

# Profitable milk production systems

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## Summary

- The Irish dairy sector has just gone through a very successful period of expansion, with increasing milk output (68%) and family farm income (85%) from the pre-expansion period (2007–2009) to 2020
- The resilience of Irish dairy farms is underpinned by maintaining a low cost of production and minimal increase in debt
- Substantial additional gains in both farm profitability and environmental efficiency can be achieved using fertile and efficient cows fed on highly productive perennial ryegrass and white clover pastures
- There is a significant risk that Irish dairy farms will drift away from efficient grass based systems towards higher input systems that will undermine our economic and environmental sustainability, and potentially undermine the licence to farm
- Any further increases in dairy farm output cannot result in increased nitrogen and phosphorous loss, or GHG and NH<sub>3</sub> emissions
- Ireland is uniquely positioned to exploit the growing demand for grass fed dairy products provided we continue to focus on our key competitive advantage of efficiently converting grazed grass into high quality milk products while at the same time continuing to focus on overall farm sustainability.

## Introduction

The Irish dairy sector has gone through a transformational change over the past 12 years with a 68% increase in milk output and 43% increase in cow numbers in the period 2007–2009–2020 (CSO, 2021). The performance has been unparalleled, both in terms of other indigenous sectors of the Irish economy or other international dairy industries. At the core of this success story are 18,000 family-owned dairy farms, producing 8.3 billion litres of milk in 2020 and supporting over 60,000 jobs across the rural economy.

The unique nutritional quality and character of pasture-fed dairy products has been a cornerstone of the growing demand for Irish dairy products in 140 premium markets worldwide. The value of Irish dairy exports was €5.17 billion in 2020, and accounted for 40% of total food and drink exports while the corresponding values for 2010 were €2.29 billion and 29% (CSO, 2021).

During the expansion period, since 2015, dairy farm debt has not increased dramatically and has actually reduced per unit of output while farm profitability has increased by 85% (comparing 2007–09 with 2020). The average farm debt before expansion (2008–2010) was €59,622 and increased by just 21% to €71,985 in 2020. It is clear that the vast majority of the investment required for expansion has come from surplus cash generated during the expansion period. Debt has reduced from €3.08 to €1.93 per kg milk solids sold, a 37% reduction over the same period (Figure 1).



**Figure 1.** Farm debt and debt per kg milk solids sold. **Source:** Teagasc National Farm Survey and CSO

### Teagasc Roadmap for a profitable and sustainable dairy industry

There are many challenges facing the Irish dairy industry not least the environmental issues outlined in paper “Delivering on Sustainability” (page 16) in this book. Over the last decade, Irish dairy farmers have demonstrated their ability to exploit opportunities and overcome obstacles. Dairy farming is the only major agricultural enterprise that has consistently delivered viable incomes to the majority of producers over the last decade. As environmental constraints begin to restrict production globally over the next decade, the economic outlook is quite positive for Irish dairy producers that focus on sustainable pasture based systems. The Teagasc Roadmap has set a target of achieving €2,450 net profit per hectare of owned land including full labour costs (€15/hr) at a base milk price of 29 c/l plus vat. This future sustainable farm system is based on maximising the performance from the existing platform, while at the same time ensuring that the number of unproductive livestock on the farm is minimized. Achieving a net profit of €2,450/ha necessitates attention to detail across all of the components of the farm business. The rewards are huge and place the business in a very positive position to cope with milk price volatility and to realise returns from the business comparable with some of the best possible investments (on or off farm). Whether you are achieving the future target, are close to the future target or are a long way from the target, the direction of travel should be the same for the business. The physical performance required to achieve the target system include >13.0 t DM/ha of grass utilised, milk solids output of 1,344 kg/ha and feeding <500 kg concentrate per cow. In order to achieve these targets, excellent herd fertility performance is required, with a low replacement rate ( $\leq 18\%$ ), high six week calving rate ( $\geq 90\%$ ), and a herd mean calving date of mid-February. High levels of labour efficiency are essential, where the focus is on cows and grass, thus facilitating these achievements with total labour input of <16 hours per cow per year. Within the target system, there is an increase in stocking rate based on increased grass growth, but there is also a change in enterprise as all replacement stock are moved off the milking platform to a contract rearing enterprise. All of this is achieved with less nitrogen coming onto the farm in the form of chemical nitrogen fertiliser and concentrate, and increased levels of nitrogen leaving the farm in milk sold and calves and cull cows, resulting in lower levels of surplus nitrogen overall and increased nitrogen use efficiency.

**Table 1. Teagasc roadmap for the sustainable intensification of the Irish dairy industry**

	Current*	Sustainable performance target
Milk delivered (kg/cow)	5,484	5,800
Milk solids (kg fat plus protein)	417	480
Protein (%)	3.47	3.70
Fat (%)	4.11	4.60
SCC (cells/ml)	170	<150
Herd EBI (€)	90	150
Six-week calving rate (%)	62	90
Labour input (hours/cow/year)	40	<16
Stocking rate (LU/ha)	2.1	2.7
Herbage utilised (tonnes DM/ha)	7.8	12.9
Concentrate per cow (kg)	1,176	<500
Fertiliser N usage (kg/ha)	184	150
Nitrogen use efficiency (%)	28	49
Net margin at 29 c/l base price (€/kg MS)	0.58	1.84
Net margin at 29 c/l base price (€/ha)	519	2,452

\*Average of 2017, 2018 and 2019 (from NFS and ICBF)

### Stocking rate

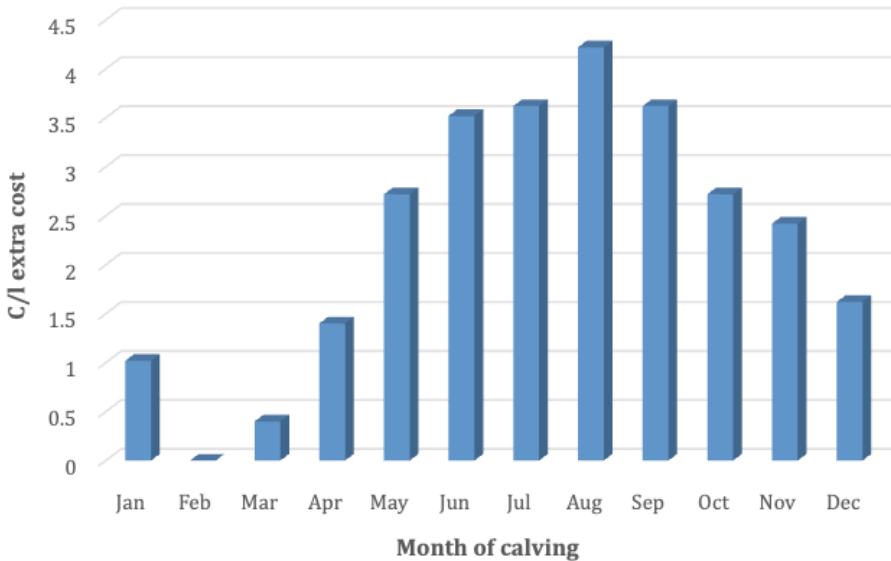
Identifying the appropriate stocking rate is a key strategic decision for pasture-based dairy farms. Previous studies have indicated that increased stocking rate was associated with increased chemical nitrogen fertiliser use and supplementary feed importation, greater nutrient surpluses and reduced nutrient use efficiency, resulting in increased nutrient losses to water and to the general environment. Currently, the average Irish dairy farm has a stocking rate of 2.1 livestock units (LU)/ha. Any increase in farm stocking rate needs to occur without greater use of chemical nitrogen fertiliser, and without an increase in concentrate supplementation per cow. Based on improved grazing management, sward composition and soil fertility, increasing overall farm stocking rate will result in increased pasture utilisation and improved farm profitability and nutrient use efficiency in the future. Increasing pasture growth while simultaneously maintaining/reducing chemical nitrogen fertiliser input can only be achieved by incorporating nitrogen-fixing legumes, such as white clover, into perennial ryegrass swards. White clover is the only plant species that has consistently been shown in research to be of additional value in intensively grazed perennial ryegrass pastures.

As a component of the sustainable intensification of dairy production, improved management practices are required to maintain low levels of nutrient loss within more intensive pasture-based systems. These include greater use and more strategic use of organic manures to replace chemical nitrogen fertiliser, more strategic use of chemical nitrogen fertiliser, reduced cultivation for reseeding, improved nutrient budgeting, and the preferential management of higher risk farm areas. As described in this paper the target system will operate at 2.7 LU/ha. This will result in significant increases in profitability at farm level and should be the focus for farmers considering further expansion. Nationally, grass utilisation is just over 8 t DM/ha, but there is potential for this to be increased to 13 t DM/ha, highlighting that further expansion is realistic and achievable. The focus for farmers operating at average level of grass utilisation should be on improving efficiency of grass growth and utilisation. For farms that are currently operating at high levels of grass utilisation and efficiency, however, this is no longer possible and their strategies should be different. Expansion beyond the farms carrying capacity by including >10% of the diet originating from bought in feed has been consistently shown to reduce profitability. It might look marginally profitable, when owned labour is not included in the calculations, but

when full costs are included, expansion based on additional imported feed is generally not profitable, increases risk and environmental footprint, and ultimately results in the dairy farmer working a lot harder for little gain. Internationally, many industries have fallen into the trap of importing additional feed into pasture-based systems to produce marginal extra milk and the Irish dairy industry must be careful to ensure that it does not follow suit. Ensuring capital costs are minimised and that the metrics affecting profitability rather than production are the focal points will ensure that the Irish dairy industry does not follow many industries worldwide.

**Seasonality**

Calving cows compactly at the start of the grass-growing season creates some significant challenges for the Irish dairy industry around labour demand and availability of adequate milk processing capacity during peak supply months that is under-utilised for the remainder of the year. However, the advantages of compact seasonal calving far outweighs the disadvantages. Seasonal compact calving facilitates the synchrony of herd demand with grass growth, which reduces cost of production (Figure 2) due to lower feed and fixed costs. It also underpins the marketing strategy of Irish grass-fed dairy production, which, by its nature, has a lower environmental footprint as less nutrients are brought onto the farm in the form of purchased feed.



**Figure 2.** The effect of month of calving on extra cost of production (c/l) relative to February calving

**System drift**

During periods of moderate to high milk prices there is always a temptation to chase marginal milk by feeding higher levels of bought in feed to increase milk output. However, when the full costs associated with this extra milk are included, the extra output reduces the overall resilience of the farm to external shocks and reduces the environmental sustainability of our grass-fed dairy system. The sustainability of the Irish dairy industry will be grossly undermined by importing feeds that are produced unsustainably. There are numerous international examples of pasture-based dairy industries that have increased output using bought-in feed, which resulted in a significant decline in competitiveness and an increase in environmental footprint. Research shows that the carbon footprint of milk production is reduced by maximising the use of grazed pasture at an appropriate overall stocking rate.

## Future direction

After the initial period of growth post-quota following 31 years of stagnation, where should the industry go from here? When asking this question, one must be cognisant of the potential for further growth, environmental policy constraints, international demand for Irish grass-fed dairy products and the economic considerations around enterprise shift into dairying. Nevertheless, and most importantly, we must be cognisant of the farmer's ambition for growth, the sustainability of the system, the risks associated with further growth and the physical potential for growth.

Consumer interest in the food they consume, including milk and milk products, is ever increasing. This has led to the development of milk brands that require farmers to mainly feed their cows grass and these dairy products are in high demand in many countries, and are sold at a market premium price. The sustained market interest in grass-based dairy products means that more and more consumers want to know the typical quantities of grazed pasture and forage in a dairy cow's diet. Ireland has developed a methodology to quantify the proportion of grass in the diet, which is being implemented within the Sustainable Dairy Assurance Scheme (SDAS) system. There is scope to build on this development and further develop brands and credentials to satisfy the growing market demand through producing dairy products from grass in a sustainable and efficient manner. Ireland can grow this potential further, ultimately adding value to dairy products, increasing the returns to the primary producers and satisfying the demand of consumers by producing grass-fed high value product. Ireland is uniquely positioned to capitalise on the grass-fed narrative by continuing to focus on grass-based systems.

## Priorities for capital investment in 2021

This year looks like it will be a relatively profitable year for Irish dairy farmers and the priority should be to invest surplus cash in areas of the farm business that are likely to increase the resilience of the business in the future. Priority areas include:

- *Soil fertility*: ensuring adequate soil fertility will optimise grass growth and improve nitrogen utilisation. It is likely that Irish dairy farms will have to achieve higher nitrogen use efficiency in the future and this may coincide with a lower milk price. Investing now in achieving optimum soil pH and P and K status will improve the resilience of the farm to future milk price down turns and to future limits on nitrogen fertiliser use
- *Slurry storage*: investing in extra slurry storage will allow slurry to be stored and spread at a time when the response to slurry nitrogen is optimum, i.e. in spring. When slurry is applied during the winter months very little of the nitrogen is recovered by the sward, however, when slurry is applied in spring using low emission slurry spreading (LESS) equipment about 40% of the nitrogen is taken up by the sward equivalent to 2.4 kg/m<sup>3</sup> or 11 kg N/1,000 gallons
- *Reseeding and white clover*: incorporating white clover into perennial ryegrass pastures has been comprehensively shown to increase milk production, reduce fertiliser nitrogen requirement and improved profitability of grazing systems. Converting old swards to new perennial ryegrass-white clover pastures will build resilience of the farm business to future milk price shocks or nitrogen restrictions while also increasing farm profitability
- *Calf housing*: increasing cow numbers over the last 10 years combined with improved fertility resulting in more compact calving has put more pressure on calf housing in spring. Many farms depend on the sale of 2–3 week old calves to provide adequate space for the remaining calves. This may not always be possible due to reduced demand for young calves from beef farms or from reduced or delayed live exports. By providing extra space to facilitate holding calves on the farm through the spring peak of supply will reduce stress on the farm facilities and labour during the busiest time of the year.

## Conclusion

The outlook for a profitable Irish dairy industry is still very positive if we do not drift away from efficient pasture-based systems that use high genetic merit cows to convert grazed grass to high quality milk. The key focus should remain on improving pasture growth and utilisation and matching stocking rate to the amount of grass grown. Investing in technologies that reduce environmental footprint such as incorporating white clover in grass swards, slurry storage, soil fertility, etc. will result in profitable and sustainable dairy farms.

