprise returned a gross margin (excl. premia) of just €7/head. This is similar to the performance on the 68 non-breeding farms that were analysed using €PM for 2003, where the gross margin (excl. premia) per ha was on average just €17. Therefore, when looking at the gross margin (excl. premia), the suckler herd on the Meagher farm is compensating for the weanling to beef enterprise.

The sheep enterprise appears to be generating a significantly higher gross margin (excl. premia) than was achieved on 41 other flocks analysed for 2003. Most of this advantage is coming from very low variable costs per ewe due to the fact there is a very small number of them compared to the number of cattle on the farm and costs are probably artificially low because of this.

Table 3 gives the Meagher's total fixed costs for 2003 as calculated using ePM. Three significant proportions that go to make up the total figure are also shown. These are machinery running costs, depreciation and land lease costs. Also shown are the average fixed costs from the 176 beef farms recorded in 2003.

Table 3. Fixed Costs associated Tim Meaghers farm from *eProfit Monitor* (2003)

	Total (€)	**Per ha (€)**	**2003 ePM avg. FC/ha* (€)**
Machinery Running	15,116	102	84
Depreciation	29,492	199	86
Land Lease	16,894**	114	56
Other Fixed Costs	26,370	178	219
Total	**87,872**	**593**	**445**

* Combining average beef fixed costs from 108 suckler farms and 68 non-breeding farms.
** Land Leased from non-family members.

The biggest difference between the two is the depreciation figure at €199 versus €86/ha. The land lease cost figure given is only for land rented from outside the family. It still represents a significant cost to the farm. Fixed costs in general are high on this farm in comparison to a lot of other farms.

Looking to the future

Before examining what steps might be taken with regard to a particular enterprise, it is worth looking at what the likely affect might be of dropping the 53 ha of leased land (the land leased from outside the family). If the overall farmed area was to be reduced by 53 ha but the same enterprise mix retained (at a reduced scale), the gross margin (excl. premia) per ha should remain the same. Obviously this would not be an option in reality but it is interesting to see the overall likely affect on net profit.

Table 4. Affect of consolidating entitlements on overall net profit (€)

Overall farmed area reduced by:		53 ha (leased land)
Lower gross margin (excl. premia)		- 21,677
Changes to fixed costs		
Lower land lease	+ 16,894	
Lower machinery running	+ 5,406	
		+ 22,300
Overall affect on net profit		+ 623
Revised fixed costs		65,571
Fixed costs per ha (95 ha)		690/ha

Table 4 summarises what the affect of this reduction in farmed area might be. The loss to the farms overall gross margin would be €21,677. The land lease payment of €16,894 would be saved and there would no longer be a machinery running charge for this 53 ha saving €5,406 (53 ha x €102/ha). The net benefit therefore of dropping the rented ground would be €623.

In this scenario, the farms overall fixed costs are reduced in the area of machinery running costs and leased land, but they would still be high at €690/ha because they would now be spread over a smaller area (95 vs. 148 ha). Within this total figure for fixed costs, depreciation would rise from €199 to €310 per ha. If this revised figure is compared against the average of €86/ha already mentioned (from the 2003 ePM) the contrast is even bigger.

Irrespective of what option is chosen for the future, one aim must be to reduce the depreciation figure by investing less in what has caused it to rise in the first place, which for the most part was machinery purchases. These may have been needed in the past for the scale of the operation but might not be needed in the future on a smaller area farmed. By bringing the depreciation cost back to €150/ha, it would add a further €15,200 to the net profit figure.

However, if land lease costs did fall substantially over the next couple of years, the farm would be in a position to considerably increase scale in a short period of time because of the infrastructure that has been put in place. Therefore 'offloading' machinery without seeing what will happen in the land rental market first is not a consideration at this point in time.

Assumptions used

When examining what options might be suitable in the future, assumptions have to be made about a number of the key variables that are needed to calculate the likely gross margins that will be achievable from these options. Table 5 outlines the assumptions made. Fertiliser usage on this farm is low and the cost per tonne of purchased concentrates is also below what is typically being paid. It is assumed that these lower than average costs will remain into the future. Contractor costs per hectare are also low because most of the work is done with owned machinery. It is also assumed that this will remain the case for the foreseeable future.

As can be seen in Table 2, the gross margins generated on this farm in the past compare favourably with that achieved on other farms. Gross margin (excl. premia) is a good indicator of the level of efficiency that a farm is being run at. It is assumed that this high level of efficiency will be continued into the future.

Table 5. Assumptions used when assessing future margins

Suckler calving date		Early autumn/spring
Weanling purchase date		Late autumn
Weanling purchase price (€/100kg)		180
Sales dates (months)		
	Heifers	Summer (20)
	Steers (home bred)	Summer (22)
	Steers (bought in)	Spring (22)
	Bulls	Spring (15)
Carcase weights (kg)		
	Heifers	290
	Steers	380
	Bulls	350
Beef selling price c/kg carcase		
	Spring	300
	Summer	280
	Autumn	260
Lamb weaning rate		1.5
Lamb sale value (€/head)		80

Options for the future
Six different options were examined for the farm and these are detailed in Table 6. Options one to five are all based on dropping the 53 ha of outside rented land with option six holding onto it. Options one and six are on the basis that the REPS scheme is not entered into. In the other four options REPS is embraced.

Table 6. Future systems analysed for Tim Meagher

	Land (ha)	REPS	System
Option 1	95	No	120 autumn suckler cows Finishing steers & heifers
Option 2	95	Yes	100 autumn suckler cows Finishing steers & heifers
Option 3	95	Yes	110 autumn suckler cows Finishing bulls & heifers
Option 4	95	Yes	40 autumn suckler cows 110 weanling steers to beef
Option 5	95	Yes	1000 mid-season ewes
Option 6	148	No	100 autumn suckler cows 85 spring suckler cows

Gross margin analysis

When comparing the gross margins that might be possible from each of the six options analysed the single farm payment is not included but the REPS payment is so that one system can be compared fairly with another.

Table 7. Projected gross margin (excl. premia) but including REPS

	Gross margin/ha (€)	Gross margin (€)
Option 1	€798	75,851
Option 2	€750	71,209
Option 3	€709	67,348
Option 4	€655	62,263
Option 5	€821	78,000
Option 6	€789	116,840

Table 7 shows the possible gross margins calculated using all of the assumptions mentioned above.

The gross margin per hectare that each system has the potential to generate is a return for the labour that is involved with a system. Table 8 gives an estimate of the man work units (MWU) that would be involved with each of the six options. Also if a system can generate enough of a gross margin to cover a farms fixed costs then the single farm payment will be fully retained. For a farm to retain the single farm payment it will have to have a gross margin of close to €66,000 if it is farming the 95 ha or €88,000 if it continues to farm the 148 ha (with no reduction in land rental or machinery running costs).

Table 8. Man work units (MWU) required for each system analysed

	MWU	Gross margin/MWU (€)
Option 1	1.9	39,922
Option 2	1.6	45,506
Option 3	1.6	42,093
Option 4	1.4	44,474
Option 5	3.1	25,161
Option 6	3.1	37,690

When looking at the possible gross margins from each of the options analysed it is worth noting a number of points. Comparing option one and two, the only difference between these options was farming within REPS or farming an extra 20 cows with the progeny brought through to beef. The extra margin generated is €4,500 for an extra 0.3 of a MWU needed. On the 95 ha farm the option that gives the highest gross margin is the all sheep enterprise (option five). This may well be the case in the future but the extra income generated from having all sheep instead of cattle would be got at the expense of labour. As can be seen in Table 8, an extra 1.2 MWU's would be needed for this option over option one. Option four gives the lowest gross margin of all. This is because it still has a significant proportion of bought in cattle in it. It also has the lowest number of MWU's associated with it, but this will be at the loss of having a reduced margin overall.

Comparing Options 1 and 6

The only real difference between options one and six is the scale they are carried out at. Neither is in REPS and both involve suckler herds with all the progeny brought through to beef. Table 9 shows that the difference in the gross margin would be approximately €41,000.

Table 9. Option 1 (120 cows) vs. Option 6 (185 cows)

	Option 1	Option 6
Land area (ha)	95	148
Suckler cows	120	185
Labour	1.9 MWU	3.1 MWU
Gross Margin (excl. premia) (€)	€75,851	116,840
Gross margin difference		+€41,000
No saving in fixed costs		-€20,000
Net Benefit (rental & return on labour)		+€21,000
OR /ha (on 53 ha)		+€396
OR /ac (on 131 ac)		+€160

As the scale of the farm will not be reduced it can be assumed that there will not be any saving possible in overall fixed costs. This is a loss of approximately €20,000 (from Table 4). The real benefit therefore of farming to this greater scale is €21,000. From this €20,000 the land rental cost for this extra 53 ha. will have to be deducted to give the real return on labour. Land rental costs will fall over time but until this happens it will not be possible to say whether option six will be worthwhile or not. Apart from the land rental costs of the future, the time commitment that would be involved with option six would also make it much less attractive in comparison to options one to four.

Conclusions

This farm has a significant proportion of rented land and consequently has built up considerable fixed costs that cannot be reduced overnight. Unless the purchase price of weanlings falls below what has been assumed and the sale price of finished beef rises substantially above what was assumed, the weanling to beef enterprise on this farm will have to be seriously questioned into the future. The value of joining REPS will almost outweigh the financial benefits of not being in it, but more importantly it would mean a reduced workload into the future.

If land rental prices drop substantially over the coming years the fixed costs on the farm could be spread over a much larger area by renting land. The level of the drop in rental prices will determine whether this will be a worthwhile option or not, especially taking into account the extra workload that would be involved in going to this level of scale. If land rental costs do not reduce and the area farmed remains at 95 ha the fixed costs will have to be reduced overtime to a more realistic level for the size of farm involved and the type of enterprise farmed.