Tillman, R.W., 2017. The Success Story of Dairying and the Environment in 2042 – How it was Achieved. In: *Science and policy: nutrient management challenges for the next generation*. (Eds L. D. Currie and M. J. Hedley). http://flrc.massey.ac.nz/publications.html. Occasional Report No. 30. Fertilizer and Lime Research Centre, Massey University, Palmerston North, New Zealand. 6 pages.

THE SUCCESS STORY OF DAIRYING AND THE ENVIRONMENT IN 2042 – HOW IT WAS ACHIEVED

Russ W Tillman

Fertilizer and Lime Research Centre, Massey University
Private Bag 11 222, Palmerston North 4442, New Zealand
Email: R.Tillman@massey.ac.nz

Introduction

It is the year 2042. Dairying is still a major export earner and dairy farms are profitable businesses. But water quality in New Zealand is better than it was 25 years ago, and it continues to improve slowly year by year. In this paper, I look back over the last 25 years and describe the changes that have occurred under the following three headings:

- Financial incentives
- Environmental regulation
- On-farm practices

Industry structure and financial incentives

In 2042, dairy farmers receive strong financial incentives to minimize their impact on water quality. These incentives are not "artificial subsidies" paid by the government. They reflect actual financial premiums in the market place.

Twenty-five years ago, it would have seemed surprising that minimizing impacts on water quality could generate market premiums. In fact, even in 2042 this is possible only because minimizing impacts on water quality are just part of a much larger New Zealand "quality brand". This "quality brand" emerged out of what was previously known as New Zealand's "clean green image", but it is now much more rigorously defined, regulated and promoted.

This "quality brand" has greatly helped the marketing of New Zealand's goods and services overseas. Indeed, in the case of agriculture it has been essential. In 2042 an increasing proportion of the global demand for protein is manufactured using new industrial biotechnologies that do not require animals. Traditional animal-based farming systems cannot compete on price with the food produced by these industrial processes, and so they must compete on quality. And this quality includes all aspects of the production system.

Within this overall "quality brand" individual industries have developed protocols and codes of practice that best suit their markets. In the case of dairying the most important selling point in some markets is that our animals are mainly grass fed in the paddock. In other markets our extremely high standards of animal welfare are the selling point – or our low GHG footprint. It is the multi-faceted nature of this brand that allows water quality to be "bundled up" with other aspects of the farming system that are important to consumers, and create a competitive advantage that enables farmers to be rewarded for environmental performance.

The financial benefits flowing from these environmental brands have changed the mindset of many industries, including farming. Because processing companies now financially reward farmers who enhance the environmental brand, farmers now regard expenditure on environmental performance as "investment in a brand" rather than a "compliance cost". The whole concept of having to make a "trade-off" between financial and environmental performance has become less relevant.

Of course, such a comprehensive and valuable brand such did not emerge "fully formed" overnight. It started in a very small way in 2018 to gain some marketing advantage from the imposition of a carbon tax on dairy farmers – a tax that is still in place today.

The principles underpinning the tax were very simple. Dairy farmers paid a "carbon tax" to the government. The amount of tax owing depended on the quantity of GHG emitted from the farming operation, and a "carbon price" determined by the government. The government then paid ALL the tax collected back to the farmers as a tax refund. But the money was paid back as an amount per kg MS.

Thus, the scheme rewarded farmers who produced milk with a low carbon footprint, at the expense of those farmers whose milk had a larger carbon footprint. In other words, it set up a "competition" between farmers. It is this type of "competition" between farmers that drives environmental improvements in 2042.

When it was first introduced, the financial implications of the carbon tax were not large because the carbon price set by the government was deliberately low. On an average sized farm in 2018, producers with the lowest GHG footprints were likely to receive a net tax refund of about $10,000 and those with the highest GHG footprints were likely to have a net tax liability of about $30,000. This difference in tax liability did not threaten the financial viability of farms, but it was large enough to encourage farmers to reduce emissions of GHG where this could be done easily and at little cost.

The success of this carbon tax in enhancing New Zealand's environmental reputation prompted the government to work with industry to develop and promote a much wider "Environmental Brand". But, for the brand to have credibility and value in the market place it had to be backed up by real action. New Zealand had to be "world leading". The lip service paid to the former "clean, green image" just wouldn't cut it. In the dairy industry in 2042 the brand is supported in two main ways. The first is the carbon tax framework described above. The second is a star rating system for dairy farms that affects the level of payout for individual farmers.

The rating system consists of five stars, each relating to a separate component of the dairy farming operation. The five components are:

1. GHG footprint (measured per kg MS)
2. Nitrate leaching footprint (measured per kg MS)
3. Environmental infrastructure and management
4. Animal welfare.
5. Milk safety and quality.

For each component, a farm may be awarded a full star, a half star, or no star. Therefore, some farms could (and do) have 5 stars and, in theory, some farms could have zero stars. In reality, any dairy farm with less than 2 stars will probably not be able to supply milk to any of the major processors.

Farms with 5 stars receive a higher payout/kg MS than farms with a lower number of stars. Currently in 2042, a difference in rating of half a star (e.g. from 5 stars down to 4.5 stars) results in a difference in payout price of approximately 45 cents/kg MS.

In a similar way to the carbon tax, in each star category farmers "compete" with each other for the highest star ratings. In this way, the bar is always being lifted. For the stars relating to the GHG and nitrate leaching footprints, the top 40% of farmers receive a full star, the second 40% of farmers receive half a star and the bottom 20% receive no star. The nitrate leaching footprint is calculated on the quantity of nitrate reaching a receiving water – rather than leaching from the root zone. In this way differences in "attenuation factors" between farms are taken into account.

Changes in Legislation and Regulation

The strong financial incentives associated with the carbon tax and the star rating system have greatly reduced the need to regulate dairy farms to ensure good environmental performance. This has been a good thing because prior to the introduction of these schemes in 2018 the environmental regulation of farming was becoming increasingly contested.

This was well illustrated by the approach taken by many regional councils, and the Environment Court, to nitrate leaching from farms. In addressing this issue there was a strong preference for "hard" quantitative limits on nitrate leaching from farms.

The problem with this approach is that any imposed "limit" tends to become a "target". We see the same thing with speed limits on our roads. Thus, a common reaction on farms that were originally leaching less nitrate than the limit imposed by the regional councils was to regard this as an "opportunity" to "speed up" - to intensify production until the limit (or target) was reached. And there was no incentive for farmers already complying with the limit to "slow down" by further reducing their nitrate leaching.

Another example of "limits" becoming "targets" was provided by a spokesman for the dairy industry who commented in 2014 that the "bottom line" water quality limits published by the government indicated that there were "some no-go areas, some slow-go areas but that in other areas, there was a lot of headroom left." In other words, there were catchments where dairying could expand considerably before the "bottom lines" were reached. Once again limits had become targets.

This would have been OK if the limits on nitrate leaching, or the "bottom lines" for water quality, did in fact represent a satisfactory environmental outcome. But this was usually not the case. The setting of environmental "bottom lines" or "nitrate leaching limits" inevitably became a political exercise in which what was desirable environmentally was "traded off" against what was perceived to be financially feasible. As a result, farmers were being granted consents for 20 to 25 years to farm within environmental limits that, in reality, were only "second best" at the time the consent was granted, and that became almost irrelevant as technology improved.

To be fair to regional councils, they were under enormous pressure from environmental advocates to be seen to be doing something about dairying. Justifiably frustrated by the lack of any real progress in halting the decline in water quality, some environmental advocates became increasingly strident about the need for dairying to change its ways. In an extreme example, a well-known columnist stated in 2016 that it may be necessary to reduce cow numbers by up to 80%.

With hindsight, these calls by the environmental advocates were a tactical error. They reinforced a perception that increasing the intensity and/or extent of dairying inevitably resulted in a decline in water quality. And in opposing this they opened themselves up to criticism for putting the economic future of the country and individual farmers at risk. In this sort of climate, it was difficult to have a constructive debate.

Today in 2042, environmental advocates accept that a profitable dairying sector benefits the country as a whole. And there is not a dairy farmer in the country who thinks that poor water quality is a good thing in itself. There is therefore, no "structural" conflict of interest, and the various financial incentives have broken the old "zero sum game" between profitability and environmental impacts.

As the positive impacts of the carbon tax and the star rating system became apparent, both central and local government realized that the limits-based approach was hurting rather than helping environmental outcomes. Eventually central government abandoned the idea of applying arbitrary minimum standards on water quality and instead required Regional Councils to always strive to return water quality "*as close as practicably possible to the original pristine state*". And regional councils accepted that environmental performance was most usefully measured by emissions per kg MS (rather than per hectare) and that the standards should be set by what the best farmers were doing, rather than by regulation.

Understandably, regional councils were initially very reluctant to move away from regulating nutrient losses on a per hectare basis. They were concerned they would lose what little control they had over the discharge of nutrients into waterways. In the event, these concerns proved groundless. Farmers found it very difficult to markedly increase production without, at the same time, increasing both the production costs and the nitrate leaching footprint. And the increase in nitrate leaching footprint then resulted in a reduction in payout price.

This financial pressure has meant that nitrate leaching from dairy farms in 2042 is now less than half of what it was in 2017. This is much better environmental outcome than could have been achieved by trying to enforce regulatory nitrate leaching limits.

Dairy Farming in 2042

Looking back over the last 70 years, the fundamentals of dairying in New Zealand have not changed greatly. The main difference today is the increased use of new technologies to enhance the "quality brand".

The financial incentives have resulted in farmers reducing costs to a minimum and focusing on environmental efficiency. The emphasis is on PROFIT not PRODUCTION. And this has been encouraged by changes in the tax system and overseas investment rules that mean the financial returns from dairying now largely come from the farming operation itself, rather than capital gains, as was the case in the 30 years prior to 2014.

To maintain a competitive edge in the marketplace requires constant improvement. The industry has adopted the adage associated with the All Blacks and other top sporting teams that "if we are standing still, we are going backwards". There is thus a whole-of-industry focus on constant innovation. A key part of this is the ongoing upskilling of all farmers and their advisors. There is a major focus throughout the whole industry on the pathways from research, through development and extension to implementation on the farm and delivery to the marketplace.

In 2042 most dairy farms operate a "hybrid" grazed pasture system. More than 80% of the cows' nutrition is from pasture grazed in the paddock, with the remainder provided by supplementary feed that is eaten in a covered yard. The ratio of time in the paddock to time in the covered yard varies between seasons and between different regions in the country, in order to minimize nitrate leaching, protect pastures from damage and ensure the highest standards of animal welfare..

Self-moving fencing systems that are controlled remotely while the cows are grazing have enabled optimum levels of pasture utilization without compromising per cow performance.

Supplementary feeds are chosen to reduce the GHG footprint and improve the farm's star rating. For this reason very few supplementary feeds are imported from overseas in 2042.

The design of the covered yards ensures the highest standards of animal welfare. The covered yards, milking sheds and manure storage areas are designed so that some of the methane emitted is collected and metabolized.

On most farms cows are milked by robotic milking machines. Cow health and production is intensively monitored. As an example, sensors at the entry to the milking shed detect any change in gait or unusual distribution of weight that might signal the onset of lameness.

The pastures on dairy farms have changed greatly from 2017. Precision seed drilling and fertilizer application together with the ability to hold cows off the pasture during wet periods and carefully control the intensity of grazing, has enabled new species to be used on dairy farms. There is now a wide range forages that reduce the emissions of methane and the excretion of nitrogen, and at the same time persist and produce well in New Zealand dairy farming conditiuons. There have also been concerted efforts to breed more efficient dairy cows that emit less methane, and excrete less nitrogen per kg MS produced.

The national average annual per-cow production and the average time in the herd have both increased significantly over the last 25 years. These increases are the result mainly of improved performance by formerly poorer performing farmers. The financial incentives for environmentally efficient production have greatly compressed the traditional "normal distribution" in farmer performance.

Each of these developments individually has only improved environmental performance by a few percent, but in aggregate they have resulted in a big difference.

Summary – How it was Achieved

- Astute environmental branding has generated financial premiums that can be passed on to farmers who enhance the environmental brand.
- As a result, there is now less need to "trade off" environmental performance and profit.
- There has been no "silver bullet". Improved environmental performance has resulted from continuous small improvements.
- Competition between farmers has proved to be the best way to achieve these ongoing small improvements.
- Environmental regulation has been greatly simplified.
- Over the last 25 years central and local government have moved to "set directions, not targets". Ongoing improvement has been the key.
- It is to the credit of the government and particularly industry leaders that they haven't let "perfect be the enemy of good". (As an example, there were teething problems with both the carbon tax and star rating system when they were being developed and then introduced. But these were not used as excuses not to proceed.)