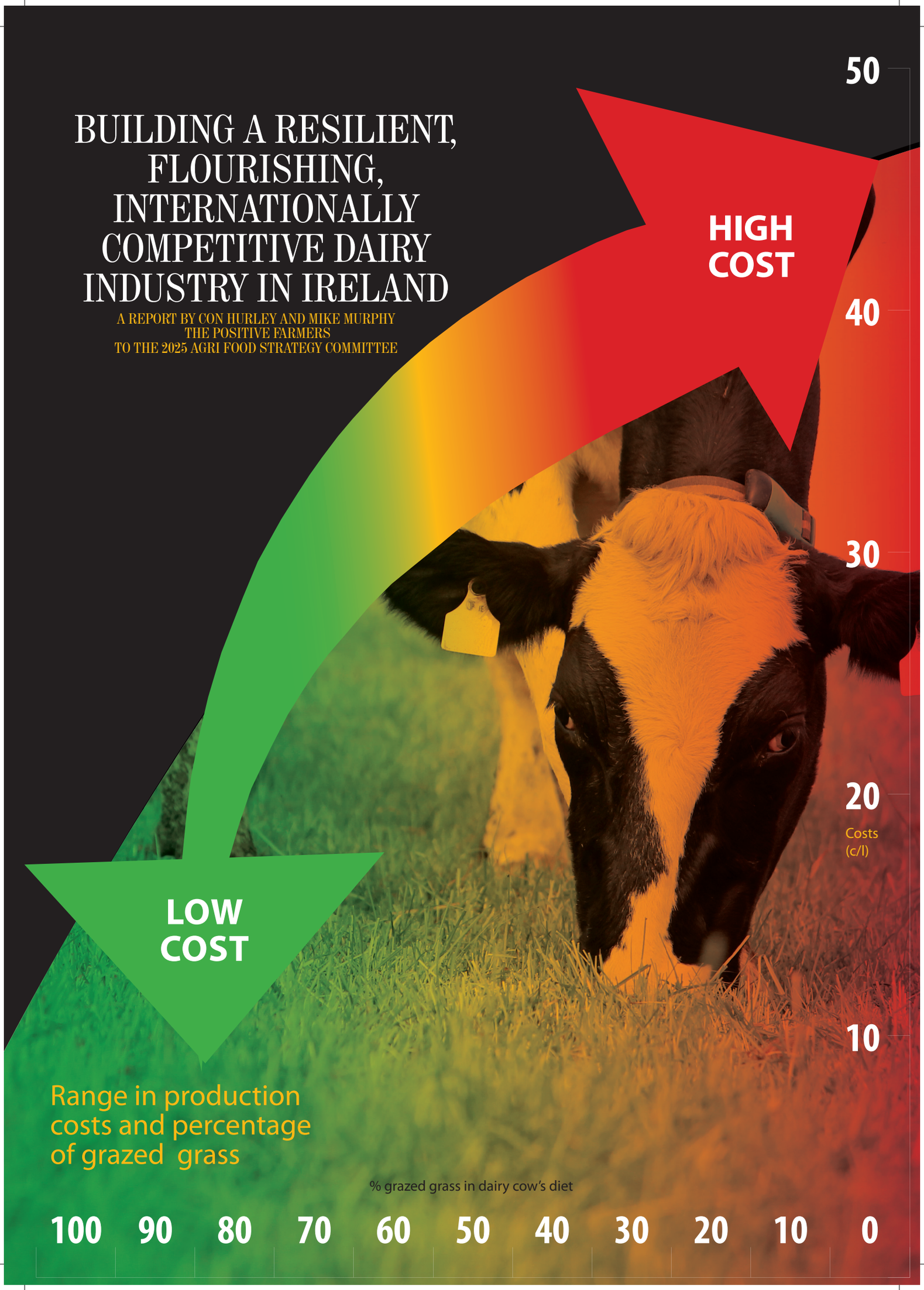
BUILDING A RESILIENT, FLOURISHING, INTERNATIONALLY COMPETITIVE DAIRY INDUSTRY IN IRELAND

A REPORT BY CON HURLEY AND MIKE MURPHY
THE POSITIVE FARMERS
TO THE 2025 AGRI FOOD STRATEGY COMMITTEE



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Acknowledgements

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The authors

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Mike Murphy is a partner in a commercial dairy farm in Ireland and is a director of substantial dairy farming businesses in New Zealand and the USA. For the past 45 years, he has been a strong practitioner and proponent of grass-based milk production and, on an unpaid basis, has brought 10 dairy study tours to New Zealand in the past 15 years. He is a co-founder and director of the Positive Farmers Conference.

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GRASS – THE DRIVING FORCE

The Food Harvest 2020 is clear on the vital role that grass can play in the an expanding Irish dairy industry: ''The Irish dairy sector possesses a significant cost advantage in the form of an environmentally-sustainable, rain-fed, grass-based production system, which allows milk to be produced efficiently for much of the year.'' This is Ireland's single most important comparative advantage in an international dairy market, which is becoming increasingly competitive. This report provides convincing scientific support for this statement. In simple terms, this comparative advantage can be summarised by the relative costs of grass, silage and bought-in concentrate feeds.

The obvious conclusion from this relationship is that the more grazed grass you can use to feed a dairy cow, the lower the cost of her milk production, leading to higher profit margins per litre of milk sold. This is clearly born out in the graph showing the range in production costs and percentage of grazed grass on the opposite page.

The ''environmentally-sustainable, rain-fed, grass-based production system'' referred to in the Food Harvest 2020 report is defined by Moorepark researchers as having 75% grazed grass in the cow's diet, together with 15% to 20% grass silage, supplemented with 5% to 10% of concentrate feeds.

This report refers to the system as the GrassRich route to expansion.

This expansionary route will deliver significant benefits to farm families, the rural economy and national employment and exports.

Relative costs per kilo of dry matter

	€
Grass	1
Grass silage	2.5 to 3.0
Concentrates	4 to 6

The potential of the GrassRich route

Following the removal of the milk quota system on 1 April 2015, Ireland possesses the potential to develop a dairy industry that can:

- Triple dairy export earnings to €9.15bn per annum – up from €3.045bn in 2013.
- Double the number of jobs in the dairy sector.
- Increase family farm incomes by €560m per annum.
- Inject €4.25bn per annum into the rural economy.
- Provide high-income dairy farming opportunities for young people and owners of drystock and tillage farms.
- Continue to grow, despite inevitable price volatility, weather variations and other challenges to farm profitability.

Grass – the main driver

Increased grass production should be the main driver for dairy industry expansion.

Currently, it is estimated that Ireland's dairy pastures produce an average of nine tonnes of dry matter per hectare, of which seven tonnes is utilised as grazed grass and silage. A realistic target would be 14t grown and 12t utilised.

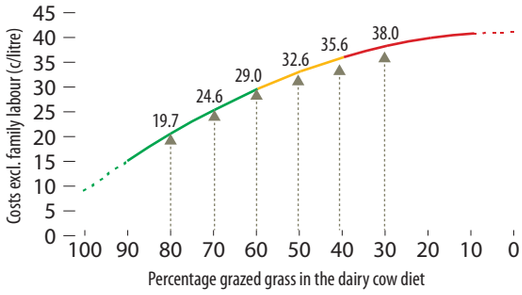
Teagasc estimates that some 700,000ha will be devoted to dairy cows by 2020. If a concerted effort is made to lift grass production and utilisation to the above targets, these 700,000ha will produce enough grass and silage to support a national dairy herd of 1.925 million cows.

National milk output would increase to over nine billion litres of milk – well ahead of the Food Harvest 2020 target. There is a huge prize and reward for exploiting Ireland's comparative advantage as a grass-growing country.

The key point to grasp here is that this almost doubling in milk production is primarily a result of growing and utilising increased tonnages of grass per hectare. It is not a result of simply increasing cow numbers and feeding them increased quantities of bought-in feed, which is up to six times more expensive than grazed grass.

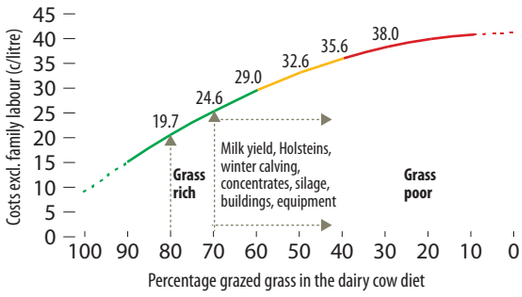
The potential for grass to cash is phenomenal. And it is readily achievable.

Range in milk production costs and percentage grazed grass



Source: adapted from Dillon et al, Moorepark

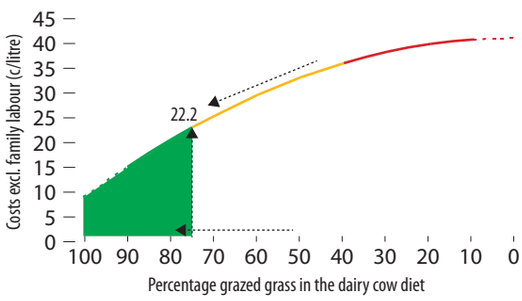
The drift from grass



Source: adapted from Dillon et al, Moorepark

The GrassRich route

(75%+ grazed grass)



Source: adapted from Dillon et al, Moorepark

Danger

The greatest danger to realising this potential is that farmers will drift away from grazed grass as the foundation for low-cost, profitable milk production and sustainable, profitable farm family incomes.

This report refers to this drift as the GrassPoor route to expansion. In its extreme form, this drift leads to the total confinement systems as seen in the US and UK, where grazed grass falls to 0% of the diet. In Ireland, there has been drift on some farms and, particularly, in Northern Ireland, to the stage where grazed grass falls to under 50% of the cow's diet.

Consequences from a drift to the GrassPoor route

The following consequences are based on evidence and experiences from the dairy industries of New Zealand, Victoria (Australia) and NI.

For the farm business

Initially, farm output and receipts increase substantially. However, production costs increase significantly and profit margins shrink. The business becomes vulnerable to reduced milk prices and increased production costs – interest rates and concentrate costs.

In actual practice, milk prices have fluctuated considerable over the past 20 years. Costs have also increased particularly due to adverse weather events. Following the global financial crisis, banks have put pressure on farmers to repay debts.

The result is that many farm businesses in Victoria have gone under, those in NI are on the edge and 28% of NZ farmers who have gone the GrassPoor route are now in financial difficulty due to the current collapse in milk prices.

The drift to GrassPoor dairy farming increases the requirement for buildings and machinery – both of which give a low to negative return on capital.

For the farm family

The drift to GrassPoor dairy farming increases labour requirements. It takes a lot more man-hours to operate a 200-cow unit where silage and concentrates are fed – usually all year round. When profit levels are adequate, this labour can be hired.

However, when profits fall, the farm family take on the extra labour. In NI, many farmers are working 85 hours a week and derive an income of about €5/hour. This is putting tremendous physical and mental pressure on the farmer and his family.

The farm family also pays a huge price when the farm business becomes unsustainable and has to be sold. In Victoria and New Zealand, there are tragic stories of marital break-ups, mental and physical ill health and even suicides.

For the country

The drift from the GrassRich to the GrassPoor system leads to a reduction in competitiveness and expansion stalls. This is what has happened in Victoria and NI.

The potential benefits of the GrassRich route outlined above will not be achieved. Irish farm families, the rural economy and national exports will be the worse off if farmers drift into the GrassPoor expansionary route.

Realising the potential

The basic premise of this report is that Ireland possesses more than adequate land resources to cater for the anticipated expansion in milk production without resorting to increased feed off-farm inputs. In other words, the GrassRich route for expansion should be strongly promoted and protected as the comparative advantage that will enable Ireland to develop an internationally-competitive dairy industry, delivering huge sustainable benefits to farm families, rural Ireland and the national economy.

EXECUTIVE SUMMARY

In addition, efforts to push farmers down the GrassPoor route must be resisted and counteracted at all levels.

Two main recommendations

Set up an Irish pasture (grassland) productivity trust

Ireland would benefit from the establishment of such a trust, which would:

- Bring together all the parties interested in developing and promoting increased pasture (grassland) productivity as the growth engine for the profitable development of the dairy, beef and sheep sectors.
- Develop a set of common goals and strategies for increased pasture productivity – i.e. growing and utilising high tonnages of 12ME grass.
- Develop an economic pasture productivity index, which would be the pasture equivalent of the economic breeding index (EBI), which has been so successful in focusing farmers on selecting the best genetics for Irish conditions.
- Generate funds for research projects that widen and support the focus on increased pasture productivity.
- Encourage the concept of ''precision grass production'', along the same lines as the best performers in the tillage sector,

Stakeholders in the trust could include: Teagasc (research and extension), the Irish Grassland Association, third level institutions, agricultural colleges, the *Irish Farmers Journal*, the Positive Farmers, milk purchasers and co-ops, the Department of Agriculture and other relevant Government agencies, farming organisations, the Irish Cattle Breeding Federation, agricultural Consultants, banks and relevant input suppliers.

Set up a dairy industry collaboration group (or dairy industry strategic planning group)

This is representative of the Irish dairy industry and provides the leadership needed to bring the key industry stakeholders together to protect and enhance Ireland's comparative advantage, while also building stakeholder clusters that form the framework of an internationally-competitive dairy industry.

Stakeholders in this collaboration group could include, in addition to relevant members of the trust: Government, milk processors and exporters, banks, An Bord Bia, the Irish Dairy Board and others.

Specific recommendations

Government

- Recognise the value to the Irish economy and employment of a grass-based dairy revolution – one that could deliver a trebling of milk production by 2035. The Government should provide political support for policies that enable this to happen and tackle unreasonable roadblocks. The rewards are huge: the value of the extra milk produced is about €3.5bn per annum.
- Recognise that the "milk revolution" will require increased resources for extension and education. Current cutbacks on extension will undermine a major means of economic recovery and long-term prosperity – they are a form of national sabotage and should be reversed.
- Introduce tax incentives that encourage investment which will support the Food Harvest 2020 target of a 50% increase in milk production through pasture productivity improvements and the extra livestock needed to consume the extra grass grown. Current tax reliefs encourage expensive (not productivity related) capital infrastructure and do nothing for stock growth.
- Recognise the need for many more models of land usage and herd ownership and ensure that there are no policy barriers to their development. Introduce whatever policies are needed to foster a career ladder that has been of such huge benefit in New Zealand, by encouraging and supporting talented young people into the dairy industry. Their role in bringing in land that currently is not in dairying into dairying could reduce the pressures to over-stock and over-complicate systems.
- The Government needs to be seriously concerned that the greenhouse gas emissions policy will not allow Ireland to exploit its potential and, even worse, that it will incentivise Ireland into systems that are not profitable and actually increase absolute emissions and emissions intensity.

Tackle the serious threat that is the Kyoto Agreement on carbon emissions. International milk production will increase at 1.7% per annum and it is grass-based systems that should be favoured to produce this extra milk with the lowest carbon emissions per tonne of milk solids.

This is a major strategic priority and the Irish Government should co-operate with other grass-growing countries, such as New Zealand, to establish the role of grassland as a significant "carbon sink".

Currently, there is a complete disconnect between EU policy and the potential for Ireland to displace emissions from countries that produce milk with high emissions per unit of product.

- The Government also needs to be proactive about nitrates leaching and associated restrictions on grass production, stocking rate and milk production. A long-running experiment at Moorepark has established that nitrate leaching is minimised when grass production per hectare is high and then most of this is used for milk production.

Teagasc (general)

- Be absolutely clear on your mission for Irish dairying and your role in it. Specifically, this should be to protect, enhance and exploit Ireland's comparative advantage.
- Establish, with total clarity, leaving no room for confusion, the one singular message for Ireland that there is only one milk production system that optimises family farm incomes using Ireland's natural comparative advantage as a grass-growing country.
- Despite the increasing pressure on financial and staff resources, resist any temptation to weaken extension services. This is crucial, given the huge role that extension has to play in:
  a) Spreading the Moorepark message, and
  b) Counteracting the contradictory messages from others.

Teagasc research

- Moorepark is now the leading pastoral dairy research institution worldwide. The strong focus on low-cost, grass-based milk production needs to be maintained and strengthened.
- Maintain a strong leadership role in defining the most profitable systems of milk production under Irish conditions and strongly promote this system through extension, publications, conferences, field days and the extension service. Strong research leadership on policy is critical.
- Resist the temptation to redirect research effort into activities and systems that can undermine Ireland's comparative advantage.
- Develop tools for grass measurement and farmer-friendly applications for widespread use by farmers.
- Develop a simple tool (language) that farmers can use to improve pasture productivity, similar to the EBI.
- Develop a deeper and broader understanding of the reasons why farmers make seemingly illogical and destructive decisions.

Teagasc extension

- Focus strongly on the links between farm profit, family income and low-cost, grass-based dairying, as well as emphasising the higher risks associated with high-input systems, especially when combined with high borrowings.
- Promote increased pasture productivity as the best route to profitable expansion.
- Set up regional demonstration farms for the profitable milk production from grass.
- Promote better farm planning.
- Develop an integrated life, money and farm profile to encourage farm families to integrate their farm financial and technical decisions into the wider framework of their personal life and financial goals.
- Introduce specialist life and business coaching skills into the advisory service.
- Introduce a number of industry awards and competitions to highlight best practice and performance.

Dairy breeding

- The goal of the Irish Cattle Breeding Federation (ICBF) should continue to be the provision of genetics suited to Ireland's grass-based dairy systems.
- Promoters of American Holstein genetics should use the EBI system to provide information on the suitability of Holstein cows for Irish dairy farms. Factors such as farm profitability and fertility should be included with the (undoubted) milk yield potential of these animals. The extra costs associated with feeding and housing these animals should be provided.
- Breed societies and pedigree breeders need to be open and clear as to their objectives and how they help farm families increase farm income and labour efficiency.

Irish Farmers Journal

- Continue to provide accurate, timely information to farmers, especially technical information that promotes grass-based dairying
- Over the years, the *Irish Farmers Journal* has provided sensible leadership, both formal and informal, within the dairy industry. Such leadership will continue to be very necessary during the years ahead.
- In particular, the *Irish Farmers Journal* can motivate and stimulate the formation of The National Pasture Productivity Trust. The lessons learnt from NZ, NI and Victoria provide strong evidence for the establishment of an independent co-ordinating body. The National Pasture Productivity Trust would provide leadership within the dairy industry to ensure that farmers and stakeholders remain focused on exploiting and protecting Ireland's comparative advantage
- Consistently articulate through dairy features and management columns the central role of the grass-rich route (grass to cash at low cost). Link increased pasture productivity with increased farm profitability.
- Encourage and participate in the development of an economic pasture productivity index similar to EBI.
- Set up a number of competitions and awards that recognise and reward the various aspects of operating a successful, grass-based dairy business at different stages of development and age of people involved – there are some good examples in NZ.

EXECUTIVE SUMMARY

- Commission a full-scale study to answer the question: Why have New Zealand farmers drifted into high cost production systems? This would be of benefit to the dairy industries in both countries and, if agreed, could be a collaborative study.
- In collaboration with Teagasc, develop easy-to-understand terminology that represents an excellent measure of pasture productivity. This could be a utilised metabolisable energy (UME) figure for each farm (and, indeed, each paddock) and provide the same motivation for increased pasture productivity as the EBI has for improved dairy herd performance.

Milk purchasers/co-ops

- Recognise that the profitable production of milk from grass is the cornerstone on your competitiveness.
- Support the promotion of grass-based dairy systems.
- Resist any temptation to encourage farmers towards winter milk production through the milk payment system – early calving bonuses, winter milk bonuses and penalties for peak production.
- Co-operate with other milk processors to optimise the operation of factories when milk supplies are low.

Farming organisations

- Be absolutely clear about the crucial role that pasture productivity has in lifting family farm incomes.
- Support all efforts to help farmers improve pasture productivity.
- Protect farm families against the predatory actions of people who damage farm family incomes, farm profitability and farm viability.

Lending institutions

- Borrowing propositions have three components:
  - the quality and track record of the borrower,
  - quality of the proposition – repayment capacity,
  - collateral.

When the first two of these are right, then lack of collateral should not be an obstacle.

- AIB and BOI should invest in the growing dairy industry by building stronger teams of agricultural specialists.

Farm input suppliers

- Be clear on whether whatever you are selling will add to farm profitability and give a good return on investment or will give a poor return on investment to the farmer and may also be a poor choice for the farmer to spend his money.
- Include this investment information in any publications you make about your products.
- If you are a supporter of grass-based dairying and increasing pasture productivity, join The National Pasture Productivity Trust.
- There is an opportunity for some input supplier, perhaps in the fertilizer sector, to develop a similar approach to that of Origin Enterprises, which is investing in "precision agriculture". According to the *Irish Farmers Journal* (23 August 2014), "Origin has invested heavily in systems ranging from basic soil sampling to more complex soil scanning and detailed nutrient mapping. This aids the agronomist in decision-making." Grass, as a crop would benefit from such an approach.

Education

- An expanding dairy industry will provide job and career opportunities at all levels. The Department of Education, agricultural colleges and third level institutions need to gear up to cater for the needs of a growing industry.
- Agricultural colleges and third-level institutions need to use their land resources to support the grass-based milk production systems that are the foundation of Ireland's comparative advantage. It is difficult to see any justification in devoting land and resources to high-input/high-yield production systems.

Farmers

- Be aware of the potentially disastrous consequences of bad farm policy choices. Learn from the experiences in NI, Victoria and, to a lesser extent, NZ, where bad farm policy decisions have resulted in trauma and heartache for farm families.
- Make a definite decision to build your dairy farming expansion plans on lifting grass production and utilisation and increasing stocking rate accordingly.
- Measure how much your farm is growing and how much you are managing to utilise as silage and grazed grass.
- Develop a plan to increase the tonnage of grass grown per hectare and the amount utilised as grazed grass.
- Develop an integrated life, money and farm business plan and update this every year.
- Involve all relevant family members in developing this and when making important (strategic) decisions.
- Seek professional help in the above.
- Be aware of the potentially tragic consequences of farm expansion without a plan.

GRASSLAND POTENTIAL

The basic premise of this report is that, with clear policies, good leadership and focused decision-making, Ireland's key natural resource of four million hectares of grassland, which allied to a moist, mild climate gives Ireland a long growing and grazing season, gives the country a significant comparative advantage over most competitors and it can become the foundation for internationally-competitive milk and meat industries.

Such industries have the resilience to withstand the inevitable financial, market and natural setbacks that threaten viability at all levels. They also flourish for the benefit of farm families and people throughout the industries in marketing, processing, research, extension, education and ancillary services and inputs and provide a strong economic stimulus throughout the country.

The purpose of this report is to stimulate the leadership, structural and policy initiatives required to build this flourishing, resilient, internationally competitive milk industry in Ireland.

These initiatives are needed because experiences from other dairy industries show that the comparative and competitive advantages can be seriously compromised and damaged through a lack of or inappropriate leadership, structures or policies.

The principal focus of this report is on Ireland's comparative advantage over most international competitors. This comparative advantage is the combination of a mild, oceanic climate with the four million hectares of pasture land that farmers use to grow grass and produce milk and meat naturally and at low cost. Currently, farmers produce 5.2bn litres of milk, 518,000t of beef and 54,000t of sheep meat from these four million hectares.

However, these pastures possess the potential to increase grass production by at least 50% and, consequently, very significant increases in milk and meat production. The rewards are huge – for farm families, rural Ireland and the national economy.

The secondary focus of this report is on what needs to happen to establish Ireland as an internationally-competitive producer of dairy products. The striking conclusion is: Ireland needs to establish a structure that enables the various industry stakeholders to combine and collaborate to form an industry that is stronger, more resilient and more competitive than the sum of its parts.

This report is in two sections:

Section one focuses on how we can harness the productive potential of the pastures devoted to milk production for the benefit of farm families. In this part, we outline the nature and extent of this comparative advantage and the potential it has to drive farm profits and increased milk production at farm and national level.

We also look at what has happened in other countries and regions where farmers have moved away from grazed grass and squandered their comparative advantage.

Finally, we examine the Irish situation and make suggestions and recommendations on policies and practices that should be embraced and those that should be avoided if we are to build a flourishing, resilient dairy farming sector.

Section two addresses the structures needed to build an internationally-competitive dairy industry. The authors accept that this is a huge subject far beyond our competence and resources. However, we will highlight the importance of competitive advantage and cluster theory and the important range of issues which need to be urgently addressed.

The Irish dairy industry is poised for expansion. The Food Harvest Report forecasts a 50% increase in milk production by 2020. This increase of some 2.5bn litres of milk will be processed primarily into milk powders, cheese and butter, which must all be exported onto the world market.

This market has been expanding at 2% per annum with supply increasing by approximately 1.7 per annum, providing a healthy market for exporters although there has been significant price fluctuation due to a number of factors.

INTRODUCTION

These factors include competition between the main market suppliers, the EU, New Zealand and Australia and varying demand, especially in China.

Two emerging factors will narrow the gap between supply and demand resulting in increased competition, thus putting pressure on milk product prices and increasing milk price fluctuation. Current predictions are that Irish milk prices are likely to fluctuate between 25c and 40c per litre over a five- to eight-year cycle, so the need to maintain a focus on low costs is obvious in order to survive the low milk price periods.

In the short term, the end of the EU milk quota regime will release pent-up potential for increased milk production throughout the EU.

While this will be a short-term phenomenon in most significant EU dairy industries, Irish milk production has the potential to continue increasing for decades to come.

In the longer term, the entry of the USA as potentially the main supplier on the world dairy market will greatly increase supply and competition in the marketplace. This is a serious threat because of the very favourable feed price to milk price ratio. The 3.9% increase in US milk supply in July 2014 is an early warning signal of very strong US expansion.

Ireland has the potential to build an internationally-competitive dairy industry that can, if realised, become the backbone of the Irish rural economy, providing increased farm incomes and employment while boosting exports and economic growth. Such an expanding industry can provide huge rewards for Irish farm families and those working in the dairy industry.

The Food Harvest 2020 report has set a target for Irish dairy farmers to increase milk production by 50% by 2020. The potential for further expansion is higher still and further large increases in milk production are likely to occur during the decades after 2020.

However, the expansion routes chosen by farmers will have serious implications for the medium and long-term competitiveness of the Irish dairy industry and, indeed, for the financial success or failure of farmers and others who derive a livelihood from dairy farming.

It is important to repeat and emphasise that growth per se is not, and must not be, the main objective at farm or national level.

Growth in terms of more cows and higher milk deliveries, leading to increased exports, must be seen as an outcome of policies and practices that increase the tonnage of grass produced and utilised mainly in the grazing form.

In other words, policies and practices that focus on the country's comparative advantage – and put more money into farmers' pockets. There must be total clarity on this as it is the only pathway to sustained profitable growth over many decades.

The purpose of the report is to stimulate the leadership, structural and policy initiatives required to build a flourishing, resilient, internationally-competitive dairy industry in Ireland. These initiatives are needed because experiences from other dairy industries show that a country's comparative and competitive advantages can be seriously damaged through lack of or inappropriate leadership, structures or policies.

A flourishing dairy industry can form the foundation for a vibrant Irish rural economy, as well as providing jobs in milk processing and marketing, a secure future for family-run dairy farms and growing opportunities for non-dairy farmers and young people wanting to enter the dairy industry at all levels.

A resilient dairy industry is one that possesses the capabilities to survive inevitable shocks such as low milk prices, high interest rates, high feed prices, difficult weather years (for example, 2009 and 2012 were the worst weather years in 40 years) and other unexpected crises and to bounce back to its former flourishing state. This resilience is especially important at farm level where it is strongly linked to the potential of Irish pastures to grow high tonnages of grass and the skills of farmers to turn this into low-cost, high-quality milk through the grazing cow. This policy is underpinned by the world-class research programme at Moorepark.

This is Ireland's comparative advantage.

SECTION ONE

1

Exploiting and protecting Ireland's comparative advantage as a prime grass-growing country

Grazed grass

Ireland's comparative advantage

> **The Irish dairy sector possesses a significant cost advantage in the form of an environmentally-sustainable, rain-fed, grass-based production system, which allows milk to be produced efficiently for much of the year**
>
> **– Food Harvest 2020**

The statement above was produced by the Food Harvest 2020 committee chaired by Dr Sean Brady, former chief executive of Lakeland Dairies. The statement identifies what is probably the main advantage that Ireland enjoys compared with most other dairy-producing regions and countries – the ability to grow large quantities of high-quality grass and convert it through the grazing cow into high-quality milk.

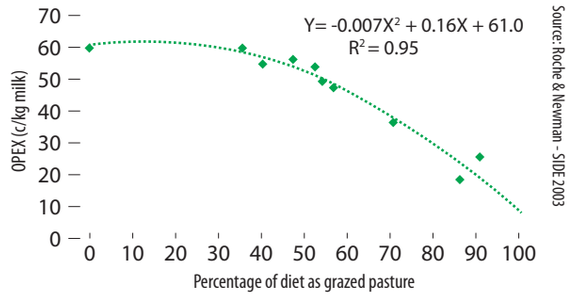
In simple terms, this comparative advantage can be summarised by the relative costs of grass, silage and bought-in concentrate feeds.

The obvious conclusion from this relationship is that the more grazed grass you can use to feed a dairy cow, the lower the cost of her milk production. And this is, in fact, the case in practice.

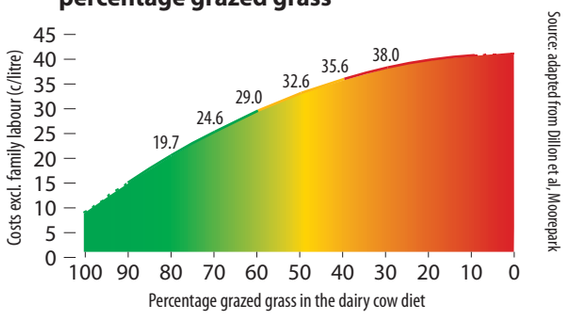
Research scientists in New Zealand and Ireland have verified this by analysing the connections between the amount of grazed grass in the cow's diet and costs of producing milk as shown in the graph on the opposite page. This graph clearly shows that milk production costs (OPEX) decrease as the percentage of grazed grass in the diet increases. The decrease is very slow initially, up to about 40% grazed grass. This is probably because the costs of housing, harvesting and feeding equipment remain in situ until cows really begin to spend more time in the paddock grazing.

Once the diet moves beyond 40% grazed grass, costs really tumble as a result of the lower cost of grass as a feed and, also, as a result of lower housing and machinery costs. A farmer doesn't need expensive housing or feed wagons when cows are mostly out grazing. In Irish conditions, the winter period places a limit on the total amount of grazed grass in the diet. This limit is usually around 75% with the balance of feed being supplied by silage and concentrates. This, essentially, is the foundation of the grass-based production systems developed at Moorepark and Ruakura and practiced on the best farms in Ireland and New Zealand.

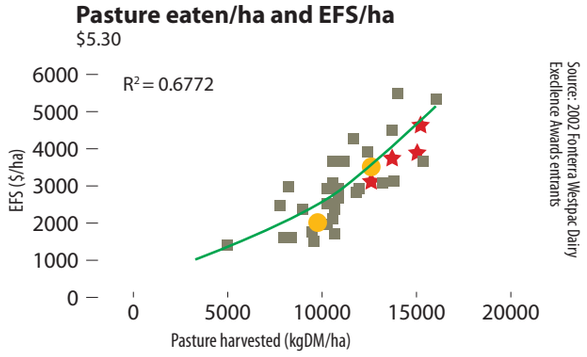
Relationship between proportion of grazed grass in the diet and OPEX



Range in production costs and percentage grazed grass



Pasture eaten/ha and EFS/ha



Each additional tonne of DM/ha is worth €161/ha

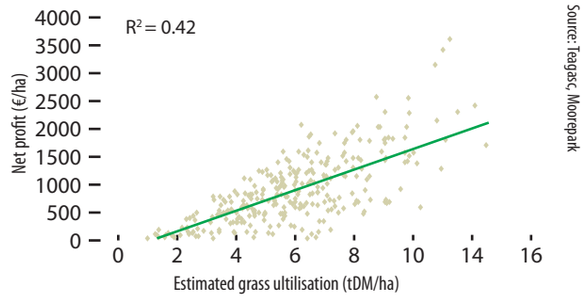


Table 1: Relative costs per kilo of dry matter

	€
Grass	1
Grass silage	2.5 to 3.0
Concentrates	4 to 6

Table 2: Drivers of Dairy Farm Profitability

Factor	Correlation with Profit	Relative importance for profitability
Cost of production	0.70	14 x
Production/ha	0.36	7 x
Production/cow	0.19	4 x
Extra feed per cow	0.05	1

Summary of 20 years NZ Dairy Economic Survey data

Table 3: Drivers of dairy farm profitability

Factor	Correlation with profit
Grass utilised/ha	0.42
Cost per litre	0.56 (with profit/litre)
Costs/ha	0.34 (with profit/ha)
Costs/litre	0.07 (with profit/ha)
Profit/ha	0.36 (with profit/ha)
Profit/litre	0.03 (with milk production/ha)
Milk production/cow	0.007 (profit/litre)
	0.075 (with profit/ha)
Extra concentrate feed per cow	0.03 (profit per litre and concentrate per cow). No relationship with profit per hectare

Source: Teagasc Moorepark

There is also a very high correlation between costs of milk production and profitability.

These figures clearly show that the main focus of decisions for profitable milk production should be on production costs and output per hectare. Focusing on costs will have a 14 times larger effect on farm profit than feeding more concentrates. The following correlations show in more detail that grass utilised per hectare, production costs per litre and costs per hectare are far more important levers for increasing profit than milk production per cow and extra concentrate feeding.

It follows that the more grazed grass in the diet, the more profit a farmer can expect to make from his farm. This information and research confirms the crucial role that grass utilisation plays in dairy farm profitability. Recent research at Moorepark has shown that the value of every tonne of grass utilised per hectare delivers an extra €161/ha in increased profitability.

Based on this information, the best route to increased farm profitability – and increased profitable milk production – is to:

- ► Increase the amount of grass grown per hectare of land.
- ► Utilise as much of this as possible – up to 85% target.
- ► Ensure that the dairy cow's diet is:
  - 75% grazed grass with the remainder being,
  - 20 – 25% grass silage and,
  - 5 – 10% concentrate feeds.
- ► Stocking rate must be 100% aligned with grass production per hectare and the farmer's ability to manage this to achieve the above figures

These should be the key drivers for farmers, advisers and researchers.

Consequences of increasing grass grown and utilised – farm level

According to the National Farm Survey (2012), the average dairy farmer farms 54ha of grassland and carries 67.5 cows and 34.4 other livestock units. The land devoted exclusively to milk production (milking platform) is estimated at 36ha.

Best available estimates for current average grass growth and utilisation on the average Irish dairy farm are 9t and 7t, respectively, (equivalent to 75% utilisation). And the best estimate for the proportion of grazed grass in the average spring-calving cow's diet is 75%. The above calculations are based on a relatively modest grass grown target of 12t/ha. Moorepark scientists suggest that a realistic target is 14t of grass grown across all soil types and 17t on better soil types.

If grass production and utilisation were increased to modest targets of 12t and 9t, respectively, then the extra two tonnes of grass utilised per dairy hectare would see a profit increase of €322 per dairy hectare, or almost €12,000 per farm.

Table 4: Current position

Grass grown/ha	12 tonnes	
Grass utilised/ha	9.0 tonnes (75%)	
Stocking rate (cows only)	1.88	
Feed demand	per cow tonnes/DM	per ha tonnes/DM
Grazed grass	3.503	6.59
Grass silage	1.326	2.49
Concentrates	400	752
Total	5.229	9.83
Percentage of grazed grass in diet	67%	67%

Milk production would also increase due to two factors:

- ► Replacement of non-dairy stock on the milking area by dairy stock, and
- ► Increased stocking rate due to the extra grass grown and consumed.

The farm would then be carrying about 90 milkers, plus a bull and 18 replacement units, giving a total milk output of around 31,500kg milk solids (350/cow, 700/ha), due almost exclusively to the amount of extra grass grown and utilised, the extra cows that feeds and the conversion of drystock units to dairy stock.

Even more dramatic increased results are possible. For instance, moving from average (9t grown and 7t (75%) utilised) to 14t/ha grown and utilisation to 85% gives an extra 5t/ha utilised. This gives an increase in farm profit of €805/ha or almost €29,000 for the average farm where 36ha are devoted to milk production.

The potential for grass to cash is phenomenal. And it is readily achievable.

Consequences of increasing grass grown and utilised – national level

It is estimated that dairy farming accounts for about one million hectares of Irish pastures. Of this, 650,000ha are used directly for milk production, while the remainder is used for rearing dairy replacements.

Teagasc estimates that this area will increase to 700,000ha by 2020. This will happen because of conversions to dairying from other farm enterprises – livestock and tillage. The extra 50,000ha can lead to a 7.7% increase in milk production.

What would be the effect of lifting grass production and utilisation to the ambitious, but realistic targets of 14t grown and 12t, respectively, across the 700,000ha?

Firstly, it would increase national dairy farm profitability by about €560,000,000 per annum (€560m), equivalent to about €34,000 on each of Ireland's 16,500 dairy farms, with even greater potential over the following decades.

Table 5: The grass-rich route

Grass grown/ha	15.5 tonnes	
Grass utilised/ha	11.6 tonnes (75%)	
Stocking rate (cows only)	2.40	
Feed demand	per cow tonnes/DM	per ha tonnes/DM
Grazed grass	3.66	8.72
Grass silage	1.24	3.00
Concentrates	400	1.00
Total	5.30	12.72
Percentage grazed grass in diet	69%	69%

Table 6: The grass-poor route

Grass grown/ha	12 tonnes	
Grass utilised/ha	8.5 tonnes (71%)	
Stocking rate (cows only)	2.40	
Feed demand	per cow tonnes/DM	per ha tonnes/DM
Grazed grass	3.05	7.32
Grass silage	1.5	3.60
Concentrates	1.00	2.40
Total	5.55	13.32
Percentage grazed grass in diet	55%	55%

Secondly, the stocking rate capacity of these highly productive pastures would increase to about 2.75 cows per hectare, which would support a national dairy herd of almost two million dairy cows. This is due to the increased stocking rate capacity of each hectare, plus the replacement of drystock with dairy stock and some farm conversions.

This would give a national milk output of over nine billion litres of milk, well ahead of the Food Harvest 2020 target. There is a huge prize and reward for exploiting Ireland's comparative advantage as a grass-growing country.

The key point to grasp here is that this almost doubling in milk production is primarily a result of the increased tonnages of grass grown and utilised per hectare.

It is not a result of simply increasing cow numbers and feeding them increased quantities of bought in feed!

The choices open to farmers

These are the two fundamental choices facing farmers – the high grass, profit-driven route or the high-input, milk production-driven route. And they represent two radically different approaches to dairy farming expansion.

Each approach will have a different effect on milk production costs, overall farm profitability, milk output, exposure to risk and, ultimately, Ireland's comparative advantage.

Before we compare these two choices, it is important to outline what happens on-farm after each choice is made.

Profit is sanity – production is vanity

As we explain on the following pages, the ''grass to cash at low cost'' is the optimum choice for profitable milk production in Ireland – a choice that is recognised by researchers, farmers, extension and responsible contributors.

The farming system that results from the ''profit goal'' is:

- Farm profit is the ultimate goal.
- The system that delivers consistent, low-risk profitability is the grass-based system where grazed grass makes up 75% of the cow's total diet.
- Farm decisions are focused on pasture productivity, stocking rate, grazing management, selection of high EBI cows, calving date and spread, cost control and silage plus concentrates plus other bought-in feeds constitute up to 25%, but not more, of the diet.
- The result is a milk output that reflects these farm management decisions. Milk production and milk yield per cow is a residual – not a goal.
- The real goal of profit is achieved.

In contrast, the farming system that results where milk production is the main goal is as follows:

- Milk production per farm and per cow is the goal.
- The system that delivers high milk production is based on Holstein, high-yielding cows, heavily stocked.
- Farm decisions are focused on breeding high yielding cows (Holstein), cow nutrition, feeding high levels of concentrates, associated housing, milking and management information systems, high quality silage.
- The result is high milk production per farm and per cow. Farm profit (when it exists) is a residual – not the actual goal.
- The real goal of high milk production is achieved!

Comparison of two expansion routes

First, take a farmer (Table 4) with a better than average herd of cows on a grazing platform of 40ha on which he is growing 12t of grass dry matter per hectare. He milks 75 cows with an average yield of 387kg milk solids per cow.

This farmer has two main choices for expansion, which are:

- The GrassRich route, typical of the top 10% of Irish dairy farmers. This is where farm expansion policy is to increase the amount of grass grown and utilised and then to match stocking rate to the

increased grass production, and
- The GrassPoor route, which is typical of the majority of farmers in NI. This is where farm expansion policy is to milk more cows but no extra grass is produced and the additional feed needed to feed the extra cows is bought in as concentrates and silage.

Let us examine these choices in more detail.

The increased grazed grass path
- Increase grass grown per hectare through reseeding, raising soil fertility, necessary reseeding and other management changes (e.g. possibly drainage).
- Match stocking rate to this increase in feed supply and increase percentage of grazed grass in the diet.

The GrassPoor route
- No increase in grass grown.
- Increase stocking rate.
- Supply increased feed demand with bought-in feed – silage and concentrates.
- Total grass utilisation falls as does the percentage grazed grass in the diet.
- There is much less grazed grass available on the shoulders because of the increased SR, so more silage needs to be made and fed.

Dr Laurence Shalloo and Dr Brendan Horan, Teagasc Moorepark, have made a physical and financial comparison of the three situations based on the following assumptions, as shown in Tables 7, 8 and 9.

Comment
There are significant aspects of the GrassPoor approach that need mentioning.
- It requires more capital spending on machinery and buildings.
- Profitability is lower.
- The farmer and operators work longer hours.
- It is much higher risk.
- It is not a simple system to manage and is difficult to replicate onto other farms.

The super GrassRich route
The figures do not represent the true potential of growing and utilising more grass. The figures in Table 10 show what happens when grass production moves up to 16t DM/ha and utilisation as grazing and silage moves to 85%.

This is really top-class grassland farming, where the percentage of grazed grass in the diet reaches 75%, which is probably the potential optimum under Irish conditions and at a stocking rate of 2.72 cows/ha.

Table 11 shows what happens when stocking rate is pushed up to 2.72 cows/ha without any increase in grass grown or utilised.

Note that the percentage grazed grass in the diet has dropped to 46%, resulting in a sharp lift in production costs.

It is also unlikely that this system can remain a compact spring-calving herd, using high EBI cows or crossbred cows. Experience indicates that farmers, who move this far away from grazed grass and feed 1.5t concentrates DM, also drift into winter milk and Holstein cows, which are more suited to high input systems.

Return on investment on grass production
Increasing grass production from 12t to 16t per hectare, plus increasing utilisation from 75% to 85% moves the tonnage of grass eaten on a 100ha farm from 900t to 1,360t.

The extra 460t is worth an additional €74,060 in farm profit based on the Moorepark figure that every

Table 7: Input costs

Category	Cost
Concentrate cost €/tonne	270
Urea €/tonne	420
CAN €/tonne	320
Land rental €/ha	267
First cut €/acre	125
Second cut €/acre	95
Labour €/hour	12.50
Milk production response l/kg	0.75

Table 8: Systems comparison - physical

	Current	Grass-rich	Grass-poor
Grass grown/ha	12	15.5	12
Grass utilised/ha	9 (75%)	11.6 (75%)	8.5 (71%)
Grazed grass as percentage of total diet	67%	69%	50.5%
Stocking rate cows/ha	1.88	2.4	2.4
Cows milked	75	96	96
Milk kg MS	380	380	415
Sales litres/cow	4,910	4,910	5,365
Total farm milk sales – litres	368,250	471,360	515,000

tonne of extra grass eaten increases farm profit by €161/t.

The policy choice and decision to follow the grassrich route to expansion yields a high return on investment at low risk. Virtually all the important factors are under the farmer's control and there is tremendous personal satisfaction in seeing results that underpin profitable business expansion and increased family farm income.

Farm evidence supports grazed grass

Research information to be published soon by George Ramsbottom of Teagasc (2014) provides more convincing evidence of the superior profitability on farms, which focus on getting more grazed grass into the cow's diet.

The evidence is based on the performance of 1,591 commercial dairy herds from 2008 to 2011 and the results are very clear.

The figures in table 12 show clear differences in production systems with increasing use of concentrates going from one to four. One immediate result is that pasture utilisation falls from 8.5t to 6.8t DM/ha. When more concentrates are fed, cows respond by eating less grass. For every tonne of purchased feed per hectare, pasture utilisation fell by 0.61t/ha. The cows substituted a low-cost feed with a feed costing five times as much.

The financial consequences of this are clearly seen in Table 13.

Despite a reasonably high milk price (around 31c/l) profit/ha declined by €215 from system one to system four. That's €10,750 on a 50ha farm. Profit fell by €78.20/ha for every tonne of DM purchased feed.

These results, which arrived just in time to be included in this report, copper-fasten, beyond all doubt the case for grazed grass – grass to cash at low-cost and the GrassRich system.

Table 9: Systems comparison - financial

		Current	Grass-rich	Grass-poor
Grass grown/ha		12	15.5	12
Grass utilised/ha		9 (75%)	11.6 (75%)	8.5 (71%)
Grazed grass as percentage of total diet		67%	69%	50.5%
Cows milked		75	96	96
Total farm costs		€127,407	€157,401	€170,670
Milk price				
Total	24.5c/l	- €1,171	€3,914	- €9,087
Farm	29.5c/l	€20,388	€31,505	€18,508
Profit	34.5c/l	€41,947	€59,095	€46,103
Milk price				
Margin	24.5c/l	-0.3 c	0.8 c	- 1. 8 c
Per	29.5c/l	5.3 c	6.3 c	3.7 c
Kg milk	34.5c/l	10.8 c	11.9 c	9.26 c

Table 10: The super grass-rich route

Grass grown/ha	16 tonnes	
Grass utilised/ha	13.6 tonnes (85%)	
Stocking rate (cows only)	2.72	
Feed demand	per cow tonnes/DM	per ha tonnes/DM
Grazed grass	3.75	10.2
Grass silage	0.75	2.04
Concentrates	0.50	1.36
Total	5.00	13.60
Percentage grazed grass in diet	75%	75%

Table 11: The really grass-poor route

Grass grown/ha	12 tonnes	
Grass utilised/ha	8.5 tonnes (71%)	
Stocking rate (cows only)	2.72	
Feed demand	per cow tonnes/DM	per ha tonnes/DM
Grazed grass	2.57	7.00
Grass silage	1.47	4.00
Concentrates	1.51	4.11
Total	5.55	15.10
Percentage grazed grass in diet	46%	46%

Matching stocking rate to grass production

The figures in Table 14 show how increasing pasture productivity has a much more significant effect on increasing stocking rate than feeding extra supplements.

In other words, if you want to increase milk production (at farm or national level), it makes far more sense to grow more grass than to feed more concentrates.

Growing more grass

In the 21 June 2014 issue of the *Irish Farmers Journal*, dairy farm consultant Matt Ryan (formerly of Teagasc) gave some excellent advice on what farmers can do to grow more grass and the benefits that ensue.

He highlighted the need for improved soil fertility (P, K and S), wet weather grazing management and grazing management skills which can produce more grass with a profit increase of €188/ha for every extra tonne of grass grown. He also highlighted the cost reduction figure of 2.55c/litre by lifting the amount of grazed grass by 10% – equivalent to €127.50 for a cow yielding 5,000 litres.

"Grass is our cheapest feedstuff, costing €80/1,000 units of energy; and it is 2.5 times cheaper than first-cut silage and 3.5 times cheaper than dairy ration at €275/t," says Matt.

"But we are not growing enough of it. For every tonne of grass DM that the 90 farmers in my discussion groups grew, they increased their profit per hectare by €188.

"The first step to maximising grass yield for a farm is to do a paddock needs analysis (PNA). By doing this, you will identify the gap between the desired and existing yield of grass on a paddock; this is facilitated by weekly grass measurement, using any of the computer packages to record the data. With this, you will identify what the paddock is yielding and what it is capable of yielding, using the best paddocks or other discussion group members data as the benchmark. This creates the paddock profiles, poor grass, low fertility, wet patches, poor grassing etc. Action must then be taken based on research/advisory practice and advice."

Efficiency of capital utilisation

Dairy farm expansion requires capital, which should be targeted at investments that give the highest return on capital. Note that the highest return on investment comes from improving soil fertility, particularly P, K and lime. There is also a huge opportunity here as 90% of soil samples submitted for analysis are very low in P, K and lime. Some 61% of samples are low in both P and K.

Farmers sometimes see farm size and fragmentation as factors limiting expansion. However, the more immediate limitations are much more likely to be soil fertility and other factors affecting pasture productivity and this is where the farm management and advisory focus should be.

This analysis does not include any extra capital spending on machinery or buildings. However, the experience is that farmers who target increased output based on more cows and/or increased milk production per cow, increase capital spending on ancillary equipment and buildings. These include extra in-parlour equipment, computers, concentrate storage, diet feeders, tractors and more expensive buildings.

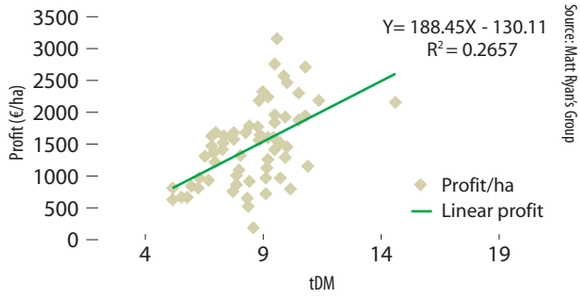
The evidence is that this extra spending (it is not investment) increases farm costs and puts the farm business at risk when milk prices fall.

In addition, these GrassPoor/high-input systems increase the number and complexity of the decisions the farmer has to make. In the GrassRich system, the main daily decision is to allocate enough area so that the cows graze down to residuals of 3.5cm to 4cm. In the high-input system, daily decisions need to be made on how much concentrate to feed and, in most cases, this causes substitution and grass intakes and quality drop.

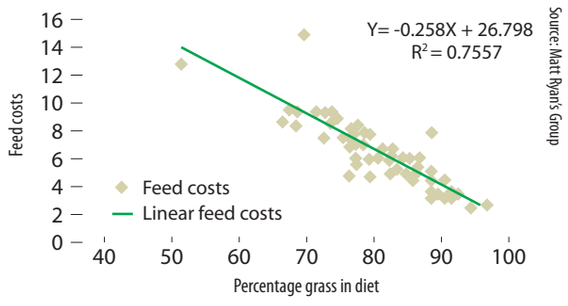
Taxation policy

Farmer decisions are strongly influenced by taxation policy, especially any measures that reduce tax – even though this may not always be in the best long-term interests of the farm family. People do strange things for even stranger reasons when it comes to taxation and government can have a major positive or negative influence on how the industry develops.

Profit/ha generated by every extra tonne of grass dry matter on dairy farms in 2013



Feed cost and percentage grass in diet



Current tax reliefs encourage expensive (not productivity related) capital infrastructure and do nothing for stock growth. We need incentives that encourage investment that will increase pasture productivity and the extra livestock needed to convert the extra grass into milk, which is the lifeblood of an expanding dairy industry.

From 1975 to 1984, there was a compound increase in milk production of between 6% and 7% per year. This was encouraged and supported by the 110% stock relief, which was available at that time. There is a justifiable argument for the introduction of 100% stock relief (due to the rapid stock growth which will take place between 2015 and 2020) to allow the dairy industry express its pent up capacity, in an unhindered fashion. This will deliver significant export revenues, employment, rural development and national external earnings. If 100% stock relief is not going to be a possibility, then stock relief should be increased to the maximum allowable.

Stock relief (and other stimulatory taxation initiatives) provide practical support for the target of 50% increase in dairy output, which will require 330,000 additional dairy cows. This will have a huge effect on farm cashflow. The increase in stock value comes to €412m (330,000 cows at €1,250/cow). In addition, the value of the extra 82,500 replacement stock needed to sustain the extra cows comes to €100m. This €512m is a non-cash item currently treated as profit so is subject to tax. Paying this tax will have severe cashflow consequences for the dairy industry for three main reasons:

- Each of these cows will have to be reared – Teagasc estimates a cash cost of €1,000 to fully rear a heifer, which is a cost of over €400m incurred by farmers to rear the extra animals needed to deliver Food Harvest 2020 targets.
- These stock are not available for sale and it is two years before they actually generate revenue.
- This growth in stock also requires further investment by those same farmers in housing, milking facilities, land, etc. This investment is in the order of €3,000 plus per cow. That is an additional €1,500 million to be spent on facilities for extra stock.

Table 12: Comparison of four production systems in Ireland

Production System	1	2	3	4
% of annual feed requirements purchased	Less than 10%	10 – 20%	20 – 30%	Over 30%
Average herd size	96	83	82	84
Pasture utilised t DM/ha	8.5	8.1	7.6	6.8
Purchased concentrates				
T DM/cow	0.36	0.66	0.99	1.31
Purchased concentrates				
T DM/cow	0.71	1.33	2.07	2.75

Table 13: Financial comparison of four production systems

Production system	1	2	3	4
% of annual feed requirements purchased	Less than 10%	10 – 20%	20 – 30%	Over 30%
Milk price c/l	31.3	31.0	30.8	30.5
Total costs c/l	18.0	19.2	20.7	22.1
Profit/litre	13.6	12.1	10.4	8.8
Profit/ha	€1,298	€1,257	€1,180	€1,083

Table 14: Matching stocking rate to grass production

Supplements of DM per cow (tonnes)	Pasture grown – tonnes/ha			
	10	12	14	16
0.25	1.7	2.1	2.4	2.8
0.50	1.8	2.2	2.5	3.0
0.75	1.9	2.3	2.7	3.1
1.00	2.0	2.4	2.9	3.3

Source: Teagasc – biologically optimum stocking rates in resilient farm systems

Table 15: Potential return on investment in the dairy farm business based on initial performance, response and investment costs

Investment	Cost	Impact	Annual return on investment
Increase soil P and K levels	Apply 20 and 50kg P and K per /ha	+1.5 t DM/year herbage growth	152%
Reseed full farm in eight-year cycle	€650/ha	+1.5 t DM/year herbage growth	96%
Improve grazing infrastructure	€1,000/ha for roads, fencing and water	+1.0 t DM/ha/year herbage utilisation	58%
Increase supplementation to increase milk yield/cow	€280/t DM of concentrate	Additional 0.8 l milk/kg of concentrate	3.2%

Padraig French and Laurence Shalloo: *Irish Dairying – Harvesting the potential,* 2013

Table 16: Total dry matter production from 50 dairy farms in 2013 – PastureBase Ireland

	Mean	Maximum	Minimum	Range
Total DM production	12.2	18.0	7.3	10.7
Grazing DM production	10.3	16.8	6.2	10.6
Silage DM production	1.89	5.0	0	5.0
Number of grazings	6.25	9.2	4.6	4.6

Hence, there is huge investment needed to both rear and provide facilities for extra dairy stock. To be taxed on stock growth will cause severe cashflow challenges for farmers and is likely to limit expansion potential on many farms.

Another consequence of the removal of milk quotas will be the increase in value of dairy stock. It is likely that the value of the national dairy herd will increase by 20-40%. This is equivalent to €250 to €500 per cow across a new national herd of 1.4 million cows.

This equates to 1,400,000 cows at €500 per cow = €700m.

Irish dairy farmers will find it very difficult to have the cashflow needed to pay the tax take on this stock value growth based on the earlier mentioned on-farm investment needed in stock and facilities.

Grass measurement in Ireland

A major weakness of grassland farming in Ireland is the lack of a simple, low-cost, user-friendly method of measuring grass production, utilisation and the proportion of grazed grass in the diet. Teagasc estimates that about 10% of dairy farmers are making some effort at grass measurement but that only 1,000 are actually measuring grass.

In January 2012, Teagasc launched PastureBase Ireland (PBI) as a national grassland database, which is now operating on 530 farms nationally. The results from approximately 50 dairy farms in 2013 indicate a huge range in pasture productivity.

The range indicates the tremendous scope that exists for farmers to grow and utilise more grass and, in the process, increase farm profitability. To focus farmers, advisers and researchers on this potential, we recommend the introduction of some relatively simple, farmer-friendly pasture productivity measurements.

Currently, many farmers in Ireland and abroad find the web-based Agrinet system very useful. It is also hoped that current advances in the technology of grass measurement will make the task of measuring actual pasture production on individual farms much easier and should pave the way for widespread grass measurement on farms. These devices work in conjunction through a satellite link and deliver information to the farmer's mobile phone (iPhone or Android).

The information includes the current grass wedge on the farm, growth rates, growth to date and annual growth figures.

These advances, once their accuracy is proven, will help revolutionise the role of pasture information, especially those items in the pasture productivity profile.

Teagasc aims to have 2,000 farmers measuring grass in the short term. Teagasc will link these developments into the PastureBase programme, which should be improved to deliver pasture utilisation and grazed grass figures.

Logically, this information from both of the above devices should link into the grassland database. There should be a central point of all grassland data for industry development.

Pasture productivity profiling

The continued prosperity of Irish dairy farmers and the competitiveness of Irish milk products rest primarily on the amount of grass produced from pastures, the proportion used for milk production and the percentage of grazed grass in the dairy cow's diet.

These three measures should be incorporated into a pasture productivity profile as a primary tool for all farm expansionary plans, advisory and research programmes and communications.

A key recommendation of this report is the development of a programme that can be used to:

- ► Establish the current level of pasture productivity on the land used for milk production.
- ► Compare current to potential pasture production on that particular farm.
- ► Identify the actions that need to be taken to move towards the pasture production potential.
- ► Outline the financial and production benefits gained by increasing pasture productivity.
- ► Motivate farmers to make decisions in pursuit of increased farm profitability based on an efficient grass-based system of milk production.

Ireland needs an economic pasture productivity index

Dairy cow breeding in Ireland has improved in leaps and bounds since the introduction of the economic breeding index (EBI) in 2001.

The EBI describes the expected profitability per lactation of the heifers bred from the bulls the farmer selects.

The EBI combines six factors that directly relate to farm profitability; milk production, fertility, maintenance costs, calving performance, beef performance and cow health factors.

Given the positive effect the EBI has had on farm profitability, the authors of this report strongly recommend the development of a similar tool that farmers can use to:

- ► Evaluate current pasture performance.
- ► Establish the potential pasture productivity performance per farm and per paddock.
- ► Identify the key factors that need to be tackled in order to lift pasture productivity
- ► Calculate the costs and benefits of increasing pasture productivity.

The economic pasture productivity index (EPPI) would become an essential decision-making tool for farmers, advisers and media and would clearly direct the focus on increasing farm profitability through increased grass production and utilisation.

The authors recommend that Teagasc immediately begins to work on the development of an EPPI, which would take into account:

- ► Current pasture productivity.
- ► Potential pasture productivity.
- ► Analysis of the factors needed to be improved in order to achieve this potential. The could include:
  - • Soil fertility analysis, especially for P, K and lime status
  - • Soil improvement – drainage
  - • Sward composition – reseeding
  - • Grazing management
  - • Farm layout
  - • Other
- ► A cost/benefit analysis

EPPI (two suggestions)

Suggestion A

This focuses on the energy harvested from pasture in terms of utilised metabolisable energy (UME). The UME/ha is relatively easy to estimate and captures in one figure the following:

- ► The quantity of grass grown.
- ► The quantity of grass utilised as grazed grass and silage.
- ► The digestibility of this grass and silage, which correlates to its milk production potential.

New Zealand research at Lincoln University shows how the amount of energy (ME) consumed per hectare increased over a five-year period.

Suggestion B

A pasture productivity profile (PPP) is based on the following measures:

- ► Grass grown per hectare – averaged over the entire land used for milk production.
- ► Grass utilised as grazed grass and silage for milk production.
- ► Digestibility (ME).
- ► Grazed grass as a percentage (%) of the cow's total feed intake.

Table 17: Energy harvested from pasture – Lincoln University, NZ

	02/03	03/04	04/05	05/06	06/07
KG DM eaten/ha	14.3 t	15.3 t	16.1 t	15.3 t	16.4 t
Average pasture ME	11.0	12.0	12.2	12.4	12.4
ME eaten/ha (gigajoules)	157	187	192	191	203
Kg DM eaten/cow	3.82 t	3.84 t	3.98 t	3.83 t	3.90 t
ME eaten/cow (gigajoules)	42.2	47.8	48.5	47.8	48.4

The ME system would look something like this in the GrassRich system outlined above showing the potential

Table 18: Potential of grass-rich system

	Current	Grass-rich	Grass-rich potential
Grass utilised	9 t	13.6 t	15
Digestibility (ME)	10	11	12
UME/ha	90	150	180
% of potential	50%	83%	100%
Increased farm profit per 10-unit lift in UME/ha	Currently, there is no direct information or research in this area. This could be rectified without too much effort.		
Increased profit moving from current situation			

Table 19: Pasture productivity profile

	Current	Potential
Grass grown (tonnes DM)	11	18
Grass utilised (tonnes DM)	8	15.3
Digestibility (ME)	10	12.4
Grazed grass in cow's diet (tonnes DM)	2.9	3.6

Notes: Index is an average of the percentage figures

The pasture productivity index (PPI)

The possibility of developing a PPI should also be considered. This could be a single figure combining and comparing the current and potential of the three main measures of pasture productivity for the farm.

It could look something like what is shown in Table 20.

Table 20: Pasture productivity index

	Current	Potential	
	Tonnes/ha	% of potential	Tonnes
Grass grown	11	61%	18
Grass utilised	8	52%	15.3
Digestibility	10 ME	81%	12.4 ME
Grazed grass in cows' diet	2.9	80%	3.6
Pasture productivity index		68.5	100

Cautionary note: A concern here is that it would be possible to significantly increase the PPI by lifting grass grown, making more silage and actually reducing the percentage of grazed grass in the diet. For example, if grass grown and utilised are both 100% but grazed grass in the diet drops from 2.9t to 2t/ha, the farmer will still show an increase in PPI to 85%, yet profit will have almost certainly dropped significantly.

A really key measurement would be kilos of grazed grass per hectare, which is the key metric, and two of the pathways to improve this being to look at growing more grass, and to increasing pasture utilisation (grazed and silage).

However, in reality, it will be difficult for farmers to consider the effect of grazed grass utilisation as distinct from total grass utilisation. As a general rule, if a farm grows more grass and naturally adjusts stocking rate to maintain utilisation efficiency, then invariably total grass utilisation will increase and the proportion of the total diet that is actually grazed will remain constant.

So, the objective of the PPI is to increase grass growth and utilisation (total kilos produced for grass or silage) and maintaining the percentage of the individual animal's diet from grazed grass in excess of 75% to 80% is the correct overall approach.

More work is needed to decide what factors to include on the PPI and how they should be weighted. They can then be brought together into an overall EPPI.

Suggestion A has an advantage over suggestion B in that it would be impossible to achieve very high UME figures if a high proportion of increased grass grown was made into silage rather than being grazed.

However, the key point is that an EPPI will focus farmers' attention on lifting pasture productivity and profitability just as the EBI has focused farmers on breeding more profitable cows suited to grass-based systems.

The pasture productivity improvement plan

This is an advisory tool, which is used to outline the timed steps the farmer needs to take to move from his/her current pasture productivity profile to a target profile, which is related to the potential pasture productivity for the farm.

The potential pasture productivity can be estimated from measurements of the best paddocks on the farm, from other farms in the area, and from research results.

The pasture productivity improvement plan (PPIP) needs to show the potential technical outcomes and financial rewards of increasing pasture productivity. It also needs to put costings on the improvements needed to increase grass production and utilisations.

The PPI action plan

The steps needed to move towards the potential pasture productivity profile (PPP) requires identification of and evaluation of the factors that need to change. These can be broken down into the three basic measures in the PPP.

Grass grown

- ► Pasture composition – grass varieties, clover, weeds.
- ► Soil fertility – P, K, pH, etc.
- ► Soil structure – drainage, etc.
- ► Management factors.
- ► Location – soil potential, local weather patterns.
- ► Other

Grass utilised

- ► Matching supply curve with appropriate demand curve,
- ► Cow factors – EBI,
- ► Calving date and spread,
- ► Stocking rate.
- ► Supplements fed.
- ► Other management factors.

Proportion of grazed grass in the diet

- ► Management factors.
- ► Cow factors
  - • EBI
  - • Calving dates and spread
  - • Diet selection
  - • Others

Table 21: Pasture productivity improvement profile

	Current	Potential	
	2014	**2017**	**2020**
Grass grown per ha (tonnes)	11	15	18
Grass utilisation %	73%	80%	85%
Grass digestibility ME	10	11	12.4
Grass utilised per ha (tonnes)	8.0	12	15.3
Bought-in feed (tonnes forage and concs)	2.0	1.0	1.0
Total feed used for milk production (tonnes)	10	13	16.3
Cows milked/ha (SR)	2.1	2.86	3.4
DMI grazed grass	2.8	3.36	3.48
per silage	1.0	0.84	0.8
cow bought-in feed	1.0	0.6	0.4
Total	4.8	4.8	4.8
Grazed grass as a % of total cows' diet	58%	70%	75%
Pasture productivity index	68.5	85	100
UME per ha	80	132	184

Table 22: Economic value of moving from index 68.5 to 100 on 40ha

	Current	Potential	
	2014	**2017**	**2020**
Pasture productivity index	68.5	85	100
Extra grass utilised over current utilisation	-	200 tonnes	365 tonnes
Value of extra grass at €161/tonne[1]	-	€33,200	€58,765

[1] Based on Moorepark research

Table 23: Farm productivity profile (50ha farm)

	Current	Potential	
	2014	**2017**	**2020**
PPI	64	85	100
Cow stocking rate	2.1	2.86	3.4
Cows Milked	105	143	170
Production per cow kg MS	400	400	400
– litres	5,170	5,170	5,170
Production per farmkgs MS	42,000	57,200	68,000
– litres	542,850	739,310	878,900

Costs of improving pasture productivity

Costings need to be put on the extra fertilizer, reseeding, farm infrastructure and any other actions taken to life pasture productivity.

So also must the costs of buying and accommodating the extra cows and milk storage and milking equipment.

These can be used to construct cost-benefit analyses and returns on capital.

Extra labour, if required, also needs to be included.

Finally, all of these factors can be scaled up and integrated into the actual area of land devoted to milk production.

Pasture profit index

Teagasc, in conjunction with the Department of Agriculture, Food and the Marine (DAFM), has developed a profit-based index, called the pasture profit index (€/ha) which compares the profit potential for perennial ryegrass varieties in Ireland. This provides very useful information for selecting grass varieties when reseeding.

Farmer – adviser interaction

The above approaches and tools are well suited for use as an advisory approach and should also be used in discussion groups as one of the priority goals in increasing pasture productivity and farm profitability.

At every farmer/adviser meeting and discussion group, the following questions should be addressed:

- What is the grass productivity potential for this farm?
- How much grass is the farm growing per hectare?
- What are the constraints to increase productivity?
- How much grass is the herd consuming?
- What is the appropriate stocking rate now and outline how it should increase with increased pasture productivity?
- What is the action plan to lift the EPPI from where it is now towards its potential?

The National Pasture Productivity Trust

Ireland would benefit considerably from the establishment of a National Pasture Productivity Trust that would:

- Ensure that increased pasture productivity, grass utilisation and grazed grass are the key components of the engine that drives farm profitability and expansion.
- Bring together all the parties interested in developing and promoting increased pasture productivity as the growth engine for dairy expansion.
- Develop a set of common goals and strategies for increased pasture productivity.
- Generate funds for research projects that focus on increased pasture productivity.

Comment

Based on the above information, the authors strongly believe that Teagasc develops an EPPI that can focus farmers and advisers on the absolutely key factor driving farm profitability – pasture productivity.

The index should take account of grass grown, grass utilised, grass quality (ME) and possibly the percentage of grazed grass in the diet. These must become the main technical measures associated with profitable milk production in a grass-based production system.

These measures should become the common language in discussion groups and other communications and interactions with dairy farmers. Develop the concepts of the PPP and the pasture productivity action plan.

The case for increasing the production and utilisation of grass on Irish dairy farms to 80% and over is compelling.

The case for achieving 75% grazed grass in the cow's diet is equally compelling.

Focus

Researchers, advisers and others interested in promoting dairy farm profitability should focus on:

- Encouraging and enabling farmers to increase grass grown and utilised and
- To achieve 75% grazed grass in the diet.
- These efforts should be accompanied by a change in the factors that are used to analyse dairy farm performance.

CONCLUSIONS

- Easily attainable increases in grass production and utilisation would add €225m to national dairy farm profitability and would support a national herd of 1.5 million dairy cows. However, the reward and prize for really increasing national pasture productivity is much, much greater:
  – a national herd of two million cows,
  – national milk production of nine billion litres,
  – increased farm profitability of €34,000 per farm,
  – increased national dairy farm profitability – €560m.
  – this figure would be multiplied many times over in succeeding decades if the foundation is "grass to cash at low cost''.
- The continued prosperity of Irish dairy farmers and the international competitiveness of Irish dairy products rest primarily on the amount of grass produced from pastures, the proportion used for milk production and the percentage of grazed grass in the dairy cow's diet.
- Moorepark research has shown that the value of every tonne of grass utilised per hectare delivers an extra €161/ha in increased profitability
- Farmers pursuing high grass-based systems will always be more profitable than farmers chasing high milk yields and feeding high levels of concentrates.
- At low milk prices (24.5c/l), farmers pursuing high grass-based systems will make modest profits while farmers chasing high milk yields and feeding high levels of concentrates will lose money. Hence, the GrassRich route is far lower risk and much more bankable.
- The return on investment from inputs used to increase grass production ranges from 58% to 152%.
- The return on investment from feeding extra concentrates is 3.2% - and this does not include any additional capital investment needed to accommodate concentrate feeding. Nor does it allow for the high probability that substitution of grass by concentrates will happen. The on-farm productivity in NZ and Ireland of milk produced per kilo of concen-

Recommendations

- ► Set up a National Pasture Productivity Trust.
- ► A key recommendation of this report is the development of a programme that can be used to:
  - • Establish the current level of pasture productivity on the land used for milk production,
  - • Compare current to potential pasture production on that particular farm,
  - • Identify the actions that need to be taken to move towards the pasture production potential,
  - • Outline the financial and production benefits gained by increasing pasture productivity,
  - • Motivate farmers to make decisions in pursuit of increased farm profitability based on an efficient grass-based system of milk production.
- ► Develop an EPPI which, in a single figure, combines and compares the current and potential paddock and farm pasture productivity.
- ► Develop a pasture productivity plan for each farm. This an advisory tool, which is used to outline the timed steps the farmer needs to take to move from his current pasture productivity profile to a target profile, which is related to the potential pasture productivity for the farm

trates is only 50% of the results achieved on research farms because of the substitution effect.

- ► Very few farmers know how much grass their land grows and how much is utilised. This is a serious weakness.
- ► Because all of the above is logical, it would be understandable to make the assumption that it is a straightforward task to convince farmers of the benefits and rewards of basing their expansion of grass based systems. Provide the proof, install the proof in sensible advisory packages backed by practical research and farmers will follow. And Ireland will end up with a profitable, grass-based dairy industry that exploits the country's comparative advantage as one of the world's premier grass-growing regions.
- ► This could be a very flawed assumption, as the experience from some of the world's other premier grass-growing regions shows. This is the clear message from experiences in Australia, New Zealand and Northern Ireland, which is the topic of the next section.

2

Lessons from the grass-growing regions of Australia, New Zealand and Ireland

Dairy expansion experiences

Only a fool learns from his own mistakes. The wise man learns from the mistakes of others.
– Otto von Bismarck (1815 – 1898), 1st Chancellor of Germany

Ireland has a great opportunity to learn from the expansionary experiences of farmers and dairy industries in regions that possess a similar comparative advantage and regions that are primarily export orientated. The Australian state of Victoria, New Zealand, the six counties of Northern Ireland and, indeed, Ireland in the pre-quota era, all experienced significant dairy industry expansion. Initially, farmers in all four areas chose low-cost, grass-based systems to increase milk production. Gradually, however, increasing numbers of farmers decided to move away from, and even abandon, these profitable systems.

Despite the obvious advantages of the grazed-grass system, almost 100% of farmers in Northern Ireland and Victoria have moved to high-cost, high-input, low-margin, GrassPoor systems of dairy farming.

An increasing proportion of New Zealand farmers are moving in the same direction.

The consequences: farm families in Victoria have suffered personally and financially when external pressures such as drought and low milk prices wiped out profit margins.

In New Zealand, the lift in milk prices in 2012 and 2013 temporarily saved 28% of producers from potential bankruptcy. With current milk prices plummeting to $6/kg MS from $8.40 last season, these high-cost farmers are again in a high-risk situation.

In Northern Ireland, dairy farmers are working 85 hours a week for earnings of £5 per hour (almost €6).

The key question: why did so many well-educated, skilled, experienced farmers move form simple, high-profit, low-risk systems to more complex, low profit, high risk systems? This is a crucial question for Irish farmers and dairy industry leaders and will be examined in more detail in part three.

The rest of part two examines the experiences in pre-quota Ireland, New Zealand, Northern Ireland, and Victoria so that, like Otto von Bismarck, we can learn from the mistakes of others!

The sequence in this section is:

- Beginning to move away from low-cost, grass based systems (Ireland, 1973 to 1983).
- High proportion of farmers in high-cost systems (New Zealand, 2000 to 2014).
- The majority of farmers in high-cost, high-risk production systems (NI, 1995 to 2014).

- Traumatic experiences of high-cost, high-risk farmers due to milk price decline, extreme weather events and high borrowings (Victoria, 1990 to 2014).

The Irish experience

From 1960 to 1972, milk production doubled in Ireland, mainly due to increased stocking rates and simple, grass-based production systems. In 1973, Ireland joined the European Economic Community and, stimulated by increasing milk prices that were guaranteed through intervention support, proceeded to double milk production until the introduction of the milk quota regime in 1984.

There are some striking similarities between the Irish dairy industry in 2014 and in 1972, when the country was abuzz with anticipation of Ireland's entry into the EU. The EEC, as it was then called, was the six-member European Economic Community that was rich, short of food and willing to subsidise farmers to increase output. Until then, Irish dairy output had been restricted to the low-return, competitive UK market, so EEC entry was seen as a major opportunity for Ireland. Just as the end of the milk quota regime is seen now.

In 1972, increasing income – something that was desperately needed on most farms – was the driving force behind expansion in dairying and the seventies was a decade of massive energy and enthusiasm. We started with about a million cows producing 500 million gallons of milk on about 100,000 dairy farms. Annual increases in milk prices fuelled farm expansion and the construction of new factories needed to process the extra milk. By the time milk quotas came in, Ireland had more than doubled milk output from 1.3 million cows but with less dairy farmers – 65,000.

The industry was on the brink of even further expansion. According to a 1972 research study, Irish land had the potential to double livestock numbers to 10.3 million livestock, of which three to four million dairy cows was seen as a realistic goal.

The imposition of milk quotas quenched the fire of dairy expansion in a country that seemed destined to become the New Zealand of the northern hemisphere.

Let's see what lessons we can learn from the decade of expansion, 1973 to 1984.

Initially, on-farm expansion was based mainly on grazed grass production systems as farmers in the traditional dairying areas of Munster and Ulster increased their dairy herds and much larger dairy herds were set up in the non-dairying areas of Leinster.

Expansion was supported by:

- The grass-based research experiments at Moorepark, which were modelled on research at Ruakura in New Zealand, where some of the Moorepark researchers had spent time.
- The farm advisory services which were strongly motivated by lifting family farm incomes through expansion, more cows, more grass, more milk, more profit.
- The media, notably the *Irish Farmers Journal*. TV and radio had farming programmes while the major daily papers all had agricultural correspondents.
- Dairy co-operatives who needed extra milk for the increased processing capacity.
- Taxation was initially supportive of farm expansion but this changed in the early eighties.
- Government's national economic policy.

From 1973 to the late seventies, the main reason for milking more cows and producing more milk was to lift farm incomes.

With low (or non-existent taxation on income) farmers kept capital spending to a minimum and focused on lifting grass production and utilisation through soil fertility, drainage and increasing stocking rate.

However, this emphasis changed gradually during the late seventies and into the eighties due to a number of factors:

- Possibly the most influential of these changes was the belief by farmers and researchers that grass-based dairying had reached production limits set by stocking rates and milk yield per cow.
- Examination of individual cow milk records provided researchers and academics with a high correlation between calving date, lactation length and milk yield per cow. Current practice revolved around March calving, so that cows calved onto grass with minimal concentrate feeding. Cows that calved earlier had longer lactations and higher milk yields.
- Milk processors introduced milk payment bonus systems to encourage early calving and winter milk production in order to achieve a more even supply pattern and better utilisation of processing facilities.
- The farm advisory service and the *Irish Farmers Journal*, two key influencers of farmer decision-making, supported these changes.
- Finally, the newly-introduced income tax system allowed farmers to claim increased production costs against income, as well as depreciation on capital investment.

The result of these changes was a swing to earlier calving with consequences that were unforeseen at the time.

- Cows that calved a month or two before grazed grass was available required more and better quality silage and higher levels of concentrate feeding.
- This led to increased capital investment on:
  - More expensive cow housing,
  - Slurry storage,
  - Silage harvesting equipment,
  - Concentrate storage and feeding facilities,

- The suppliers of these concentrate feeds and capital investments targeted farmers with advertising and promotion.
- The Irish/British Friesian was gradually replaced with the higher-yielding Holstein-Friesian strain
- In 1980, the misery index (interest rate and inflation) hit 43% and high-cost, heavily borrowed farmers ran into severe financial difficulties, requiring concerted rescue efforts by the IFA and others in tough negotiations with the banks.

In summary, the combined efforts and resources of farmers, co-ops, researchers, advisers and the IFJ swung from:

- Developing a grass-based system that would return high profits at low costs.
- Developing a high-cost system that would deliver high milk yield per cow.
- The focus shifted to making high-quality silage and away from grazing management.

By 1980, a small but growing proportion of Irish farmers had become high-cost and high-risk. Many ran into financial troubles due to the combination of inflation and interest rates known as ''the misery index'', which hit 43% – interest rates went to 21% as did inflation. High-cost, heavily-borrowed dairy farmers ran into financial difficulty with the banks. The situation was exacerbated by the introduction of milk quotas and the economic recession of the mid eighties.

However, it is perhaps, ironic that the introduction of the milk quota regime in 1984 put a stop to the headlong plunge into production focused, high cost dairying. Farmers and researchers began to look at ways of producing the farm milk quota as cheaply and profitably as possible. However, the damage had been done and the period of stable, high milk prices during the 1980s saw the Holstein becoming the predominant breed – a type of cow that was not suited to a high-grazed grass system. Research at Moorepark continued with a heavy focus on cow nutrition and silage quality.

It wasn't until 1991 that the focus shifted again to grass-based dairying. The lead came from Cork farmer Michael Murphy, supported by then *Irish Farmers Journal* dairy editor Con Hurley, with the result that more and more farmers swung back to a grass-based system that ''put more money in their pockets''. The research and advisory effort refocused on grass-based dairying and processors stopped using the milk payment system to encourage off-season milk production. Finally, the dairy breeding effort began selecting Friesian genetics that suit the grass-based system and many farmers also began using Friesian-Jersey cross cows for the same reason. The importance of cow fertility in lifting profits in higher grazed grass systems was realised.

So, as we move towards 2015, the Irish dairy industry at farm, advisory, research and IFJ levels is in a healthy state in terms of the focus on grass as the key to on-farm profitable milk production. The majority of dairy farmers south of a line from Dublin to Galway are focused on producing milk at a low cost from grazed grass.

However, this is no guarantee that expansion will continue to be based on grass, and especially grazed grass. The drift from grass could happen again, as it did in Ireland and Holland in the late seventies, New Zealand, Northern Ireland and Australia since the nineties.

A key question is: why did farmers, researchers and advisers within these countries drift into lower-profit, higher-risk systems. We need to understand this. The answer is vital for Irish farmers and policy-makers if we are to expand profitably and at low risk by exploiting Ireland's comparative advantage and develop an internationally-competitive dairy industry.

New Zealand experience

The New Zealand dairy industry can justifiably be regarded as the world's most competitive dairy industry even though it has lost some of this competitiveness in the last four to five years.

Today, New Zealand is the world's leading exporter of dairy products. NZ dairy farmers are collectively the most profitable in the world. They are the best educated and skilled farmers. Importantly, the New Zealand industry is structured to provide a ladder of opportunity that enables young people with low capital (and no land) to build up substantial dairy farming businesses.

Today, some 12,000 dairy farmers milk five million cows and produce almost 21 billion litres of processing milk.

Dairy farming trends in New Zealand are of particular interest to Ireland because:

- Beginning in the late 1950s, there has been a long association at research, farm and advisory level between the two countries.
- The dairy industries in both countries are traditionally pasture-based.
- New Zealand has more than trebled milk output over the past 24 years and, so, could provide a useful model for an expanding Irish dairy industry post-2015.
- The recent drift to high cost milk production in New Zealand can provide valuable lessons and information for Ireland.
- The tag of ''dirty dairying'' by urban dwellers is informative.
- NZ government policies and regulations are worth exploring, especially on tax and environmental issues.

Industry structure

Over the past 60 years or so, the New Zealand dairy

industry developed a structure that made it the most competitive industry on the world market, of which it is the main exporter. The ability of NZ farmers to produce milk at low cost from highly productive pastures and a mild, damp climate has established a huge comparative advantage for the industry, and has established the New Zealand dairy industry as probably the most internationally competitive.

A snapshot of the NZ dairy industry around 1990 would show:

- The Dairy Farming Research Organisation based at Ruakura, and the scientists McMeekan and Bryant, in particular, had developed the low-cost grass based production systems as the most profitable for NZ farmers. There is a clear recognition that the driving forces of a dairy business are:
  - Increased profits,
  - Good cashflow,
  - Investments into productive assets only.

  These all combine to increase wealth. Higher profits and increasing equity drove the Ruakura milk production system. Researchers McMeekan and Bryant were the giants who ensured this clarity of policy. Especially noteworthy is their strong insistence that technology must fit into the system that maximises profitability, or it is not worth adopting. Ruakura may not have made a huge contribution to improved technology but its contribution to better policy is priceless.

During the 1980s and up to 1995, the research team, led by Arnold Bryant, continuously finetuned this grass-based system and promoted it through open days, conferences, the media and the consulting officer extension service.

- The consulting officer extension service was owned and run by the New Zealand Dairy Board and its main function was to give farmers advice on growing their businesses using the information from Ruakura. This was done primarily through a well-developed network of discussion groups, facilitated by the consulting officers, who were recruited more for their communication and facilitation skills than for their technical excellence.
- The Dairy Board also owned the New Zealand *Dairy Exporter* and this published research information and farmer experiences about profitable, grass-based dairying, as well as carrying industry and international dairy stories.
- The industry had developed a ''ladder of opportunity'' that encouraged and enabled young, qualified, skilled and ambitious people to enter dairying with very little capital. Such a young person with a suitable qualification would begin as an employed milker and then graduate on to a contract milker. The next step was sharemilking after which came herd ownership and farm ownership.

  This progression provided a serious career opportunity for young people and a great way for them to set up a profitable dairy farming business and build wealth. This ladder of opportunity pumps vigorous, energetic and innovative, young blood into the industry. It invigorates everything in contrast to the stagnation in Europe. Sharemilkers get the "debt monkey" on their backs early but clearly understand that it is a wonderful opportunity to build equity, but they have to perform. In order to succeed, they have to:

- Work hard.
- Be business like, measure assess and plan.
- Use relevant technology.
- Have objectives and a strong performance orientation.
- Have a prioritised agenda, i.e. what is important to be successful? Why? What priority should it have?
- Daily use of relevant measurement to stay focused on key principles, i.e. use of targets to measure against. Results can be spectacular as seen by one farmer who has grown $25,000 to $2.5m in under 10 years.

  This system ensures that most of New Zealand's pasture land, which is its key natural resource, is farmed by competent people.

- A number of industry awards were introduced to highlight achievement and success, e.g. Sharemilker of the Year and Farm Manager of the Year. These competitive awards are very influential and help motivate farmers towards whatever parameters and standards the competition sets.
- Massey University (and, later, Lincoln) was the main educational establishment. Through Professor Colin Holmes, and others, the university bought into the grass-based production systems, ran its own experimental farm and provided graduates who worked at various level for the industry,
- Beyond the farm gate, the NZ Dairy Board was responsible for 100% of exports products which were manufactured by about 15 farmer-owned co-operatives.
- The NZ government supported the rapidly expanding dairy industry through liberal tax regulations on inheritance tax and capital gains tax. There was also strong government support for land mobility, ownership, partnerships, sharemilking and the establishment of Fonterra in 2001 as a ''monopolistic'' dairy co-op.
- Public attitudes supported dairying because it was seen as the key driver of the NZ economy and there were strong rural-urban links.

New Zealand – 1995 to 2012

As Table 24 and the graph above it shows, the NZ dairy industry has experienced huge expansion over the past two decades. The authors believe that a similar jump in Irish dairy exports will happen from 2015 to 2035, if we follow the correct policies at all levels.

The year 1995 is selected because this was when Con Hurley, at the behest of Prof Colin Holmes, was invited to speak at the Massey University Dairy Con-

EXPANSION EXPERIENCES

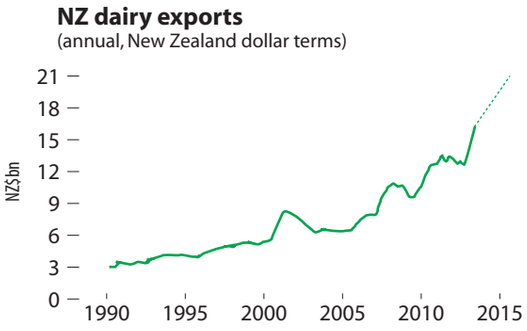


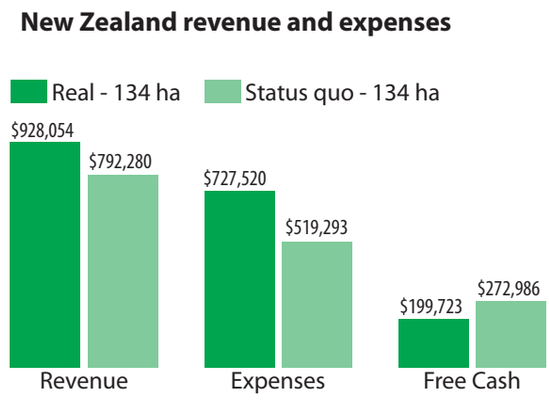
Table 24: NZ dairy statistics

	1995	2000	2005	2012
Herds	14,600	13,800	11,800	11,900
Herd size	200	250	320	400
Stocking rate	2.41	2.53	2.74	2.85
Litres processed (million)	8,633	11,630	14,103	18,883
Milk price $/kg MS (actual)	3.20	3.78	4.58	6.40
Milk price $/kg MS(inflation adjusted to 2013)	5.02	5.23	5.60	6.44

Note: milk production increased to 21 billion litres in 2014 at a milk price of $8.40. Milk price for 2015 is forecast to drop to $6.

Table 25: The shift to high-input milk production in New Zealand - Fonterra Report

	Low input (Pasture based)	Medium input (Up to 20% bought-in feed)	High input (Over 20% bought-in feed)
	Proportion of NZ dairy farmers in different production systems		
2000/01	70%	17%	13%
2010/11	40%	35%	25%
Change	- 30%	+ 18%	+ 12%



ference to warn NZ farmers about the consequences of moving into high-cost production systems in response to increased milk prices. Ironically, when Prof Holmes met Con during his study tour in 2013, he said: "Farmers took no heed of your warnings and messages and the industry has become high cost and increasingly uncompetitive."

So, what has happened in NZ? And why has it happened in a country that has been the world leader in grass-based, low-cost, low-risk, profitable systems of milk production?

Since 1995, NZ milk producers have gradually moved into higher cost production systems, primarily through increased use of supplementary feeds, especially palm kernel feed or bought in maize silage. According to one source, the NZ dairy industry has eroded its competitive (and comparative) advantage through the unnecessary and unprofitable intensification of farming businesses. The sharp appreciation of the NZ dollar against the US dollar over the past decade has also contributed to a loss in competitiveness.

A recent analysis, over the decade 2002 to 2012 shows that, although farmers milked more cows, bought more land and substantially increased milk solids sold, they made $20,000 less money milking approximately 400 cows than they would have made had they remained milking less than 300 cows. The figures indicate that farmers are working a lot harder and, at best, are making no more money. In addition, their businesses are far more exposed to external price fluctuations and are more heavily borrowed as a result of expansion. These farmers now have more capital tied up in dairy businesses that are more complicated to manage and at higher risk of low milk prices and other shocks.

The analysis delved deeper into the question of profit from intensification by looking at the actual results of farmers who intensified and increased milk production by increasing feed levels and buying more land. They had a stocking rate of 2.83 cows/ha by milking 385 cows on 138ha. A comparison was made with farmers who maintained stocking rate at 2.57 cows/ha, increased milk production by buying extra land while maintaining stocking rate at 2.57 cows/ha using the same low cost production system for 354 cows.

This analysis indicates that intensification resulted in the average dairy farmer milking 31 more cows, producing 19,067 kg more MS, and making -$73,263 less money than a similar size farm less intensively farmed.

The drift to high-cost milk production

The above analysis show that, in New Zealand, there has been an undeniable and large-scale trend for farmers to move into systems that depend more on imported feed than feed grown on their own farms, especially grazed grass.

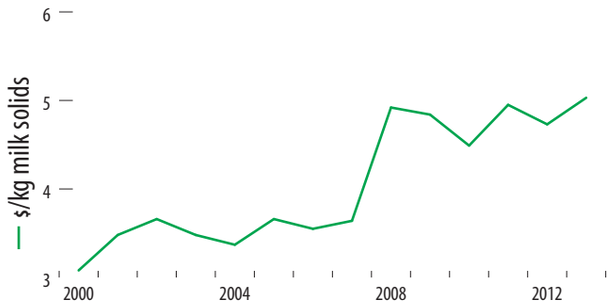
This trend has been accompanied by a significantly increased spending on buildings to house and feed cows, slurry storage and associated equipment and machinery.

The ''cost creep'' began in the early 1990s when a small number of farmers began to focus on lifting milk production per cow. The perception was that the Ruakura System was restricting the potential of the increased genetic merit of NZ cows to produce milk. So, some farmers decided to introduce more concentrated feeds and maize to increase milk yield per cow. This shift was helped by a period of relatively high milk prices.

From 1995 on, the ''cost creep'' gathered pace and became a ''cost current'' as more and more farmers bought in more feed. Accompanying this was increased spending on machinery and equipment to handle and store this feed and a growing interest and spending on cow housing.

The overall result is that milk production costs have increased well beyond the simple Ruakura system. The figures in the graph below indicate the cost increase trends. The operating expenses are the cost of production plus depreciation and an allowance for unpaid family labour.

Operating expenses per kilo milk solids excluding interest and personal drawings



Note that 50% of NZ farmers have operating costs above $5.03 and that milk price for 2015 is forecasted at $6.00

Outlook for NZ dairy farmers

For high-cost producers, everything will depend on the maintenance of milk prices at levels to cover production costs, pay tax and meet family living expenses. Milk price reached record levels of NZ$8.40 for the 2013/14 season. However, a recent report by the bank ANZ Agri Focus (August 2014) forecasts a 31% price drop to $5.75 (or lower) for 2014/15 with a slight recovery to $6.50 the following season. In conjunction, the bank is also forecasting increases in interest rates. The reasons for these forecasts include the Russia/Ukraine crisis, increased EU dairy exports and supply-demand problems in China.

It is not difficult to see the effect that a prolonged low milk price would have on high-cost NZ farmers, many of whom, need at least $6/kg MS to just meet production costs.

High borrowings are also a serious threat. The average NZ cow carries a borrowing of NZ$7,700 or NZ$22/kg MS. With interest rates at 6.8%, this adds another $1.50 to costs, bringing them up to $6.50 before depreciation, living expenses and taxation. Dairy farmers, where these figures apply, are in a very precarious position.

Why have 28% of New Zealand farmers drifted into high-cost, high risk production systems?

This is a question that deserves some reflection because, for most of the past 60 years, New Zealand dairying has been the world gold standard for grass-based milk production.

The question deserves a much more detailed study than is possible in this report. However, the following comments are based on a variety of sources, personal experience of the authors, the 2013 NZ dairy study tour and subsequent correspondence with a number of informed people in New Zealand and are indicative of what a more detailed study would find.

Switch in research focus

From 1950 to 1995, Ruakura gave very clear policy guidelines, which made NZ the lowest cost milk producer in the world with an impregnable competitive advantage. The switch in research focus occurred with the retirement, in 1995, of Dr Arnold Bryant, whose clear message was that farm profit was determined primarily by using stocking rate and calving spread to maximise pasture utilisation. The ''champion of grazed grass'' was succeeded by researchers who believed that the Ruakura system had held the industry back.

As a result, the research focus shifted away from the pure grass-based system and followed the wave of higher input farmers, who were moving towards European-style systems. Increasingly, production per cow became the goal, along with the built-in assumption that production equalled profit. And this was further justified by a simple formula based on milk price and grain price – ''it is profitable to feed supplements when the cost of a kilo of supplement is 5% or less than the price of a kilo of milk solids''.

From 1996 on, the lack of focus on low cost at research level has led to a situation where dairy farm costs have inflated by 9% a year over the past decade. As a result, farm costs have risen sharply and NZ is in danger of losing its competitive position as the world's lowest cost milk producer.

So, just like what happened at Moorepark in the late 1970s, an increasing proportion of research resources were devoted to factors associated with production per cow, especially animal nutrition. The result is that actual pasture grown and utilised is poorly understood and ill-defined, unlike kg MS/cow and kg MS/ha which are easily measured and provide the most easily understood information used in farm discussion groups.

Table 26: DairyNZ production systems

System 1	All grass self-contained, all stock on the dairy platform
	No feed is imported. No supplement is fed to the herd except supplement off the effective milking area and dry cows are not grazed off the effective milking area
System 2	Feed imported, either supplement or grazing off for dry cows
	Approx 4 – 14% of total feed is imported. Large variation in percentage as in high rainfall areas and cold climates such as Southland, most cows are wintered off
System 3	Feed imported to extend lactation (typically autumn feed) and for dry cows
	Approx 10 – 20% of total feed is imported. Feed to extend lactation may be imported in spring rather than autumn
System 4	Feed imported and used at both ends of lactation and for dry cows
	Approx 20 – 30% of total feed is imported onto the farm
System 5	Imported feed used all year, throughout lactation and for dry cows
	Approx 25 – 40% (but can be up to 55%) of total feed is imported

Note: farms feeding 1 – 2kg meals or grain per cow per day for most of the season will best fit in System 3

Source: Facts and figures for New Zealand dairy Farmers. DairyNZ

Hence, when the goal is output, and pasture utilisation is poorly measured or understood, the result for most is high levels of substitution, and subsequently high costs.

There was a corresponding shift in extension focus, especially after the merger between the consulting officer service and research to form DairyNZ. Critics argue that this merger has weakened the effectiveness of both organisations.

Today, the research focus at DairyNZ has widened further away from high-profit, low-cost, high-grazed grass systems to include environmental work, European wintering systems and other non-core areas. The authors are amazed to see the ''world'' champ falling on the ropes of high costs and nobody in industry leadership positions has shouted ''stop!''

A key criticism has been the establishment of a five-part system of categorising farming systems.

The categorisation of farms into production systems is being criticised because it provides no leadership message to farmers. Critics argue that this approach actually justifies high input systems and supports extension and research into high input systems.

A financial analysis of farmers in the five systems appears to give some comfort to the proponents of systems four and five. However, the numbers of high input farms in the financial analysis is relatively small and it is believed that those farmers are generally exceptionally good managers, who would make a high profit in whatever system they choose.

Operating profit includes the estimated amount of labour used (paid and family labour). However, accuracy of this information is poor and is not based on time and motion studies, and some comparisons show that both the hours worked and the complexity of that work increase substantially in a high input system. Grass-based systems are ''decision light'' relative to high-input systems which are ''decision heavy'' and require far more management skills and time for success.

Comparative stocking rate (kg liveweight/t DM) as a measure of the appropriate SR is now widely used in NZ and critics say that it has contributed to the system drift to GrassPoor farming. This basically allows/condones farm systems where SR is increased and additional feed supplements are introduced – but takes no account of the portion of grass in the cow's diet – a key measure of profitability.

The attitude of NZ banks is a clearer indicator of the relative profitability of the five systems. Banks are less willing to lend to farmers on system five versus systems two or three, because the banks' experience is that they have lost money by lending to high input farmers.

Another indicator of the relative superiority of the high-grass systems is that farmers who have grown their business with multiple units have done so

almost invariably with the simple, robust, GrassRich systems.

Lack of independent farmer-focused media

The *Dairy Exporter* is regarded as the leading farming publication in New Zealand. It was established in 1925 by the NZ Dairy Board and served as a key publisher of research information and farmer experiences about profitable, grass-based dairying, as well as carrying industry and international dairy stories. Effectively, the mission of the *Dairy Exporter,* mandated by its ownership by the Dairy Board, was to provide information that would help dairy farmers increase farm productivity and profitability through the proven grass based system developed at Ruakura.

In 2004, the *Dairy Exporter* was sold by Fonterra to NZX Agri, a subsidiary of NZX, which is effectively the New Zealand Stock Exchange. Editorial policy has changed and articles no longer focus exclusively on low cost/high profit grass-based milk production systems, but reflect all production systems. The magazine is subscription-based and is well supported by commercial advertising.

The *Dairy Exporter* website states that the ''NZ *Dairy Exporter* is New Zealand's leading dairy industry magazine, informing dairy farmers, sharemilkers, farm managers and others within the wider dairy industry. Published 12 times a year, NZ *Dairy Exporter* concentrates on topical news and issues of interest to all those involved in the dairy industry. Readers and advertisers can be confident that in each issue there will be an emphasis on relevant farm activities for that particular season, regular specialist columns, extensive conference coverage and a variety of on-farm profiles that are at the heart of the industry.''

Nowhere, does the statement include farm profitability, wealth creation and the grass-based systems that maximise both. Currently, there is no independent farming publication in New Zealand, although DairyNZ does publish a newsletter I*nside Dairy*.

Role of milk processors

Traditionally, NZ milk processors have been staunch supporters of seasonal milk production from grass. Many farmers are, however, disturbed by recent policy developments at Fonterra, which processes almost 90% of the NZ milk supply. This giant co-op has introduced a Capacity Adjustment Scheme, which effectively penalises farmers whose peak production is above the co-op average and rewards suppliers with a flatter production curve.

According to Fonterra, the principles of the CA scheme reflect the extra demand placed on processing capacity by farms that produce more than the company-wide average milk volumes during peak months.

Payment adjustments take from the higher-producing farms during peak times and give to those with flatter production. The new CAS introduced in June 2014 penalises excess production during the four peak months (September to December) by 52c/kg MS. According to Fonterra, most farmers will notice only plus or minus 3c over the season whereas the "flat-curve" milk producers could have as much as 5c/kg to 6c/kg adjustments made to their payments.

Some farmers see the CAS as the thin end of the wedge towards a milk pricing system that will increasingly incentivise off-season milk production and favour high input producers. They are also concerned about a recent statement by the Fonterra CE, stating that NZ dairy farmers are 10 years behind international environmental standards. While this may refer to the need for farmers to clean up their ''dirty dairying'' image, some sources believe it may lead to a further increase in unnecessary spending on cow housing.

Personal correspondence replies

A number of people responded to the following query:

Based on my knowledge of dairy farming in NZ, it seems that the best system of milk production is one based on maximising the percentage of grazed grass in the diet. There has been plenty of research to support this from McMeekan onto Arnold Bryant. By 'best', I mean a system that delivers a high profit and provides a high return on capital and is very labour efficient.

Under the current method of systems classification, this applies to systems 1 and 2. However, over the past 20 years, there has been a continuous drift to higher input systems 3, 4 and 5, which are higher cost, deliver less profit, are more labour intensive and yield a lower return on capital.

Why have so many NZ farmers choose to move into these systems?

Here is a selection of responses.

► Some reasons given by farmers I know for choosing to go the high input route:

• We wish to grow our business but don't want to buy more land. Thus we own more cows and Fonterra shares and have a higher gross income.

• We need a new challenge but don't want to buy more land as we have gone as far as we can on our grass based system.

• We were bored.

• We want to release the genetic potential of our cows.

• We want to flatten our supply curve and hopefully earn a premium from the dairy co-op for producing more shoulder milk.

• At an $8 payout all supplements are cheap.

• Environmental regulations will eventually drive us away from cows being outside all year on a pasture based system so we might as well change now.

• We want to do the same production every year no matter what the weather.

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• We can better utilise our pasture by having a higher stocking rate and feeding supplement.

• We are tired of having challenges that are hard to manage, e.g. floods, snow and worrying about cows not being well fed.

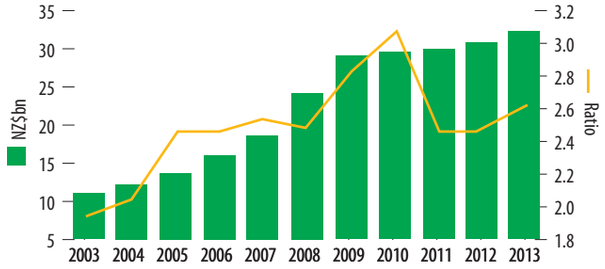
- ► DairyNZ is showing poor leadership and Fonterra is showing the wrong leadership.
- ► DairyNZ has become so big it now has CEOs with PAs and all the trimmings a corporate model has. With it comes the political need to retain the levy to fund all of this.

It appears to me that appealing to all levy payers, to make sure you retain your levy, is potentially a bigger driver for Dairy NZ than providing leadership on maintaining our international competitiveness.

I also believe our Fonterra directors no longer appreciate that Fonterra's success has been driven by having 12,000 farmers with resilient businesses to supply them. We are clearly getting changes now that are in the interests of the company but not in the interests of the businesses that have to survive the peaks and troughs of the commodity cycle to stay competitive. The capacity change stuff is not new; they have just changed it so it is now very clear that you are being rewarded for shoulder season production. This is a move that prioritises manufacturing efficiency ahead of on farm efficiency – a move that has not even been challenged by our council.

- ► Farmers have a natural instinct to feed cows very well and this leads to wasted pasture.
- ► Dairy companies promote flatter milk curves by "seasonal milk pricing" and this leads to feeding in shoulders and higher residuals = wasted grass.
- ► Our farm costs are $2/kg milk solids lower than industry average. On 300,000kg of milk solid,s this difference comes to $600,000. There are a lot of people thinking up reasons why they should have that money rather than me.
- ► I think Dairy NZ is now providing ''what does the customer want'' advice instead of what is profitable.
- ► Peer pressure: 400M/S cow has more bragging rights than 300M/S cow.
- ► About 2.5 million tonnes (500kg/cow) of Palm Kernel Extract (PKE) is being imported into NZ and this has made feeding very convenient.
- ► I have observed over many years that only when there is financial crisis does eating more grass become more popular for a while. Then, the DairyNZ slogan becomes: ''tight management for tight times.'' Why not have a relentless focus on ''tight management'' at all times.
- ► We have an absence in NZ of a base model research farm to which all others are compared.
- ► We don't have an ''Arnold Bryant'' thumping the table and repeating regularly about the profitability of the base model farm system. In other words, there is no clear research focus on the most profitable and competitive production system, which is based mostly on grazed grass
- ► I know one farmer on system five, who achieved the top performance with a farmer on system one. However, the system five performance came with the qualification that it was riskier and also that the operator was an outstanding pasture manager before changing to a system five.
- ► The debate over systems is often between educated specialists, selling something to a general farmer usually of lesser education. So, who wins the debate? These nutritionists and vets often have never run a business and don't understand all the impacts of their advice. I have seen some of them having a go at farming themselves after being frustrated with the ''dumb farmers'' not executing the plan correctly. This does create purchasing opportunities soon after.
- ► Most will do computer modelling of the economics but not follow up the actual outcomes. The biggest issue is the costs that are fixed into these businesses over the long term. You can't show them until after a long period and individually they appear small.
- ► Some of us (farmers) are concerned about the generational success of the NZ dairy industry but I don't think many of these sales people even understand what that means.
- ► High input can work to small scale on a grass-based system. The key person has to live and breathe it on a daily basis. Most people don't allow for this in their computer modelling.
- ► In NZ supplements are profitable at 5% of the milk price if all the pasture is harvested (85%). So, at good milk prices, it makes economic sense to supplement. However, surveys indicate that at farm level the response per kilo of palm kernel is only 50% of the response in a controlled experiment
- ► We all assume that all farmers want to make high profits. This not true in NZ and Ireland.
- ► It is harder to learn the skills of good pasture management and matching stocking rate, than to balance feed demands by ordering in supplement.
- ► Yes, they all want to make a profit but some farmers want cows to look good and have high per cow performance. This is when the sales people come in to ensure that the cows do their potential.
- ► Unless NZ and Irish farmers realise that their land is more valuable than their cows and they want the highest economic return from the land rather than the cows, we have a hard job to make people change.
- ► Genetic companies have a vested interest in higher milk production per cow.
- ► My view is that NZ farmers have been conned by overseas governments who have sent their nutritionists to NZ telling us that our cows are underfed and showed farmers how to feed them ''better''. This was all just ploy by those governments to make us uncompetitive on the world market. I

NZ dairy farm debt and debt to export earnings ratio



have wanting to say that to someone for a long time.

- ► These people come here because they believe they can make a huge difference and on output they are correct but not when it comes to long-term farm profitability.
- ► Production is vanity. Profit is sanity!

Dairy farm debt

Dairy debt almost trebled over the past decade, and currently stands at $32bn. It is concentrated among a relatively small proportion of highly leveraged farms with around half of the dairy debt being held by only 10 percent of dairy farmers. Strong export earnings saw the sector's debt to income ratio improve between 2010 and 2012, although for the decade as a whole this ratio tracked steadily upward.

Learning from the best NZ farmers

Despite the trend away from grass based dairy farming, not all NZ farmers have gone the high cost route, and we can learn some clear messages from those that remained with the grass-based system developed by Arnold Bryant and his colleagues at Ruakura – that is system two.

The key competitive edge of these NZ dairy farmers is their capacity to seize opportunity. Their analytical skills and excellent timely decision making qualities are focused on profits. So, they make high quality on-farm decisions to drive profits.

Farmer skills are highly developed in the daily use of relevant key measurements to achieve the profits. They use knowledge and relevant technology but they are absolutely clear that technology that does not increase profits is useless. They strongly resist new technology which increases the complexity of their systems. They will not be busy fools increasing milk production unless it clearly improves profits.

There is a clear recognition that the driving forces of a dairy business are:

- ► Increased profits.
- ► Good cashflow.
- ► Investments into productive assets only.

These all combine to increase wealth. Higher profits and increasing equity drive the top NZ dairy farmers. They are absolutely clear on what is necessary to achieve these and have a clear focus on what needed to achieve their financial goals.

At farm level, these NZ farmers achieve low cost by:

- ► Almost complete dependence on pasture.
  - • Little or no meals
  - • Low labour
  - • Low machinery
  - • Low building investment
  - • Low silage
  - • Low pollution problems
- ► Very high labour productivity.
  - • KISS systems (superbly executed)
  - • Rapid milking (design and handling procedures)
  - • High use of grazed grass
  - • Superb handling facilities (drafting, roads, fencing, water and milking facilities)
  - • Compact calving/mating and feeding of calves
  - • Excellent organisation, short high focus/high workload period
  - • A young vigorous workforce
  - • Simple innovations e.g. calf feeders
  - • Incentives, share milkers building equity.
- ► Investment in areas which will increase productivity and profit.
  - • Grow more grass/fertility/drainage
  - • Better utilisation/infrastructure
  - • Better cows to utilise and convert grass to MS
  - • Compact calving
  - • Labour productivity and cow handling
  - • Wee reared young stock leading to appropriate heifers entering the herd
- ► Low investment in unproductive areas.
  - • Unnecessary buildings
  - • Unnecessary machinery and equipment
  - • Complex, expensive milking parlours
  - • Land at prices that give a low return on investment

Despite this high dependence on grass, these top NZ farmers produce 1,000kg to 1,300kg MS/ha (14,700 to 19,100 litres at Irish MS levels) at very low cost. They achieve high productivity and profits by grazing a lot of grass and converting it efficiently into milk solids at low labour and feed costs, giving high profit/ha in simple low-risk systems.

Ireland can also learn a valuable lesson from the career ladder as evidenced in New Zealand. Bringing in business focused hungry young people and farm managers has huge potential for Ireland as has been the case in New Zealand.

Their role in bringing in land that currently is not in dairying into dairying could reduce the pressures to over stock and over complicate systems. Remember, they will have no baggage and will just want to focus on maximising their own return. There is a need for many more models of land and herd ownership than currently exist in Ireland today and we need to ensure that there are no policy barriers to their development.

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Northern Ireland experience

Following the introduction of milk quotas, trends in Northern Ireland were very similar to those on dairy farms south of the border. The province had an initial milk quota allocation of 1,322m litres but EU cuts reduced this to 1,283m litres by 1993/94.

Over the previous decade, average herd size increased from 37 to 44 cows and milk yield from 4,630 to 4,930 litres per cow.

With quota restricting output, farmers continued with grass based production systems seeking to maximise margin per litre.

The milk quota system effectively ended for Northern Ireland farmers in 1996 when the legalisation of quota sale throughout Britain provided farmers with the opportunity to buy more quota from their counterparts, mainly in Scotland and Wales. Many farmers availed of this opportunity with positive encouragement from milk processors, who along with banks, provided five-year loans at 1% over bank lending rates for quota purchase.

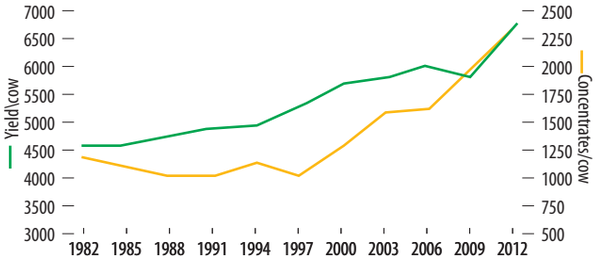
Milk yields took off to a current average of 7,034 litres a cow and concentrate usage doubled to 2.45t per cow.

With the end of the EU milk quota regime in 2015, farmers in the Republic of Ireland will be given the same opportunity as Northern Ireland producers had in 1996 – with one crucial difference; they won't need to purchase milk quota in order to expend. We can, therefore look at what happened in Northern Ireland over the past 18 years or so.

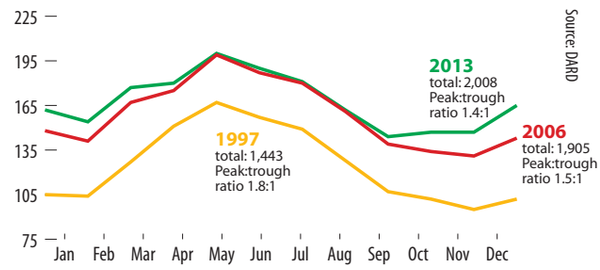
The trend in NI after 1993 is crystal clear. Although dairy farmer numbers declined by almost 5,000 and 20,000 fewer cows were milked, the total milk production has increased by 52%. This increase was driven almost completely by a doubling in concentrate feeding to 2.4 tonnes per cow and the increasing use of Holstein genetics.

There has been a significant move away from spring calving and today, cows calve fairly evenly during every month of the year with the result that the seasonality ratio has decreased from 1.75:1 in 1997 to 1.4:1 in 2013.

Yield (litres) and concentrates (kg) per cow in Northern Ireland



Milk deliveries from Northern Ireland farms
(million litres)



Whole milk utilisation (%), 2012

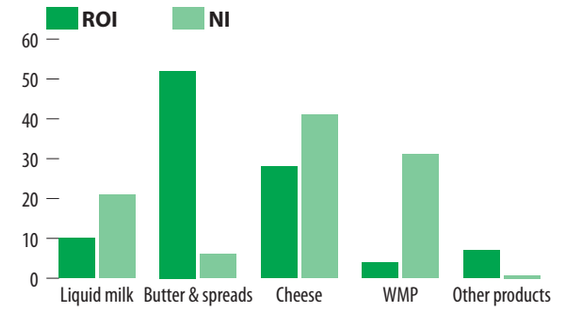


Table 27: Trends in Northern Ireland dairy farming - 1984–2013

	1984	1993	2003	2013
Total number of dairy farms	8,083	6,179	4,742	3,227
Total number of dairy cows '000	298	273	291	278
Average herd size	37	44	61	86
Average milk yield per cow	4,630	4,930	6,290	7,034
Concentrates fed per cow (tonnes)	1.2	1.1	1.6	2.4
Total NI milk production (m litres)	1,323	1,283	1,760	1,955

Such an even supply pattern is typical of industries where milk is utilised for liquid milk consumption, fresh milk products and speciality cheeses, as is the case on continental Europe. However, almost 80% of NI milk is processed into cheddar cheese, whole milk powders and butter, products that are heavily exposed to international competition. Some 35% of NI production is collected and processed by Irish co-ops such as Auriva, Glanbia and Lakelands.

The milk price payment systems in NI strongly encourage winter milk production and penalise spring and summer production as the figures in Table 28 show.

The following production system is favoured by Northern Irish advisers and researchers:

- ► November to February-calving.
- ► About 1.7 tonnes concentrates per cow.
- ► 7,000 to 8,000 litres per cow (650kg to 680kg of milk solids).
- ► 2.2 cows per hectare.

This system was identified as the optimal one for NI dairy farms based on a modelling exercise carried out by Duncan Anderson and other researchers at AFBI, Belfast and Hillsborough.

In the paper, which was read at a 2010 dairy conference in Hillsborough, Duncan Anderson said that: "The results indicate that the optimal dairy system for most Northern Ireland dairy farms is one that is somewhere between the extremes of those systems adopted in the US and NZ. Moderate input-moderate output milk production systems are shown to be robust over a wide range of milk, concentrate and fertilizer prices. Low input-low output (NZ style) and high input-high output (US style) are shown to be less versatile.

Despite this research, according to Ian McCluggage, head of technology and business at CAFRE Greenmount, ''dairy farming in NI has become Americanised with the widespread introduction of total mixed ration (TMR) feeding systems and partial or total confinement systems on many farms. Expansion has come by feeding more concentrates without a corresponding increase in technical efficiency – grass production and utilisation, forage quality and herd fertility, for example''.

He continues: ''Some of the main factors, which have contributed to the increase in output at farm level, are given below. These may provide an explanation as to how expansion has taken place and pointers for those considering expansion in future years.''

- ► A milk quota regime in the UK allowing quota trading.
- ► The availability of milk quota from mainland UK with farmers ceasing production.
- ► Positive encouragement from milk processors to increase output.
- ► Expansion funded out of farm profits.
- ► Favourable borrowing terms from several sources of finance.

Table 28: Average seasonal adjustments, monthly base prices

Month	% monthly deviation from annual base price	Monthly prices based on an annual average (base) price of 30 ppl
Jan	- 0.033	29.90
Feb	- 2.844	29.15
Mar	- 6.459	28.00
Apr	- 9.170	27.25
May	- 9.732	27.10
Jun	- 8.235	27.50
Jul	- 4.473	28.70
Aug	+ 1.539	30.50
Sep	+ 10.163	33.05
Oct	+ 15.026	34.50
Nov	+ 15.894	34.77
Dec	+ 11.558	33.47

Source: *Robust Milk Production Systems for Northern Ireland* (2010), Duncan Anderson et al

- ► Economics of scale for the best use of on-farm resources.
- ► Land prices limiting increase in farm size, dictating increased output per cow.
- ► Availability of "grazeable acres" within easy access of the milking parlour.
- ► Milk price/meal price ratio improving the economics of meal feeding.
- ► Competitive costs of alternative feeds compared to grazed grass.
- ► Dairy cow genetics.
- ► The cost of marginal litres of production.
- ► Flexible and adaptable management systems.

McCluggage says that the optimal system is based on high grass production of 12 tonnes DM/ha and 80% utilisation as grazed grass and silage. He is critical of production systems that do not exploit grass productivity and use concentrates to compensate for low grass productivity and poor farm management in general. Many farmers have moved into high-cost, complicated systems, which are more labour intensive. He cites the complex feeding systems based on batching cows, feeding to yield, continuously changing ration formulation and TMR – all striving for high milk yields. "Volume is vanity, profit is sanity," he says.

The focus on an increasing number of NI dairy farms is on volume and maintaining high milk yields. Production costs averaged 25p/l on 500 costed farms but are as high as 35p/l on inefficient Americanised farms. These are the farms that are highly exposed to milk price drops and feed price increases.

This drift to higher milk yields and higher costs was outlined in a paper presented by Patrick Gillespie to the Irish Grassland Association in January 2014.

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Here are some of the conclusions;

- ► NI followed a "feed for yield" path to expansion.
- ► Expansion in NI is associated with higher fixed costs and liabilities than found on Irish farms.
- ► Any advantage in output that NI had in comparison to Irish farms was completely wiped away by the extra input costs incurred.
- ► Adverse feed price shocks will have a greater effect on net margin/ha in NI than in Ireland.

The paper also calculated and compared the profit margins per hour worked. This is a topic that is largely ignored when comparing milk production systems. Anecdotal evidence suggests strongly that the amount of labour required to operate a grass-based system is far less than the labour required to run a high-input system on the same acreage. This comparison is rarely made because most farms studied are family farms, where family labour is not measured or costed.

However, Patrick Gillespie has analysed the returns to labour in both parts of Ireland in Table 29.

The graph and the table paint a bleak picture for many NI dairy farmers as far as earnings per hour (family drawings) are concerned. The figures show that 50% of NI dairy farmers were earning less that €2 an hour for the work they put into operating their farms. Farmers south of the border were earning more on average and also had a wider distribution i.e. a lot more of them were earning €10 an hour, or more.

The drift to high-cost dairying in NI is all the more surprising given the potential of the region to produce 12 to 14t of grass dry matter per ha, although this is produced over a shorter growing season. Even so, cows can be turned out in early February in the Ards peninsula and other dry soils and mid to late March on the wetter soils of Tyrone and Fermanagh, where better grazing management skills are demanded. Grass utilisation is seriously compromised by the fact that most farmers have committed themselves to winter milk production. On most farms, utilisation is driven by the number of cows/milk produced during the winter – farmers make a conscious decision to get silage (security) in place for next winter first and then grazing comes second. This means longer periods indoors as silage is closed for cutting in mid to late May for first cut.

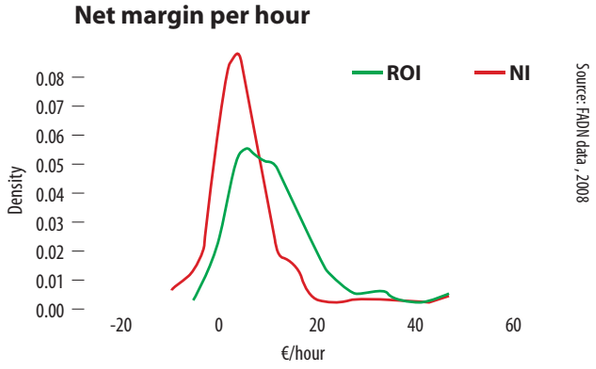
The vulnerability of high-cost NI farmers to low milk prices and other shocks has been hidden by a prolonged period of high milk price from 2010 onwards.

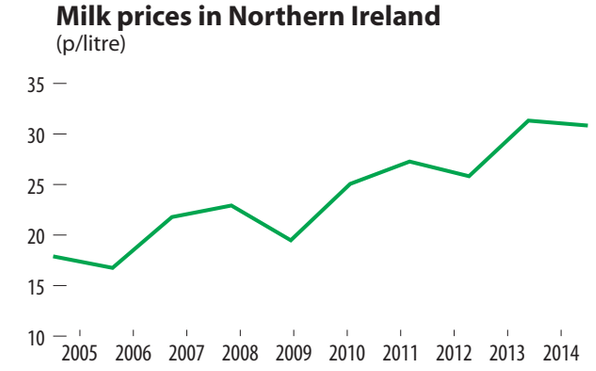
What can farmers expect when milk prices take a prolonged plunge as they are likely to in 2015? Or feed prices increase? Or interest rates rise significantly? The Duncan Anderson study shows that farmers using the optimal system have nothing to fear as they will remain in business even though profitability will fall. However, the effect of these shocks on the high-cost Americanised farms is likely to be severe.

Table 29: Net margin/hour in euro (exchange rate adjusted)

Year	Ireland	N Ireland
2004	8	6
2005	8	7
2006	7	6
2007	13	12
2008	8	2

Source: Patrick Gillespie. FADN data





Milk price will be more volatile over the next decade. A range of 22p/l to 32p/l (27.5c/l to 40c/l) is being predicted. What will this mean for farmers throughout Ireland, whose production costs are above 30p/litre (37.5c/l)? Farm production costs do not include family drawings and tax. Initially, the fall in profit can be absorbed on high cost farms where most or all of the labour is supplied by the family. The result will be longer working hours and reduced drawings for family needs. This may provide short-term relief but the medium-term effects of low (or no) profits would cause serious financial and personal problems.

Apparently some NI (and Republic of Ireland) farmers have already felt the pain of falling profits especially where borrowings are high. In the past, the solution was to capitalise the increased spending in the current account or to sell a building site. Now, it is to sell some land, usually an outfarm. And there are stories of banks foreclosing high-cost farms that have used up all their credit facilities and can't pay their bills.

A look at what has happened in the grass-growing states of Australia gives some indication of what to expect when high cost producers hit low milk prices.

Comment

Given the climatic, farm structural and grass-growing similarities across the island of Ireland, it is difficult to understand the different views between researchers and extension workers north and south on what is the optimal system of milk production. However, three factors stand out:

Breeding policy in the North has been determined primarily by the semen-selling companies. And, they have strongly promoted US Holstein genetics. Bulls and cows have been selected for high milk yields under American-style confinement production systems. They are unsuited to grass-based systems. Holstein cows are far less fertile than the more robust Friesian and Jersey-Friesian crosses favoured by farmers, researchers and extension workers in the South and in NZ. The result in the North is that it is extremely difficult to have a herd of cows that calve compactly over a period of eight to 10 weeks. So, farmers have accepted a much wider calving spread and, in practice, cows calve during every month of the year. Lifetime production of Holstein cows is about 27,000 litres compared with 40,000 litres for the Friesian cows at Greenmount.

Milk purchasers in NI use seasonal milk pricing differentials to encourage all year round milk production. It is not designed to encourage compact spring calving. While the NI dairy farmer does receive independent advice from CAFRE advisers, he/she is also the recipient of contradictory advice from milk processors, semen salesmen, concentrate feed representatives and machinery salesmen. Driving into the yards of many NI farms are people who are taking money out of farmers' pockets and decreasing farm profitability and viability.

However, despite these factors, it can be argued that the lack of clear coherent policy at research level in Northern Ireland left a vacuum that commercial interests were happy to fill. The objective of these commercial interests was to take money out of the pockets of NI dairy farmers rather than to help farmers to achieve higher profitability. Certainly, this is what has happened.

When researchers fail to consistently spell out clear policy to achieve high profitability via high grazed grass then it is of little surprise if farmers fall victim to the constant message of vested interests that high production per cow is the road to higher profits.

The results have been awful for NI dairy farmers:

- Extremely low profits.
- Very long hours an average of 85 hours/week by some informal surveys.
- Farmers in NI are reduced to a sad standard of living with an estimated £5 /hour return for their labour, management and capital.

It is impossible not to conclude that CAFRE has failed its farming clients and this is likely to continue until there is a complete rethink at all levels. At present, there is little evidence that this is happening. What a shame to see a whole sector reduced to penury. And what a lesson for dairy farmers in the Republic of Ireland.

Australian (Victoria) experience

Milk production in Australia for processing into export products is confined mainly to the South Eastern states of New South Wales, Victoria and Tasmania, where grass is – or was – the main feed. Victoria accounts for about 75% of national dairy product exports. The history of the Victorian dairy industry is of relevance to Ireland for the following reasons;

- Milk production systems were originally based on grass.
- Research and extension changed during the 1990s from a focus on grazing management to a focus on feeding for high milk yields and environmental sustainability.
- There are 5,159 milk producers in Victoria with an average herd size of 193 cows.
- Victoria is primarily an export industry with a product mix similar to that of Ireland.
- Over the past 10 years, many dairy farmers have faced serious financial difficulties.
- Milk production increased from 3.2 billion litres in 1980 to 7.4 billion in 2001 but declined to 5.86bn litres in 2010, and has risen slightly since then.

In the absence of detailed, on-the-ground research is has proven difficult to report comprehensively on what has happened in Victoria and why it has happened. However, based on some desktop research and interviews with a number of people, we are able to state the following:

- There are three grass-growing districts in the state that form the backbone of the Australian dairy export industry. One region depends on irrigation while the other two have average annual rainfalls of 1,000mm to 1,100mm (40in to 44in). There can be significant rainfall variation within and between seasons and there have been serious droughts.
- Traditional milk production in the non-irrigated South West and Gippsland districts were based on feeding 200kg to 300kg concentrates with stocking rates compatible with annual grass production figures of 6t DM/ha in the SW and 9t DM/ha in Gippsland.
- About 20 years ago, a number of private farm consultancy companies operated by nutritionists and a veterinary surgeon began promoting the feeding of ''cheap'' grain from the grain-growing districts of Australia.

EXPANSION EXPERIENCES

- Over the next 20 years, grain/concentrate and maize feeding escalated in Victoria.
- Because of drought and grass-growing patterns, split autumn/spring-calving systems using over a tonne of grain and producing 7,000 litres per cow, weighing 500kg to 550kg, were proving to be the most resilient under Australian economic and weather conditions.
- However, some farmers, supported by semen companies, feed companies and some consultants, moved into much higher input systems aiming for 10,000 litres and feeding up to three tonnes a cow. These high-cost systems used US Holstein cows, weighing 600kg to 650kg calved all the year round. One commentator says that these farmers (and their advisers) ignored the business drivers of profitable dairying under Victorian conditions and chased milk production, usually with decreased farm profitability.
- Some milk processors have introduced milk payment systems designed to encourage more level systems of production. In addition milk prices have fluctuated wildly from year to year and even within seasons.
- There has been an explosion of farm debt in Victoria as ban'ks lent aggressively and NZ farmers bought ''cheap' land in Victoria and Tasmania. As a result, land values escalated sharply until 20??
- Over the last decade, there has been tremendous financial hardship on many Victorian dairy farms, due to a range of factors including:

• Adverse weather – six ''drought years'' from 2000 to 2010, raising feed costs,

• Low milk prices have hit high-cost production systems, putting some out of business,

• Banks demanding debt repayment on the foot of falling land values and inability of high-cost, heavily borrowed farmers to meet repayments.

The human cost of these factors has been considerable, with farmers suffering ill health, physical and mental, marital problems and an increase in suicides. The characteristics of those who have suffered the most because of adverse weather, low milk prices and bank pressure are:

• High production costs,
• Poor use of grass,
• High debt levels,
• Poor knowledge of the main business drivers,
• Americanised production systems - Holstein cows, year-round calving, infertility, semi-confinement dairying, and very heavy concentrate feeding

There are plenty of lessons for Irish milk producers from the tragic experiences of these Australian dairy farmers and their families.

Against this background, the conclusions of a recent Dairy Australia report are stunning. The report by two independent consultants, investigated the key drivers of dairy farm profitability since 2006 against the changing seasonality of milk production.

Table 30: Supplementary feeding in Victoria (% of farms)

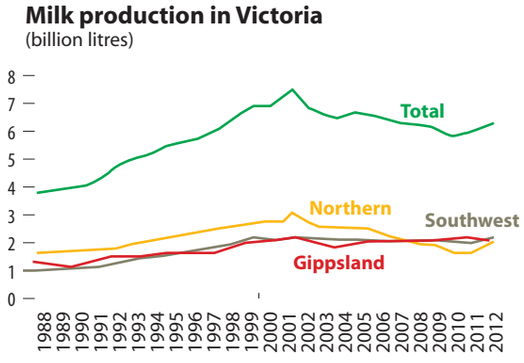
Year	Under 1t/cow	1t to 2t/cow	Over 2t/cow	Average per cow
1992	89	11	0	0.4
1994	87	12	1	0.6
1996	88	10	2	0.6
1998	76	23	1	0.8
2000	70	26	3	0.9
2002	54	40	6	1.1
2005	62	35	3	1.0
2007	52	32	16	1.4
2009	30	50	20	1.5

Source: Dharma & Martin, 2010. Based on ABARE farm survey results.

Table 31: Fluctuation in milk prices in Victoria

	cpl (Aus $)	cpl (€)
2006/07	31	18.9
2007/08	47	28.7
2008/09	41	22.6
2009/10	32	17.6
2010/11	39	26.5
2011/12	42	31.5
2012/13 (budget)	39	31.2

Source: Profitdairy – Warrambool Veterinary Clinic, dairy consultancy division. Conversions based on historical exchange rate estimates



5 KEY FACTORS

Careful, reflective analysis of what has happened in the above four situations leads to the conclusion that there are five key factors that have the most significant influence on the decisions farmers make about which production system to follow and hence on the effect on the level of exploitation of comparative advantage in each situation.

- Research: The leadership and messages coming from researchers about the most profitable system of milk production under Irish conditions, i.e. the spring-calving, grass-based system.
- Extension: Again, the leadership and messages coming from farm advisers, reference farmers, discussion groups, independent media, conferences and open days.
- Dairy genetics: The presence of a strong national breeding programme that selects bulls (and, hence, cows) to suit the grass-based system of milk production versus the strength of the suppliers of inappropriate genetics, i.e. Holstein Friesian.
- Milk price payment systems: Did they respect the seasonal nature of the grass-based system that maximised farm profit or did they seek to encourage, or even force, farmers to produce more and more milk outside the main grass-growing seasons in order to reduce milk processing costs?
- Decision-making and business competence of farmers: Where this is lacking, farm "planning" is weak and farmers are more easily influenced by hucksters and purveyors of products and advice that undermine farm profitability.

THE MAIN FINDINGS

- The most significant factor affecting dairy farm profitability is the proportion of directly grazed pasture in the cow's diet.
- Farmers with less than 50% grazed grass in the diet have a high risk of exposure to milk price and feed price.

EXPANSION EXPERIENCES

Country comparison of current state of key factors influencing grass-based farm production system

	Research	Extension	Genetics	Milk payment system	Farmer decision-making and business competence	Total
Score						
New Zealand	5	7	9	9	7	**37**
Northern Ireland	3	3	1	1	1	**9**
Victoria	2	3	1	3	1	**10**
Ireland	9 +	7	6	9	4	**35**

Note: although the assessment is subjective on a scale of 0 to 10, the total scores reflect the factors that affect the health of grass-based dairying in each country in the opinions of the authors

CONCLUSIONS

- Dairy expansion in Ireland from 1973 on was driven primarily by the need to lift farm incomes. Increased milk production was not a goal in itself. It was the means to an end – increased family farm incomes.
- There was a common industry expansionary strategy based on simple grass-based systems (Moorepark) promoted by the advisory service, media (particularly the *Irish Farmers Journal*) and government policies, tax regimes and a 'light-touch' regulatory regime
- From 1975 to 1984, there was a compound increase in milk production of between 6% and 7% per year. This was encouraged and supported by the 110% stock relief which was available at that time. There is a justifiable argument for a once off period of five years for 100% stock relief (due to the rapid stock growth which will take place between 2015 and 2020) to allow the dairy industry express its pent up capacity, in an unhindered fashion, which will deliver significant export revenues, employment, rural development and national external earnings. If 100% stock relief is not going to be a possibility, then stock relief should be increased to the maximum allowable.
- Changes in research policy, milk payment systems and taxation policy motivated farmers to chase high milk yields, thus increasing production costs and reducing profit margins, with some tragic results in the high inflation/high interest period around 1980
- Since the early-1990s, some New Zealand farmers, disenchanted with "low output" research moved towards European-style systems. Increasingly, production per cow became the goal, along with the built-in assumption that production equalled profit.
- In the mid-1990s, the champion of grazed grass (Arnold Bryant) was succeeded by researchers who believed that the Ruakura system had held the industry back. As a result the research focus shifted away from the pure grass-based system and followed the wave of higher input farmers.
- New Zealand's farmer-owned *Dairy Exporter* was sold into private ownership in 2004, removing further support for grass-based dairying.
- Dairy debt almost trebled over the past decade, and currently stands at NZ$32bn.
- In New Zealand, the lift in milk prices in 2012 and 2013 saved some 26% of producers from potential bankruptcy. Many will face that possibility as milk prices plunge in 2014/15.
- Despite compromising its grass-growing comparative advantage, the NZ dairy industry remains perhaps the most competitive on world markets and Ireland can learn much from the structures that underpin that competitiveness.
- Despite the obvious advantages of the grazed-grass system, virtually 100% of farmers in Northern Ireland and Victoria have moved to high-cost, high-input, low-margin, GrassPoor systems of dairy farming.
- In Northern Ireland, many dairy farmers are working some 85 hours a week for earnings of £5 per hour (almost €6).
- Encouraged by milk pricing systems and the move to American Holstein cows, the seasonality ratio of milk production in NI has decreased from 1.75:1 in 1997 to 1.4:1 in 2013, despite the fact that the product mix is far more typical of an industry based on seasonal calving.
- Milk production in the Australian state of Victoria was originally based on grass. However, during the 1990s, research and extension changed from a focus on grazing management to a focus on feeding for high milk yields and environmental sustainability.
- Average meal feeding levels have risen from 400kg to 1.5 tonnes per cow. The use of Holstein breeding predominates and production costs have risen steeply, as has farm debt.
- Farm families in Victoria have suffered personally and financially during the past decade when external pressures such as drought and low milk prices wiped out profit margins.

Recommendations

- We need to understand why so many well-educated farmers made such self-destructive decisions.
- Commission detailed studies of what has been happening in New Zealand. This could be a collaborative study for the benefit of both countries.
- Commission a detailed study of what has happened in Victoria.
- Commission a study of what has happened in NI and the effects on farm families.
- Develop policies, strategies and programmes to help Irish dairy farmers avoid making the mistakes made in NZ, NI and Victoria.
- Learn cheaply from the above mistakes.

3

Which direction will Irish farmers choose?

Decisions farmers make

> **When milk quotas go, dairy farmers in the south of Ireland will adopt the Americanised systems used throughout Northern Ireland**

The above chilling comment comes from a person who is very familiar with the development of dairy farming in Northern Ireland over the past 20 years and also with farmers in the Republic of Ireland. Will he be proven right? Certainly, the evidence from Northern Ireland, Australia and New Zealand backs him up.

Some current developments in Ireland indicate that some farmers and other industry stakeholders are making very questionable and, possibly, very unwise decisions.

Some examples:

- Over 200 milking robots have been bought by farmers.
- There has been a significant increase in sales of zero-grazing equipment.
- With pressure on budgets, Teagasc is considering cutting back on extension.
- The UCD faculty of agriculture is establishing a 200-cow unit with target milk yield of 8,000 litres and over 600kg milk solids.
- Many dairy farmers north of a line from Dublin to Galway are already moving to high-input systems influenced more by NI and Britain than Moorepark.

Ultimately, the collective decisions of Ireland's 18,000 dairy farmers are primarily what will determine the future shape of the dairy industry, especially the extent to which they exploit the country's comparative advantage. Of course, researchers, farm advisers, milk purchasers, government agencies and the media all provide information that dairy farmers take into account when reaching decisions. And there is an in-built assumption in many of these agencies, that farmers will make logical decisions consistent with generating increased farm profits.

The authors of this report believe that it is a major mistake to make this assumption.

If this assumption were true, we would expect the majority of Irish dairy farmers to focus on growing and grazing more grass to produce milk at low cost and generate high profits and return on capital. Unfortunately, as the experiences in New Zealand, Australia and Northern Ireland show, this assump-

tion is far from true and the majority of farmers in these dairy regions have chosen milk production systems that are high-cost and high-risk and, in some cases, have suffered the consequences of falling profits when milk prices have dropped.

With so many farmers poised to expand milk production following the end of the milk quota regime, there is an urgent need to promote low-cost, profitable milk production systems based on grazed grass and to resist the temptation to move into high-cost, high-risk systems and so avoid the financial and personal hardship that confront farm families when these systems break down, as has been the experience in other countries.

The evidence from Ireland in the late 70s and more recently from Victoria (Australia), New Zealand and Northern Ireland clearly shows that, in certain circumstances, dairy farmers willingly choose to move away from low-cost production systems based on grazed grass and into higher cost systems where grazed grass is increasingly replaced by silage (grass and maize) and concentrate feeds.

When milk prices are high and interest rates are low, these more intensive systems do deliver reasonable profits which can match or even exceed high grazed grass systems on a per-hectare basis.

However, the evidence is also very clear that the intensive systems are more vulnerable to shock factors such as:

- ► High interest rates
- ► Low milk payout
- ► High feed costs
- ► Disease outbreaks
- ► Adverse weather – droughts and/or long periods of very wet weather

Despite the potential for these risk factors to seriously affect farm profits and sometimes actual farm viability, the trend in all these countries and regions is towards these high-cost, intensive milk production systems. This seems to have been an inevitable trend. And, if this inevitability is the case, then we can expect Irish farmers to gradually move into high-input systems over the duration of Food Harvest 2020, and beyond. The country may end up increasing milk output by 50% (the Food Harvest 2020 target) but farm production costs would rise significantly and Ireland would be adversely affecting its comparative advantage. As a result, many dairy farmers would be extremely vulnerable to low milk prices, increased interest rates, increased feed prices and other risk factors.

Hence, the authors of this report believe that it is absolutely essential that we gain an understanding of the reasons that farmers choose and make decisions and take actions that greatly expose their farms and families to financial difficulties and social problems.

In this part of the report, we search for the reasons why farmers have taken such seemingly irrational decisions to put their farm businesses at risk. These reasons will reflect external influences, such as extension, research, media, as well as internal, inside-the-farm-gate, psychological reasons.

Table 32: Drivers of dairy farm profitability

Factor	Correlation with profit	Relative importance for profitability
Cost of production	0.70	14 x
Production/ha	0.36	7 x
Production/cow	0.19	4 x
Extra feed per cow	0.05	1

Summary of 20 years' NZ dairy economic survey data

Finally, we will propose some policies, actions and tools that, hopefully, will ensure that the majority of farmers decide to focus on proven, high-profit, low-risk, grass-based milk production systems.

The communication and extension policies and strategies used throughout farming are built primarily on the assumption that farmers are motivated by technical efficiency, resource productivity and financial reward. If this assumption was true, then the majority of dairy farmers in Victoria, New Zealand, Northern Ireland and other grass-growing areas in Britain would be operating high-profit, low-cost dairy farms based on the high utilisation of grazed grass from highly productive pastures.

The actuality is that in NI and Victoria, the majority of farmers have moved to low-profit, high-cost systems based on bought-in feed while, in NZ, an increasing number of farmers are drifting in this direction.

There is an urgent need to understand how and why these farmers have made these apparently illogical and irrational decisions. Then we need to put in place policies and strategies that enable Irish dairy farmers to make decisions that will deliver increased farm productivity and profitability. This will necessitate a broadening of the current Irish communication and extension policies, which have proved very inadequate in Victoria, NI and NZ.

The decision-making process of the people who manage dairy farms (farmers and managers) is difficult to categorise and describe. They are the people who, ultimately, make the choices and decisions and take the actions that determine whether they (and the Irish dairy industry) enhance and protect the country's comparative advantage or steadily erode it by moving away from grazed grass. This is what has happened in NI, Victoria and New Zealand.

It is crucial that we gain an understanding of how farmers and farm managers make decisions and what are the key influences affecting their decisions and actions.

Based on all the available evidence, we can reach one firm conclusion.

The main reason for the move to intensive high-cost systems is a decisive shift in farm policy and management focus from producing milk at a low cost from grazed grass to increasing milk production per cow at higher cost.

The steps are clear:

- A decision is made to increase milk production from a given area of land – the farm.
- The farmer decides the ''easy'' way to achieve this quickly is to increase production per cow by feeding more concentrates.
- Breeding policy focuses on high production Holstein genetics.
- The final step is to milk more cows and invest in the necessary equipment and facilities to house and fed these cows in pursuit of higher yields and to spread costs over more litres.

The simplest, easiest and most direct route to increasing production is to lift feed levels to cows through the use of concentrates. Technically, this is far easier than using grazed grass to increase milk yield, which requires a seemingly more complex set of decisions about soil structure, soil fertility, grass growth measurement, grazing allocation, etc. The response to concentrates is also immediate.

We need to gain a deeper understanding of how and why farmers decided to chase milk production per cow instead of farm profit (remember that the correlation between production per cow and farm profit is only 0.19, compared with 0.70 for production costs).

Factors that influence the decision-making process and behaviour of farmers

Based on current available information, these factors can be divided into two categories – external and internal.

External – the obvious factors

- Other farmers
- Advice and information from Teagasc advisers and other consultants
- Research information
- Milk purchasers and processors
- Government taxation policy
- Educators
  - UCD
  - Courses in agriculture – Institutes of Technology
  - Agricultural colleges
  - Leaving certificate
- *Irish Farmers Journal* coverage of dairying
- Other media coverage of dairying
- Dairy discussion groups
- ICBF
- Special interest groups
  - Breed societies
  - IFA, ICMSA
  - Irish Grassland Association
  - Positive Farmers Conference
  - Other
- Regulators
  - EU
  - Irish Government and Department of Agriculture
  - County councils
- Suppliers of physical inputs
  - Fertilizer
  - Grass seeds
  - Semen/genetics
  - Concentrates
  - Milking and milk storage equipment
  - Machinery
  - Buildings
- Suppliers of service inputs
  - Banks – finance
  - Accountants
  - Contractors – silage, slurry, grass-seeding
  - AI
  - Consultants
  - Grassland consultants
  - ICBF

Internal – the hidden factors

While the obvious influencers are those in the external category, individuals are also strongly influenced by other factors which can be in conflict with exploitation of comparative advantage and their financial well-being.

Examples of these other factors that influence decisions are:

- Stage of life
- Marital status
- Goals
- Boredom
- Level of knowledge
- Social aspects
- Peer pressure – bragging rights with other farmers
- Psychological disposition
- Attitude to – profit, animal welfare, environment
- Attitude to farm succession
- Attitude to farming – a business, career, way of life, hobby
- Off-farm income, including subsidies (SFP)
- Risk profile
- Lack of debt
- Attitude to life (philosophy)

The psychology of decision-making

There is a widespread assumption among people trained in science and economics that people use logical reasoning when they make decisions that affect their health, wealth, businesses, careers and wellbeing. This applies to many of the people and organisations that communicate with farmers. The prevailing wisdom is that farmers are motivated to make the right decisions by providing them with experimental results and financial plans that are all full of facts and figures.

These do, indeed, form the main decision-making

pathway for many people. However, many others, perhaps the majority, follow a more intuitive pathway. It could be put like this: ''Farmers are like all consumers; they decide with their guts and justify with their heads''.

So, it is critical to understand that farmers (like everyone else) are not rational (as we understand the word) decision makers. Many of them do not logically weigh up the available evidence when deciding whether to improve soil fertility to grow more grass or to buy more concentrates to increase milk yield per cow. Communicators need to understand the 'non-logical'' decision making pathways and incorporate them into their communication strategies.

The Australian experience

Frank Vanclay is Professor of Cultural Geography and head of the Department of Cultural Geography, Faculty of Spatial Sciences, University of Groningen (RUG), The Netherlands. Before that, he worked in the University of Tasmania, where he produced a paper outlining 27 principles associated with farmer decision-making.

Prof Vanclay's main principles are worthy of serious study by those in the extension and communications with farmers and particularly farm families, as they shed light on:

- Why conventional extension and communication methods have failed to prevent farmers in Australia, New Zealand and Northern Ireland making decisions that do not serve their best interests, and
- Steps that Teagasc and other communicators need to take on board in order to help Irish farmers make more effective decisions.

Here are some of the principles:

Profit is not the main driving force for farmers

Contrary to the expectation of many economists, extensionists and agricultural scientists, maximising profit is not the most important thing in farmers' lives.

Farmers seek to make a reasonable income for a reasonable amount of work taking a reasonable amount of risk, with each farmer defining what is reasonable for themselves. The additional values and virtues of being a farmer, that is the lifestyle factors, compensate farmers for those times when income may be less than what may be achieved by other endeavours. Appeal to economic incentives alone is not sufficient to bring about change.

Farmers are not all the same

The farming community is not homogeneous. There are many ways in which diversity can be observed within the farming community: rich and poor; big and small; old and young; early in the life cycle or late in the lifecycle; high mortgage and small mortgage; propensity to adopt new ideas (innovator) and propensity to retain tried and true methods (''laggard'' in extension discourse). Farmers can be categorised on every single variable that can be logically considered in conjunction with agriculture. This means there are no single problems, no single solutions, no single extension strategies, and no best medium that extension should solely utilise.

Different farmers have different priorities, different understandings, different values, different ways of working, and different problems. Extension must address the needs of all styles.

There is a strong desire to hand the farm on to one's children

Most farmers want to pass the farm on to their children in a better condition than they themselves received it. This motivation exceeds any rational economic decision about the level of care to invest in improving the farm because it makes any investment of labour, effort, money worthwhile. These feelings of commitment and obligation mean that there may be very strong feelings to keep the farm, against all economic reason. To give up the farm, or worse still the loss of a farm, are often perceived to be signs of personal failure.

Adoption is a socio-cultural process

Rather than extension being a process of communication between science as the only originator of ideas and farmers as passive adopters, extension needs to appreciate that adoption is a social process. The act of adoption is not an unthinking response to information provided by extension; rather it is a deliberate decision by an individual farmer in response to a consideration of a wide range of issues. But adoption is not a singular act of an individual in an isolated context either. Adoption takes place in a social context, with farmers discussing their ideas with other farmers. Much adoption occurs when the idea or practice to be adopted has become part of the normative concept of ''good farm management''.

Women are an integral part of the farm

A farm is rarely the embodiment of a singular individual male farmer. The word ''farmer'' is a convenience that has an established romanticised meaning that belies the reality of farm management. Farms are often complex partnerships involving many people in financial affairs and in the running of the farm and farm household.

Power imbalances and the gender-blindness, if not sexism, that afflicts extension and agricultural science means that the role of women is understated if not unrecognised. In many cases, women have played a major role in farm management. This role has been increasing, and will increase further in the future.

Even in individual situations where there has been a strong division of labour, the role of women in the private sphere in the household has been essential to the survival of the farm. Extension needs to acknowledge the role of women on the farm and needs to consider how the needs of women can be met. Women are an integral part of the farm and an important stakeholder for agriculture.

Stage in the lifecycle of a farming family and family composition are significant factors

The stage in the lifecycle of a farm family affects their need for household and disposable income, and this potentially affects finance available for other purposes. But stage in the lifecycle also affects commitment to the future, with young families being more committed to a future on the farm than either families later in the lifecycle, or young single farmers. Stage in the lifecycle is therefore a complicated variable, but it demonstrates that there are many factors that are involved in decisions about adopting new management practices or new crops, and that adoption is not a simple process of communication.

Effective extension requires more than the transfer of technology, it requires an understanding of the world views of farmers

Extension has been predicated on the notion that knowledge transfer was uni-directional, that science was the only originator of new ideas and that farmers were passive and non-evaluative receivers of new technology. It also held that all new ideas, if successfully extended, would be adopted. Non-adoption could only mean that information transfer had not taken place (not enough media attention) or there was a barrier to adoption such as a lack of money.

This argument is somewhat absurd. Surely, if it really did make sense for a farmer to adopt a new technology, and a commitment to that innovation existed (i.e. a thorough belief that the benefits outweighed the costs as broadly defined), a way would be found to adopt. Where non-adoption occurs, obviously a real commitment to the innovation does not exist and non-adoption is a sensible strategy. There are lots of reasons why farmers may not have a real commitment to new technologies and, thus, non-adoption is rational from the perspective of the farmer. Extension needs to be relevant to the needs of farmers, and needs to put their needs ahead of institutional priorities if it is to be successful.

The Irish experience

There is very little information on how and why Irish farmers make the decisions they do. Dr Áine Macken-Walsh, REDP, Teagasc, has looked at some of the factors that motivate farmers and the decisions they make. She makes the point that "while larger-scale corporate farms are influenced to a significant extent by economic factors, a defining characteristic of family farm decision-making is that it is informed by social, cultural and economic factors interdependently. The value placed by family farmers on social relationships (between family members and farmer peers); cultural forms of prestige (styles of behaviour/production and possessions that are esteemed by farmers); and economic (material) wealth, all influence family farms' resilience strategies".

"Decision-making on family farms remains highly influenced by social factors, such as relationships with family members and peers. In Ireland, for example, farm level strategies to respond to impending dairy quota deregulation, as well as adoption of technologies on farms, are significantly determined by social relationships. Essentially, the success of policies and extension efforts having their intended impact is a direct reflection of how compatible they are with family farmers' interdependent social, cultural and economic priorities. The social dynamics of farmer discussion groups, for example, are to a large extent accountable for the popularity and success of groups as an agricultural extension tool."

Taxation policy

This was covered in some detail above but it needs re-emphasising. Farmer decisions are strongly influenced by taxation policy, especially any measures that reduce tax – even though this may not always be in the best long-term interests of the farm family. People do strange things for even stranger reasons when it comes to taxation and government can have a major – positive or negative – influence on how the industry develops.

Current tax reliefs encourage expensive (not productivity related) capital infrastructure and do nothing for stock growth. We need incentives that encourage investment that will increase pasture productivity and the extra livestock needed to convert the extra grass into milk, which is the lifeblood of an expanding dairy industry. It is estimated that dairy farmers will need to invest €412m in the extra cows needed to fulfil the Dairy Harvest 2020 targets. Taxing this increase as well as the projected €700m in increased stock value will place a huge strain on farm cashflows and this would form a huge barrier to industry growth.

The goal-driven mind

People, whether they are consciously aware of it or not, are always pursuing goals. Without goals, boredom sets in. Boredom has been identified by several sources as a key factor in a farmer's decision to switch from a simple, low-cost, profitable farming system to a more complex, higher-cost, riskier farming system. Certainly, this has been the experience in New Zealand.

Farmers pursue a continuous range of goals as

they climb the ladder of opportunity from a teenager with lots of enthusiasm and little money through the sharemilking system to eventual herd and farm ownership. The grass-based system that delivered this success can then become boring when the big goal of farm ownership has been achieved. Boredom sets in, and this creates a space for further new goals that satisfy the person's need for challenge and growth.

This can be the dangerous tipping point for many farmers, especially when they have no broader life and financial goals. It is very easy for advertisers, salesmen and misguided advisers to encourage the farmer into a higher-cost system because they include challenging new goals. These are usually based on increasing milk sales through production per cow and all the nutritional and feeding technology that accompanies the pursuit of production.

When a farmer runs out of goals, then someone else's goals will fill the vacuum and seldom for the benefit of the farmer. Hence, the authors believe that farmers, like everyone else, need to have a broad set of integrated goals.

Pain versus pleasure – the carrot or the stick

Virtually all extension and communication strategies are based on outlining the benefits of certain decisions and actions. For example:

- If you get more grazed grass into the cow's diet, production costs will decrease and profits will increase. This is a pleasurable outcome. However, not all people are sufficiently motivated by the carrot, and many are lulled into a sense of complacency when positive outcomes form most or all of the message they receive from advisers, the media and input sales people.

Many people are likely to be more motivated by the fear of pain – the stick. For example:

- You could lose the family farm if your production costs are too high to survive a period of low milk prices.
- If you can't met your loan repayments, that bank will foreclose and sell your farm.
- Because costs are so high, and profits are tight, it will be difficult to send our children to university.

Losing the farm is, perhaps, the biggest fear factor for farmers, especially where the farm has been in the family for generations. Experiences in Australia and New Zealand show that farmers with high-cost systems have lost their farms in times of low milk prices, adverse weather events and financial crises. There have been similar incidents in Ireland, north and south, but these have not been publicised.

There are other ''sticks'' and sources of pain that affect farmers and their families when things don't go according to plan.

- Personal stress leading to physical and mental problems
- Depression
- Marital problems
- Suicide
- Lack of finance for children's education
- Lack of finance for retirement

In our opinion, farmer decision-makers should be made aware of the negative consequences of poor decision making.

Integrated life, money and farm planning

People who farm have families, hobbies, friends and lives full of issues and challenges – financial, relationships, health, etc. Many of these are personal and bear no direct relationship to farming. They have worries, dreams, hopes, fears, biases and beliefs just like everyone else. In other words, they are not just ''farmers''. They are the self-employed owners of a farm that provides a home, a career and a business that generates employment and the money to finance their lives and those of their growing families.

The person who farms and the farm itself have multi-purpose functions. It is important to recognise this when designing communication and extension programmes. Historically, this has not been the case. These programmes have focused almost exclusively on technical and financial aspects of farming, ignoring the other functions of the farm, which can be at least as important as milking cows and making profit, even though the farmer may not be consciously aware of this.

DairyNZ has introduced an advisory tool in an attempt to broaden the approach to farm advice beyond the purely financial and technical. The whole farm assessment report includes a short section that deals with the goals the husband and wife have for themselves, their family and the business. They are asked what does life look like for them in, say, five to 10 years. They are also asked whether or not they are happy with the balance between the farm, family and any other areas important to them. Apart from this short section, the WFA report deals primarily with farm financial, technical and management issues.

An expanded WFA would be of benefit to Irish farm families. Based on his experiences as a life coach and writer, Con Hurley suggests that farmers should integrate their farm financial and technical decisions into the wider framework of their personal life and financial plans and goals. Such an approach should also be explored and adopted by the Teagasc Farm Advisory Service, farm consultants and banks. This may need the training and employment of specialist life and farm business coaches. This would lead to decisions that are closely aligned with the farm family's medium and long-term life goals and motivate them to develop and stick with the farming system that will best satisfy these goals.

The strengths of the integrated approach to life, money and dairy farming are:

- It introduces the concept of life planning of which the farm is just one part, albeit an important one, of a whole life plan.

- ► All on-farm technical and financial decisions become aligned with the medium and long-term goals of the farm owners and their families.
- ► The integrated approach accommodates the varying needs of different farm families – needs that depend on stage of life, family situation and personal preferences and attitudes.
- ► It introduces the concept that financing a life, a family and their goals is akin to a business model with the fundamental principle that the farm must make a profit, which must be large enough to:
  - • Finance the day-to-day living costs of the farm family,
  - • Provide for the future needs of a growing family,
  - • Provide for the retirement needs of the farming couple,
  - • Enable an agreed succession plan to be worked out for a successful transfer of the farm business to the next generation,
  - • Cater for necessary farm reinvestment,
  - • Cater for desired farm growth to increase income and counteract inflation,
- ► The dairy farm is increasingly seen by the owners as a business to be run well, so as to provide the finance for all the above. Thus, a number of key business success indicators need to be developed and included for management decision making alongside other key financial and technical performance indicators.
- ► As well as being a business, the dairy farm provides:
  - • Employment for the owner(s) and sometimes their children,
  - • A career for the owner(s,)
  - • The family home,
  - • Potentially a successful business to pass on to the next generation,
- ► Integrating the farm with personal and financial goals provides a strong purpose and motivation to run the farm as a consistently profitable business and to avoid actions that would lower profitability or increase the risk of farm business failure and collapse. The fear of losing the farm is as strong a motivator for many people as is the challenge of building a successful farming business.

(Note: Con Hurley is currently writing a book/course – *The Business of Life, Money and Dairy Farming*).

The resilient dairy farm business

One of the ultimate goals for a farm family should be to build a resilient farm business. This is one that:

- ► Delivers sufficient profit to finance current family needs and to finance the future requirements of family members.
- ► Has sufficient profit to finance essential reinvestment in the business.
- ► Is able to meet bank repayments.
- ► Has a comfortable profit margin above these requirements that enables it to weather the ''unexpected' but inevitable shocks to the business. Shocks that can threaten the viability of the business in the absence of this ''comfort margin''. Such shocks include:
  - • A prolonged period of low milk prices,
  - • Severe weather events (usually rain in Ireland) that lower grass growth and utilisation, leading to increased feed costs,
  - • Increased interest rates – a problem where borrowings are high,
  - • Increased feed costs – a problem with heavy concentrate feeding,
  - • Illness of the main farmer – apart from the personal cost, the farm can be at risk if the system is too complex to be operated by someone else,
  - • Herd disease.

Production system

As outlined above, the GrassRich system is far more resilient than the GrassPoor system, mainly because it is more profitable. However, it is also a simpler system to operate and this is important if there are illness issues and when holidays are taken. There are fewer decisions to make in the GrassRich system.

Breakeven costs

Measuring production costs per litre and then calculating the profit margin per litre can give a false feeling of comfort. This is because production costs do not usually include personal drawings or tax payments. A farmer could be making a margin of 5c/l when milk price is 30c and costs are 25c. Spread this over a million litres, say, and that leaves €50,000 to meet living costs and pay tax. This may work for a married couple with no children but not for a couple with three children in third level.

Each farmer/farm family needs to develop a set of risk parameters customised to their own personal situation. At a very minimum, each farm business should have a ''breakeven cost per litre'', which includes a provision for personal drawings and tax. This is a useful approach. So, the breakeven costs for the two examples above are shown in Table 33:

This gives a clearer picture of actual income the farm needs to make and the effect of milk price fluctuation.

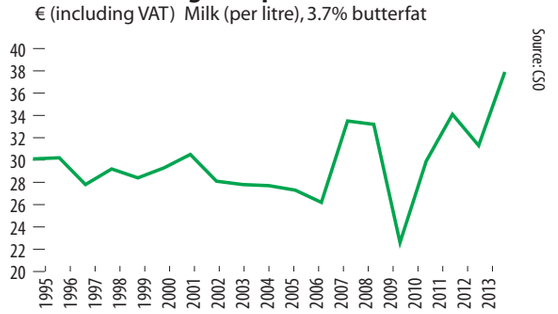
Table 33: Calculating different breakeven costs

	Single man, no family	Married couple, 3 children
	Cents per litre	Cents per litre
Milk production costs including all bank repayments	25	25
Drawings to cover living costs	2.5	5
Tax	0.5	1
Total costs = breakeven costs	28	31

We suggest that this should also be calculated per hectare, as land is the most limiting farm resource, whereas litres sold can vary. It should be done using whole farm costs and not ''common costs'', which are used to allocate fixed costs across different enterprises. Whole farm costs make far more sense on farms that are predominantly devoted to milk production, as will increasingly be the case when quotas go.

Manufacturing milk prices

€ (including VAT) Milk (per litre), 3.7% butterfat



Note: Prices from 2007 include bonuses

Milk price and money management

Milk price remains of critical importance in determining farm profit. The resilient farm will be able to remain in business during a prolonged period of low milk prices. The following figures show Irish milk prices over the past 19 years.

There have been years when there were serious drops in price and there have been some very good years, and these are the years when undisciplined spending that increases costs usually occurs because there is a surplus of money in the current account. There seems to be a direct correlation between high milk price and farm spending.

Farmers – and most people – find it difficult to resist the temptation to spend when their pockets are full!

It is highly likely that milk prices will fluctuate more widely over the next decade or so. Once milk quotas go, there will be a surge of milk production in Europe. In addition, the US is building processing capacity for dairy exports and expects to become the dominant supplier to the world market by 2025/2030. Predictions are that milk price will fluctuate from as low as 25c/l to as high as 40c/l. These are the variations that Irish dairy farmers will have to live with.

In the US, the latest Farm Bill has given farmers the tools to strongly reduce the impact of milk price volatility. This reduces the risk of low milk prices wiping out farm profits.

In Victoria, Australia, a scheme to help farmers deal with low incomes during drought years has been introduced. It is called the farm management deposits (FMDs) and it allows pre-tax income to be set aside in good years for use in low-income years. There are tax benefits if the FMD is kept for at least 12 months.

The cap on deposits is $400,000. The number of dairy farmers with FMDs has varied but they are widely used. In 2010, about 43% of dairy farmers had FMDs compared with 54% in 2008, when the total on deposit was $129m.

The Irish Farmers Association is proposing that the Government introduces an income-equalisation scheme that would allow farmers to place surplus income before tax in an account, which could be drawn down on (after paying tax) when milk price falls or there are unexpected cost increases.

Whether or not this happens, we suggest that every farmer sets up a system whereby surplus income is channelled into a separate account. This could even be arranged with the co-op, to partition the milk price into;

- The main farm account, where it is used to cover production costs and tax.
- The household account.
- Surplus account – to be used for a variety of choices such as capital debt pay down, pension contributions, education funds for children and other pre-determined uses.
- The surplus account should also be available as a contingency fund to meet unexpected costs associated with adverse weather or herd disease and also to meet bank repayments should interest costs rise.

The effect of this approach would be to channel surplus income into productive uses aligned with current and future family needs and away from wasteful, unnecessary spending on equipment, machinery and buildings.

Risk management profiling

Virtually every farm plan is based on the fundamental assumption that ''everything will go according to plan'.' This is probably the biggest risk of all and behind this assumption lies a series of supporting assumptions and their associated risk factors. It is important for the farmer to be aware of his/her assumptions and the risks these assumptions entail. The following methodology follows a sequence that is designed to personalise the risk management assessment process:

- Get the farmer to identify the assumptions he/she is making. This makes it personal.
- Identify the risk associated with each assumption.
- Outline the financial, technical, business and personal consequences of each risk.
- Decide on the actions that need to be taken to, if possible, eliminate the risk or to minimise its impact.

This approach to risk management customises it to each farmer's personal risk profile and encourages the farmer to take responsibility for risk management. It is also a very effective communication and

facilitation tool either on a one-to-one basis or with groups. Table 34 shows examples of risk profiling.

Governance

This is a new concept for dairy farmers. It is steadily gaining influence in New Zealand and is being promoted by DairyNZ. The concept can be of tremendous use to Irish dairy farmers.

Briefly, governance involves the farmer (husband and wife) setting up a sort-of board to help them set clear personal and business goals and to develop the farm plan to achieve these goals. Very importantly, this ''board'' meets regularly and ensures that all major decisions about the dairy farming system support the farm plan and the personal and farm goals. The 'board' will strongly challenge any decisions that are likely to increase production costs and reduce profits and so jeopardise overall personal and financial goals.

Hence, if the farmer decides to choose the grass-rich route to expansion, the governance board will ensure that there is no drift into the GrassPoor route.

CONCLUSIONS

- Decisions are guided by the overall intentions the farmer has for himself, his family and the farm business. But not necessarily in that order. In many cases these intentions are not consciously verbalised.
- Production is seen as a valid goal. The obvious way to increase production is to milk more cows by:
  - Increasing SR on existing land,
  - Adding more land, and cows,
  - Increase milk yield by increasing feeding levels to cows,
  - Breeding
- The simplest, easiest and most direct route to increasing production is to lift feed levels to cows through the use of concentrates.

Technically, this is far easier than using grazed grass to increase milk yield, which requires a seemingly more complex set of decisions about soil structure, soil fertility, grass growth measurement, grazing allocation, etc.

Table 34: Examples of personal risk profiling

Assumption	Risk	Consequence	Action
Financial			
I've secured a loan at 6% and that will not change.	Interest rates increase to 8% and on to 10%	Can't meet bank repayments	Fix interest rates
Milk is making 37c/l and I have a margin over costs of 12c.			
So, I'm okay even if milk price falls to 25c.	The reduced margin of 5c is insufficient to cover personal drawings and tax	Something has to give – no family holiday or less spending on farm inputs	Develop a cost-reduction programme to ensure that profit margins are sufficient to meet all costs at low milk prices
Technical			
The farm is growing 12 tonnes grass DM/ha and I've based my stocking rate on this assumption in the absence of actual measured growth figures	The reality is that current pastures are growing only 10 tonnes	Increased meal feeding and/or silage purchased to bridge the feed gap	Begin a pasture productivity improvement plan
Management skills			
I can manage the expansion project as well as my existing enterprise	I haven't the project management skills	Project underperforms	Employ a project manager
	I have the project management skills but I haven't enough time for both	Everything underperforms.	
Personal stress and ill health	Employ help on the existing farm		

Please note that the word 'farmer' is meant to include the main decision makers and, ideally, this should be the farming couple and where relevant, other family members and staff.

Recommendations

- Broaden research to improve our knowledge and understanding of farmer decision-making.
- Incorporate this knowledge into extension programmes.
- Develop a deeper and broader approach to whole farm planning – possibly based on an integrated life, money and farm plan.

SECTION TWO

4

Building an internationally-competitive industry

Cluster development

If Irish milk producers and processors are to compete successfully in a growing but more competitive world dairy market, they will have to focus strongly on the two key elements that define an internationally-competitive dairy industry.

► On-farm production systems that are solidly based on Ireland's natural comparative advantage, which is defined as the management ability of farmers to use the country's pastures to grow large tonnages of grass and convert them through the grazing animal at low cost into high quality milk.
► An industry structure that:
• Enables and enhances this comparative advantage, and
• Builds the various components of the industry structure into clusters that are mutually supportive and develop the dairy industry to the stage where it has a solid international competitive advantage.

Comparative advantage was the topic of section one of this report and we have seen how comparative advantage has been and is being damaged in countries and regions with similar advantages. We have identified those components of the industry which undermined their comparative advantages as:
• A shift in research focus from grass productivity to production per cow in New Zealand,
• Milk pricing policy and a shift to inappropriate genetics in Northern Ireland,
• A move to high-concentrate feeding and American Holstein genetics in Victoria – combined with lack of leadership from research.

These experiences indicate how fragile comparative advantage can be in the absence of some form of industry coordination that ensures protected growth orientation and also that the various components of the industry develop their own strengths.

This combination – a flourishing milk production sector, a vibrant processing/marketing sector and support and responsibility of other components of the industry – needs to be brought together to develop a truly internationally competitive Irish dairy industry. One means of addressing this co-ordination imperative is through clusters.

Clusters

The cluster approach is not simply about strengthening or developing individual companies or organisations within a particular industry – it is about building and binding that industry as a whole so that it is stronger, fitter and ready to take advantage of what the future brings. By developing an agreed strategy for development, the whole sector will be better placed to identify and take advantage of the opportunities that co-operation can bring. In his 1998 book, *On Competition*, Michael E. Porter states that:

"Clusters are geographic concentrations of interconnected companies, specialised suppliers, service

providers, firms in related industries, and associated institutions in particular fields that compete but also co-operate."

Clustering provides firms with access to more suppliers and specialised support services, experienced and skilled labour pools and the inevitable knowledge leakage that occurs where people meet and talk about business.

Common needs and interests, interdependent and overlapping, talent and creativity, and innovation are the necessary ingredients for developing a cluster. A variety of cluster models have been adopted by various countries, according to their requirements.

In Canada, the National Research Council (NRC) has focused on building science and technology based innovation in areas of local and regional strength to foster economic growth and improve quality of life. Cluster formation has a significant impact on forestry, tourism, health, materials and metals industry and arts and culture activities in Canada.

Cluster development is also revolutionising business, prompting economic development and increasing productivity across the globe. Cluster models have been implemented successfully in USA, Brazil, Italy, Japan, France and Finland.

''Cluster'' is a broad concept rather than a precise term. A cluster consists of firms and related economic actors and institutions that draw productive advantage from their mutual proximity and connections. Over the last two to three decades, clusters approach has drawn substantial interest from policy makers, legislatures, business leaders, academics, economic development practitioners and development agencies.

Clusters have been shown to increase the productivity with which companies can compete, nationally and globally. Importantly, clusters can build on and protect the comparative advantage on which the industry is built. In Ireland's case this is our ability to efficiently turn grass into milk and then into dairy products.

Clusters are based on strengths that give rise to high-value products and services. In the past, the term "rural" was synonymous with agricultural clusters. Now, emerging rural clusters include tourism, information and communication technology, manufacturing, and renewable energy production. In rural areas, the economy based on cluster structures is becoming a meaningful development trend. Clusters are effectively working in the agriculture sectors of Poland, USA, the Netherlands, Sweden and Argentina.

Examples of industry clusters and international competitiveness

- Silicon Valley is home to many of the world's largest technology corporations, as well as thousands of small startup companies. The term originally referred to the region's large number of silicon chip innovators and manufacturers, but eventually came to refer to all high-tech businesses in the area, and is now generally used as a metonym for the American high-technology economic sector. Silicon Valley is a leading hub for high-tech innovation and development, accounting for one-third of all of the venture capital investment in the United States.
- Hollywood is a classic example of how numbers of different, competing companies have come together to make Hollywood the most competitive film-making industry in the world.
- The Dutch Flower Cluster is a leading, flourishing cluster that has created competitive advantage in the growth, production and marketing of flowers throughout the Europe. The Netherlands continues to produce flowers, as well as import them for re-export. The comparative advantage lies in the development of new varieties, and the competitive advantage lies in marketing the product outside the country.
- The Swedish Forestry Industry Cluster is one of the strongest clusters. Swedish forestry exports, at over US$10.1bn, were enough to cover all of the country's oil imports, food, clothing and cars. Twenty-three per cent of the Swedish manufacturing sector's turnover and 27% of its added value are created in the country's forestry industry cluster. Twenty-six per cent of Sweden's industrial workers are employed by the forestry industry cluster and, with the companies themselves; they pay US$2.9bn in taxes. Thirty-three percent of Swedish industrial investments are made within the cluster - the forest industry alone invests US$1.1bn per year in Sweden.
- The Argentinean Oil Seed Cluster generates 25% of Argentina's exports and has experienced extremely rapid growth. An important processing industry has grown from converting agricultural inputs such as soybeans and sunflower seeds into oils and oil by-products. A domestic industry has also been established which produces 90% of the machinery required by the processing plants. The international competitiveness of Argentina's oil seed cluster demonstrates success in penetrating the most demanding markets.

IRELAND'S DAIRY CLUSTER

The following is a representation of how the components of a competitive Irish dairy industry would look using the cluster approach with the links from Land through to consumers as follows:

Land >> Farmers >> Milk processors >> Marketing >> Consumers

COMPETITIVE INDUSTRY

The logic behind Ireland's dairy cluster approach is that, while Ireland's comparative advantage lies in the land, it is the effective exploitation of this national resource that requires co-ordination of the components involved in order to build the dairy industry into an increasingly internationally competitive one.

As well as the benefits to the primary producers, this approach benefits the various companies and institutions because they become more and more efficient as part of the developing competitiveness of the industry. In time, it is not just the primary producers that become internationally competitive but also the other businesses and institutions in the clusters, thus opening up further opportunities in international markets. The question and challenge that arises is how all these people and institutions might combine in order to:

- Exploit, enhance and protect the dairy industry's comparative advantage,
- Build an internationally competitive dairy industry, while
- Still allowing them to compete between each other nationally and internationally

This report proposes that the answer may well lie with clusters.

Recommendations

It is beyond the competence and resources of this report to elaborate any further on competitiveness and clusters.

However, we strongly recommend that industry leaders come together to:

- Set up a dairy industry collaboration group focusing on strategic planning, which is representative of the complete Irish dairy industry. The aim of the group is to provide the leadership needed to bring the key industry stakeholders together to protect and enhance Ireland's comparative advantage. Such a cluster organisation would form the framework of an internationally competitive dairy industry.

Stakeholders in this collaboration group could include, in addition to relevant members of the Trust, Government, milk processors and exporters, banks, An Bord Bia, the Irish Dairy Board, universities and other relevant people and institutions on whom the prosperity of the dairy cluster depends.

- Commission studies into how best to implement cluster theory in the Irish dairy industry. Cluster organisations set about establishing goals on a bottom-up basis, i.e. not from a governmental or top-down perspective. They identify the barriers to competition and actively focus on addressing them as well as on ways to upgrade local key business resources.

Grass produced and utilised on land devoted to dairy cows

650,000ha (2014)

700,000ha (2020)

1,000,000ha (20**??**)

Service suppliers
- AI
- Farm relief
- Farm accounts•
- Financial and technical measurement

Input suppliers
- Feed
- Fertilizer
- Veterinary
- Semen
- Equipment
- Machinery
- Buildings

Policy and regulation
- Milk processors
- Government
- Dept of Agriculture
- County councils

Milk producers
- 9,000 expanding
- 9,000 static
- 1,000 + new entrants & conversions

Milk purchasers
- Co-ops
- PLCs

General public
- Perception
- PR

Leadership
- Institutional
- Media
- Private (POK)

Education and training
- Extension
- Teagasc
- Consultants
- Co-ops
- Academic
- Third level
- Agri colleges
- Leaving cert
- Discussion groups

Representative bodies
- IFA
- ICMSA
- Dairy Ireland

Research
- Moorepark (Teagasc)
- UCD
- UCC, etc

Communication
- IFJ
- Newspapers
- *Farmers Monthly*
- TV
- Radio
- Internet/digital
- Conferences – PFC, IGA, Teagasc, Dairy Ireland
- Other publications

Financial
- Banks
- Consultants
- Other

NOTES