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Rolling out the national water quality improvement programme for dairying

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Abstract

This paper reviews the Horizons One Plan story and assesses the implications for other regions, the dairy industry and the New Zealand economy. The One Plan that was approved by the Environment Court used Overseer 6.1 for implementation, but the policy was developed using 5.4. This even put organic farmers' viability at risk in high rainfall and/or free draining soil areas. Also, the viability of rural townships and businesses were under threat. Through a collaborative process the economic implications of this environmental policy were teased out at farm, district and regional levels, which helped produce a win for the environment and continued viability for dairy farmers and local communities. The approach used is being rolled out in other regions. The paper looks at the expected policy changes to highlight the national benefits to the environment and the dairy industry over the next 20 years.

Key words: N leaching, economic viability, dairy sustainability

Winning the war

The battle for the hearts and minds of city dwelling New Zealanders over water quality continues unabated. The two sides in the battle are forced into adversarial positions by the process leading to the Environment Court dictated by the Resource Management Act. The socialist left and green lobby continue to thrash themselves into a lather over "toxic ditches" (Trotter 2014) with farming representatives replying with facts and figures (Hurst 2014). Even economic commentators who should know better (Morgan, Guthrie and Simmons 2014) fail to research their subject before leaping into print about so-called "the plan to hand our children a fetid environment". In taking to task Conor English, retiring chief executive of Federated Farmers, Morgan *et al* acknowledge the example of the Horizons One Plan "…which aimed to help the people of Horowhenua and Manawatu limit the impact of farming on their waterways. Thankfully he lost that battle and the plan is in place." Unfortunately Morgan *et al* appear know very little about the process that led to putting the One Plan in place.

As we will see later in the paper the One Plan is an outstanding example of how not to formulate policy on water quality, however changes in Horizons personnel and a collaborative approach towards the end of the process have led to a win-win outcome for the region's water quality and the local economy.

Dairy farmers rely on a public licence to farm, which is largely obtained as a function of perceptions. A favourable public perception of dairy farming is closely related to dairy's performance on three key issues: stewardship of the environment; acceptable animal welfare; and lower greenhouse gas emissions. In addition, dairy's contribution to exports has a favourable public perception while high dairy farm incomes have a negative connotation if performance is poor on the above three issues.

The dairy industry through its R&D programmes are impacting on these three factors and this will improve the public perception of dairying, allowing dairy to grow faster than without R&D. In

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addition to a slowing in the industry's growth rate without R&D there are likely to be increases in the cost of complying with new environmental regulations. The industry will have to fight for dairy farming to continue to be a permitted activity, but in general it is expected that there will be increased use of consents to ensure environmental compliance in the following areas: nutrient and effluent management, fencing of streams, water takes and variations on consents to change performance levels. The dairy industry's environmental R&D activities are focused on influencing environmental policy at the national and regional level through advocacy, provision of scientific information such as on benchmarking, advice on limits and good management practice, and leading the development of a sustainable holistic policy framework (ref). In addition, the consulting officers' network is being used to inform farmers about their obligations and provide mitigation options to improve environmental performance particularly around nutrient and effluent management.

Increasingly the information required to meet environmental performance standards is becoming available on-line. The usefulness of this as a medium will accelerate as rural broadband penetration increases.

Work with national and regional authorities on environmental sustainability is approaching a watershed stage. Through the work of the core group of agricultural partners (DairyNZ, Fonterra, Federated Farmers) with the Land and Water Forum and directly with regional authorities there is now emerging a rational debate. The next few years will be critical when the regulatory architecture is established and the rush to set individual limits (particularly for nitrogen) without considering other key contributors to the problem is arrested. DairyNZ has already been influential in establishing science based targets for nutrient flows in the North Island and is currently working with South Island regional authorities as well.

In the remainder of the paper I look at the formulation of the One Plan, analysis the economic impacts of a collaborative approach to implementation and then consider the national impacts of replicating the One Plan success across other regions.

Horizons One Plan – where it came from, where it ended up

There had been moves to revise water quality management regulations in the Horizons region as early as 1997. When the One Plan was first publically notified in 2007 the impact on dairy farmers appeared draconian and the council made a poor job of selling the plan to farmers and the rural community. The plan was very controversial and led to a confrontational battle with seemingly polar positions taken by Federated Farmers and Fish & Game to name two of the key protagonists. The notified version in 2007 set challenging N leaching targets and effluent management rules for dairy.

After an extended round of hearings the decisions version in 2010 made the changes realistic and affordable with farmers required to stand up and do a much better job at managing dairy pollution and N leaching losses in particular. Fish & Game with others challenged the decision and the parties went into mediation in 2011. During this process the Environment Court judge came round to side with Fish & Game and his ruling made public on 30 August 2012 meant the dairy farmers lost point after point and the provisions of the One Plan largely reverted to those of the notified version.

DairyNZ through Mike Scarsbrook and others had been providing scientific information to the court since 2008, but Dairy NZ really got involved in a leadership role in 2012 when Rick Pridmore, DairyNZ's Strategy and Investment Leader – Sustainability, began to advocate passionately for dairy. The game changer occurred in late 2012 when Council fronted to a very angry public meeting at Dannevirke. Here it became clear that the One Plan as proposed would severely impact on dairy farmers, to such an extent that even an organic dairy farmer on the east side of the Manawatu gorge

would be unable to achieve the controlled activity limits. Furthermore the whole rural community, through the activities of the Tararua Community Economic Impact Society, had come to the realisation that the implied decrease in dairy production would severely affect their incomes and the sustainability of rural communities was under threat. Council suddenly realised that the One Plan would not be able to be implemented as proposed. In the Mangatainoka district the change from Overseer 5.4 to 6.0 increased the gap between measured current practice and the targets by an average of 20 kg N/ha/yr. Instead of 20% of farmers expected to take out restricted discretionary consents it then appeared that 80% would need to if they were to continue in dairy.

Meantime Horticulture NZ and Federated Farmers had appealed to the High Court on matters of law and hearings were held at the end of July 2013. The judgement in September 2013 was to dismiss the appeals.

In April 2013 DairyNZ reported on analysis undertaken for six case study farms which showed substantial losses in production and cash surplus in order to meet the targets. This report coincided with analysis of the impact of the One Plan on the Tararua district carried out by the Tararua Community Economic Impact Society, which highlighted the negative impacts on incomes and loss of jobs in the district should the Plan be implemented as planned.

In May 2013 DairyNZ contracted Nimmo-Bell in collaboration with Market Economics to analyse the economic impact of the One Plan for dairy farmers, sub-regions and the region as a whole (Bell, McDonald, Brook, Fairgray, Yap and Smith 2013). A collaborative approach was taken to agree on the key assumptions in the economic model involving council officers and DairyNZ technical specialists. Three scenarios were agreed for analysis: Scenario 1 (Limits) assumes all farms attempt to meet the council limits; Scenario 2 (System Change) assumes all farmers will maximise N leaching reduction without reducing profit by more than 10%; Scenario 3 (Within System) assumes farmers will adopt management practices to reduce N leaching while maintaining production and profit. Scenarios 2 and 3 were designed to model possible implications of Horizons Regional Council providing restricted discretionary consents (RDC). Scenario 3 is the one that most closely aligns with how Horizons Regional Council will be implementing the nutrient management provisions.

The Nimmo-Bell/Market Economics study highlighted the costs to farmers and the rural community of Scenarios 1 and 2, and showed that the environmental objectives of the One Plan could be met if farmers adopted Scenario 3. The report was made public at the end of October 2013. The council was happy with the report because it showed under Scenario 3 that water quality would be improved without adverse economic effects in the region. The rural community was happy because business activity would be maintained. Farmers were happy because they could continue farming profitably and without reducing production levels albeit with a new major emphasis on reducing water pollution.

The One Plan will be implemented along the lines of Scenario 3 as set out in the Nimmo-Bell report with nutrient management rules taking effect from July 2014 to July 2016. Farmers will have six months to apply for their consent from the time their catchment comes into effect. Each dairy farm will be assessed by a triumvirate of council officer, DairyNZ accredited adviser and farmer agreeing on a nutrient management plan to achieve a realistic N loss target under a 20-year consent.

We now turn to the analysis itself.

Quantifying the direct economic impacts of changes to water policy

Nimmo-Bell and Market Economics undertook a Cost Benefit Analysis and Economic Impact Analysis (similar to a RMA Section 32 Analysis) of the Horizons Regional Council's One Plan as it applied to the dairy sector. The methodology was developed in a format that could be applied to other regional freshwater improvement policy initiatives.

Under the One Plan Horizons identified the dairy sector in priority catchments as a major source of nutrients deemed to cause increased levels of periphytons in waterways. As a result the affected dairy farms in target water management sub-zones will be required to meet nitrogen (N) leaching targets (Limits), according to the Land Use Capability (LUC) of their farms. Those farmers who cannot meet the controlled activity limits may apply to the Council for a Restricted Discretionary Consent (RDC), which has less challenging targets but more conditions.

The sub-zones fall basically into the intensively farmed dairy areas east of the Manawatu Gorge (subsequently referred to as Tararua) covering 40,675 ha and the coastal Rangitikei and coastal lake areas west of the Gorge (West Coast) covering 25,257 ha.

Under the One Plan targets for Nitrogen (N) and Phosphorous (P) have been set for the region's waterways to manage perihytons. The main emphasis for dairy farming is to reduce N leaching. N leaching targets were set to reduce water N loads over a 20-year period using Overseer 5.4. Subsequently an upgrade of Overseer to 6.0 with an increase focus on soil drainage meant that some farmers would find meeting the targets a lot more challenging.

Fourteen representative farms were chosen by DairyNZ and the Council for the economic analysis. They represent various dominant biophysical and management systems being rainfall categories in Tararua, and soil types and irrigated or not on the West Coast. Each farm represented a percentage of the total dairy land in each sub zone.

Each farm was analysed at various levels of N input using a linear programming model (GSL 2014) for Scenarios 1 and 2 and Farmax (2014) farm systems model for Scenario 3, then run through Overseer 6.0 to provide estimates of N leached per hectare. The resulting revenue, expenditure and profit estimates for each farm for each scenario were converted to a per hectare basis for aggregating up to the sub-zone level, plus a combined estimate.

The results of the modelling of direct benefits and costs to the dairy sector showed a significant divergence between Tararua and the West Coast. In summary, overall the estimated combined reduction for both sub-zones in N leached is -18% under Scenario 3 (Within System) compared with the Base year of 2012. Scenario 2 (System Change) reduced the N loads from dairy further (-23%) while N reductions under Scenario 1 would result in further reductions (-32%).

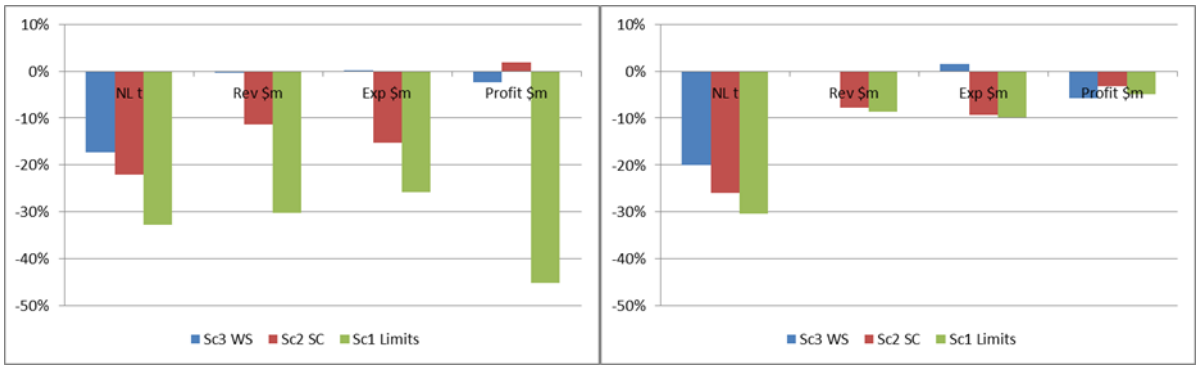
Under Scenario 2 (System Change) and Scenario 1 (Limits), dairying in Tararua district is expected to have larger negative economic impacts compared with the West Coast. While the percentage change in N leached is similar on both sides of the Manawatu Gorge reduced dairy farm production and profitability is expected to be much greater on the Tararua side. Tararua under Scenario 2 shows a 22% reduction in N leached with revenue down 11% and expenditure down 15%. This compares with 26% reduction in N leached, revenue down 8% and expenditure down 9% respectively in the West Coast sub-zone. The difference is due to a greater proportion of farms on the West Coast able to meet the targets.

The gap between the two zones widens when the Controlled Activity Limits are compared. Tararua shows a 30% reduction in N leached with revenue down 33% and expenditure down 26%. This compares with 30%, 9% and 10% respectively in the West Coast sub-zone. Most dramatically farm business profit is expected to fall by 45% on the Tararua side compared with a fall of only 5% on the West Coast side when farmers attempt to achieve the controlled limits. This is because a greater proportion of farmers on the Tararua side would need to make farm system changes compared with the West Coast.

Figure 1 highlights the changes in nitrogen leached, revenue, expenditure and profit under the three scenarios for Tararua and the West Coast.

Figure 1. Comparison of Tararua and West Coast N leaching and dairy farm profitability for three scenarios (% change compared with Base)

Tararua West Coast



The comparisons for each Scenario are: N leached (tonnes), Revenue $m, Expenditure $M and Profit $m.

The results indicate that some farmers will need to make changes to their farm system in order to comply with the Horizons One Plan. Most should be able to either meet the targets or gain an RDC by adjusting N fertiliser regimes, supplementary feeding systems and/or reduce stocking rate.

More attention needs to be paid to the time expected to lower N leaching because of the change from Overseer 5.4 to 6.0. On a regional basis a five-year phase in for within system changes and a 20-year phase-in for whole farm system change is realistic based on historical adoption rates for major policy changes (Journeaux, Schischka and Phillips 2011).

Quantifying the indirect economic impacts

Assessment of regional and national-level economic impacts is undertaken using two different approaches. First, a multi-regional IO (Input-Output) model is used to ascertain the nature and extent of likely economic impacts (measured using indicators of value added and employment change) for each of the four study areas. Second, very detailed and spatially-defined credit and debit card spending is used for the purposes of obtaining a more in-depth understanding of the likely spatial distribution of employment impacts across the Manawatu–Wanganui region.

As expected the analysis shows the economic impacts occurring under both the Limits and Systems Change Scenarios exhibit very strong spatial variation. Not only are the impacts concentrated within Manawatu–Wanganui compared with other New Zealand regions, the impacts are more strongly concentrated in certain locations within the Manawatu–Wanganui region itself.

From the analysis based on market data, it is calculated that of the 1,500 jobs lost in 2023 within Manawatu–Wanganui under the Limits Scenario, 830 of these jobs (56 %) are within the Tararua District. Impacts in other districts with priority catchments are also significant. The situation is also similar under the Systems Change Scenario, with around 58% of the estimated regional employment losses in 2023 occurring just within the Tararua district. Nearly a third of these estimated Tararua impacts occur just within the town of Dannevirke, and a further one-quarter occurs within Woodville.

The key messages from the analysis can be summarised as follows:

* A multi-scale approach is required to assess the economic consequences associated with mitigation. The impacts differ by stakeholder at each scale.

* The wider economic impacts to communities, districts, regions and nation may be both positive and negative depending on the initiatives taken to mitigation i.e. the impacts may not be evenly distributed - this is further complicated by supply chains which may focus impact on local communities or on wider districts depending on what chains exist

* Understanding the value sets of each set of stakeholders is essential if a viable transition pathway to mitigation is to be achieved. Each stakeholder group needs to be fully aware of these.

* Understanding the transition pathways for impacted stakeholders is essential - stakeholders need to be given time to achieve effective mitigation - in a way that is sensitive to their own and community livelihoods. It is insufficient to simply state that transition is technical possible and leave those effected with the responsibility of achieving it. We are all in this together.

* There will be winners and losers. Those willing to continually adopt best practice and improvements stand the best chance.

Utilising the One Plan analysis

The analysis provided quantitative economic impacts on both dairy farmers and rural communities. Horizons Regional Council Chairman, Bruce Gordon said in a press release (Gordon 2013):

> "We can now take the results from this report and use it as a guideline to work with industry to implement the One Plan in a practical and supportive manner."

In the Horizon priority zones the base amount of NL is estimated to be 1,940 tonnes per annum. Within system changes reduce NL by 350 tonnes (-18%) a benefit to the environment. In addition, there is an economic benefit of $81m gross revenue and $22m in farm business profit per annum (the difference between the Limits and Within System changes) at full implementation of the policy (Bell et al op cit 2013, p26). This result provides an indicator of the benefits that could accrue to other regions as water quality policies are implemented over time.

We use this result as a bottom up approach to estimate the benefits of rolling out equivalent programmes in other regions in New Zealand. An alternative approach is to take a top down view and this is considered in the next section of the paper.

Unrolling a programme across New Zealand's sensitive catchments

Top down analysis

The key benefit of dairy industry R&D which includes DairyNZ's train the trainer programmes is a higher growth rate of milk solids (MS) than would otherwise be the case. What farmers are able to do on-farm will be influenced by the balance regional councils adopt between economic and environmental objectives and how effectively environmental policies are implemented (Rick Pridmore, Pers. Com. 2014). If policies work effectively the growth rate in aggregate MS could be around 1.5–1.8% per annum. If policies work really well, with councils having well balanced policies, the growth rate in MS could be as much as 3.1–3.2%. We assume the most likely case is that the dairy industry adopts environmental policies that result in 2.2–2.5% growth rate in MS.

Without industry R&D DairyNZ's view is that the transition to Good Management Practice (GMP) is likely to take 10–15 years and the environment is likely to get worse as the industry continues to drive faster placing the clean green image objective increasingly at risk. If the public perceive the dairy industry is heading down this path, growth is likely to be curtailed, but if heading in the right direction growth will be less constrained.

A key issue is the lack of trained rural professions who can assist farmers adjust management to meet regional council requirements on water quality. In the 20 years after the restructuring of the economy in the mid-1980s, agriculture was out of favour with politicians and policy makers, many of whom saw it as a "sunset industry". This turned a whole generation of young people away from careers in agriculture and has resulted in a dearth of rural professionals who can help farmers make the transition from a focus on production led growth to profitable environmental sustainability. Over the last 10 years there has been a realisation among policy makers that while agriculture is still the driver of New Zealand's economic prosperity increased farming intensification is impinging on the quality of water in sensitive catchments. An extra push is needed to upskill farmers so that economic growth can continue while achieving better environmental outcomes.

Fonterra and DairyNZ have made the commitment (DairyNZ 2013) to train a workforce of rural professionals to help farmers make the transition to environmental GMP, thus making a major contribution to maintaining New Zealand's momentum towards the clean green target. The numbers of trained rural professionals required is in the range of 200 fertiliser representatives and 200 farm advisors (members of the NZ Institute of Primary Industry Management, NZIPIM). They all need to be singing off the same song sheet to speed up the rate of change.

Taking into account the available human resource, the sequencing of training of rural professionals will be done catchment by catchment in line with the need created by policy change. For example, Horizons Regional Council is currently implementing environmental policies with limits set on the quantity of Nitrogen leaching. Environment Canterbury through its zones policies has targeted farmers achieving GMP by 2017 and then to make further progressive environmental improvements over the next five years. Southland and Northland are two to three years away from limits being established.

The biggest problem is skill levels both on-farm and among rural professionals. Upskilled farm advisors are needed as most farmers and regional council staff don't use, or have limited ability to

use, farm management tools such as Overseer™ and Farmax, which are key skills required to implement environmental programmes. Hence the need for the Train the Trainer programme.

People are the weakest link in making the required changes. The more complex the policy the less likely it will be implemented. The need is for clever and simple policies to drive change quickly. Farm advice tailored to each farmer's particular resources and management is the critical link.

Modelling assumes that without the R&D programme, the growth in MS is likely to be 1.5–1.8% per annum, but it would be hard to implement and the policies would be difficult to deliver. Without the input of science and good economics, emotion rules and very strict limits would be the result with growth at 0.8%. The other 0.7% would come from industry good arrangements with no additional trained advisors. With R&D, growth could be as high as 3.2%, but there is probably too much public emotion to achieve this. The most likely level is 2.2–2.8% growth as there are still places to grow and intensify.

In summary, the industry R&D is expected to allow a faster transition to environmental GMP (3–5 years compared with 10–15 years) achieving cleaner water faster while allowing incremental growth of 1.0% MS (2.5–2.8 instead of 1.5–1.8%). This gain is valued by multiplying a 1% compound increase in total milk solids production annually, by a marginal profit of $3.64/kg MS (operating profit with overheads added back based on Horizons analysis). The PV of this is $527m (using an 8% discount rate).

Bottom up analysis

The results of the economic analysis of the Horizons One Plan for the dairy sector, provides an indicator of the likely quantitative benefits of extending the implementation approach Horizons is adopting on the environment to other regions. A key feature of this is the collaboration with the dairy industry and DairyNZ in particular. The "Without" scenario is that the N limits policy is fully adopted which results in a 32% reduction in N leached and a 28% reduction in farm profit at full adoption. The "With" scenario, of within farm system changes, results in an 18% reduction in N leached and a 4% reduction in farm profit at full adoption. Thus the difference, which is the marginal change of adopting a more balanced approach, is 14% more N leached with a 14% increase in annual farm profit. Note that still means 18% less N leached compared with the recent base load.

When these profit results are translated into Present Values (PV) over a 20-year implementation period, the aggregate marginal farm profit for the region is a benefit of $137m, which over the 440 farms in priority zones translates into a benefit of the change in policy of $310,000 per farm on average. DairyNZ's estimate of the contribution industry R&D including PGP funding makes to this is 40% making a net benefit in PV terms of $124,000 per farm subject to the policy change. We use this figure (adjusted to reflect national variation) as the benefit of the PGP when applied to farms benefitting from the Train the Trainer programme in other regions. In the cashflows account is taken of the timing of the introduction of the policy region by region. Key regions with the estimated number of farms impacted in each region and the implementation start date are shown in the table below. A total of 7,290 farms are expected to benefit from the programme over a 20-year implementation period.

The numbers in Table 1 are for those farms where N limits are likely to impact on the farming business. This was to allow comparison with the Horizons analysis. We assume all farms in Southland, Canterbury, Otago, Waikato, Hawkes Bay and Bay of Plenty will be affected by N limits. The total across these regions is around 8,000 farms, so 7,290 may be a bit low. Numbers in Hinds/Ashburton should be 350, South Canterbury streams 250 and Opihi 150.

Table 1: Regional implementation of environmental management plans

Region	Farms impacted	Year of implementation
Waikato		
Upper Waikato	700	2012
Waipa	900	2015
Waihou-Piako	1,500	2018
Lower Waikato	700	2018
Bay of Plenty	600	2014
Hawkes Bay	70	2015
Horizons	440	2014
Wairarapa	460	2013
Canterbury		
Hurunui	60	2013
Selwyn	200	2015
Hinds	200	2016
South Canterbury streams	70	2016
Opihi, Orari, Pareora	100	2017
Otago	390	2014
Southland	900	2015
Total	7,290	

Source: DairyNZ

N controls are highly likely (or already in place) throughout Canterbury, Otago and Southland. N controls in Waikato, BoP and Hawkes Bay are probable. It is reasonable to assume that N controls will be put in place across those 8,000 farms. The uncertainty is around the proportion of total farms around NZ that will have N controls. Farms in Northland, Taranaki and West Coast are less likely to be affected by N limits, but other constraints (e.g. sediment, E coli water quantity etc) will be likely.

DairyNZ's Mike Scarsbrook views 8,000 is a conservative estimate, with 10,000 as a likely upper limit (excludes west Coast and Taranaki, but includes Northland and all other areas). If there is a change of government it is possible there could be blanket controls on N loss from dairy farms across New Zealand. The analysis does not quantify the costs and benefits of this scenario.

The quantitative benefits of improvement in nutrient management, effluent management, animal welfare and whole farm assessment on dairy farms are bundled into both the top down and bottom up analyses, however there are qualitative benefits as well in the category of managing reputational risks.

Managing reputational risks

Good environmental performance and animal welfare outcomes are a contributor to the value proposition for supplying New Zealand dairy products vs. alternative supply options. Maintaining a

broad base of potential customers, in theory, provides a better market dynamic (both stronger demand and less volatility) for New Zealand products.

Increasingly food companies are linking sustainability to their brands and developing sustainable procurement policies. There is also a trend amongst global food companies towards simplification of supply chains, including through consolidation of supplier numbers. Branded food companies who have linked sustainability to their brands will be actively seeking to manage any risks to brand value from reputational challenge. Sustainability in the dairy context has been defined under the Global Dairy Sustainability Framework as encompassing animal welfare, alongside other social (i.e. labour rights), environmental, and economic considerations (Kimberly Crewther, DCANZ, pers. com. 2014).

The flow-on impacts of customers choosing to move away from New Zealand as a source of dairy products could run into billions of dollars if it eventuated. The PGP programme will reduce the risk of this happening, but this benefit is not quantified.

Risk analysis and results

The main driver of uncertainty around the economic benefit is the value per farm of the difference between fully imposed limits and a more balanced approach. The Horizons' Limits (-32% NL) are considered to be at the medium to high end of the scale compared with other regions where a high limit is represented by a 50% reduction in N leached from the base and a low limit a 25% decrease in N leached from base. The benefit is the PV of saved cost per farm of not having to go all the way to the limits. There is uncertainty around the total number of farms that will be affected by water quality policy imposed by regional councils.

	Low	Most likely	High	Expected
Benefits of balanced approach PV $000/farm	97	124	194	138
Number of farms	7,290	8,000	10,000	8,430
Expected NPV	$756.7m			
Sensitivity on discount rate:	2% NPV $1,808.5m, 5% NPV $1,138.4m			
Likelihood NPV >0	100%			
NPV range (5% and 95% levels)	$500m–$1,056m			
Cost benefit ratio	32.0			
Expected return $/ha/year	40.1			

Conclusion and key messages

Industry R&D has an excellent return on investment. Investment in train the trainer programmes fills a critical gap in ensuring dairy farmers are able to respond effectively and efficiently to regional council policies on improving environmental outcomes especially around effluent and nutrient management.

Taken over the 8,430 farms at an average 141 ha per farm the area likely to be affected by a national roll out of water quality programmes is 1.2m ha. This represents 71% of the total area in dairy. Assuming a base load of 29kg NL/ha (Horizons average for dairy farms) and an 18% reduction in NL the total reduction in NL over the next 20 years will rise to about 6.2m kg NL per annum. The national economic net benefit is estimated at $757m (NPV at 8% discount rate) or $40/ha/year to dairy farmers.

This analysis demonstrates that there can be a win-win in the battle for sustainable dairy farming and improved environmental outcomes. It is a story that is not portrayed in the media. A huge effort is going into adapting dairy farm systems to meet environmental bottom lines while maintaining farm profitability. As the roll out occurs across the nation I am sure the success of the One Plan will be replicated in other regions. Most farmers are justifiably reluctant to make changes to their systems until required to do so because there is a significant chances they could get it wrong at their cost.

There is always a percentage of farmers who won't change just as there are farmers who are in advance of the policy and have demonstrated that it will work. Turning a giant industry around takes time. Those who won't change will leave the industry and their place taken by new farmers who have the right headspace. New dairy conversions will be required to meet the limits from day one. Dairy farmers have a reputation for innovation and we are already seeing this happening with new products and techniques demonstrated at Field Days and generally around precision farming techniques. All this adds up to a positive picture for the industry and the environment. In 20 years we will be able to look back and see that we are currently at a turning point for the better.

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