ADAPTING TO A CHANGING ENVIRONMENT

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Outline

- Farmers are coming under pressure to improve their environmental performance as policy makers are increasingly introducing regulations that are based upon the "polluter pays" principle.
- Implementation of the National Policy Statement for Freshwater Management ("NPSFM") has the potential to significantly influence how New Zealand farms are operated in the future.
- It is important to understand the potential impacts that implantation of the NPSFM will have for farmers, land values and banks:
    - Farmers – Regulation of nitrogen leaching poses the greatest challenge to New Zealand dairy farmers. Depending upon the particular approach taken by the relevant regional authority, the impact on individual farmers will vary from having to do nothing, through to rebuilding their farming system or reducing production intensity.
    - Land Values – Environmental constraints that significantly affect productivity/ profitability are likely to impact dairy land values. Research shows that in areas already operating under limits, namely Lake Rotorus and Lake Taupo catchments, environmental constraints have had a negative impact on land value.
    - Banks – Will need to assess what risk environmental regulations poses to both a client's ability to service their debt, and/or, the client's equity position.
- Good environmental management will increasingly become a core function of farming, and will need to be incorporated into both day-to-day management decisions, and major long term investment/system change decisions.

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- Each farmer will be impacted differently by new environmental standards – it is important that farmers get a sound understanding of specific environmental risks/issues relevant to their property, then develop a mitigation plan that addresses their specific risks/issues.
- Mitigation plans should take a whole-of-farm approach, entrenching individual mitigation strategies within the wider farm system, and focusing on the most cost effective mitigations first before moving onto more expensive or less cost effective mitigations.

Introduction

As regional councils across New Zealand amend their water plans to comply with the 2011 Freshwater National Policy Statement, farmers are increasingly facing new limits and rules regulating the loss of contaminant from their farming systems to waterways. For many farmers, this has created significant uncertainty around how these changes will impact their ability to operate in the future. This paper examines the new regulatory landscape facing New Zealand farmers in order to understand its implications, and to identify those actions that can be taken now to "future-proof" farming operations moving forward.

Environmental scan – existing and on the horizon

Concern has been growing worldwide about the impact of intensive farming on the environment. What were once considered normal and acceptable practices are coming under increasing public, and political, scrutiny as farming becomes increasingly intensive and the impact of this intensification on the environment's natural values, character and ecosystem health becomes more apparent. This is being translated into increased pressure for improved environmental performance from not only society, but a range of stakeholders within the supply chain, including consumers, food processors and retailers.

The extent to which society now expects agriculture to be held responsible and accountable for its full impact on the environment is greater than ever before. Agriculture, like most industries, generates a range of environmental consequences including depletion of surface and groundwater; air pollution; soil erosion and contamination; loss of natural biodiversity; and discharge of greenhouse gases. The vast majority of farmers are aware of this and, as custodians of the land, generally operate systems designed to reduce their impact on the environment. Participants along the supply chain and agricultural industry groups also impose their own environmental controls upon their suppliers. Nonetheless, despite these self and industry imposed controls, policy makers are coming under increasing pressure from society to implement a greater range of regulations based upon the "polluter pays" principle.

New Zealand's approach

New Zealand agriculture has two main environmental impacts, firstly, the emission of greenhouse gases into the atmosphere, and secondly, the discharge of contaminants to air, water and onto land. In New Zealand, greenhouse gases are regulated by the New Zealand Emissions Trading Scheme (NZETS). New Zealand farmers are currently not required to account for biological emissions from agriculture. The NZETS has indirectly impacted production costs for New Zealand farmers through increased energy and transport costs (both of which are included in the NZETS). However, as there is currently no direct compliance cost for New Zealand farmers under the NZETS, there is considered to be no impact on production costs for the purpose of this paper. The focus of this paper is on the regulations used to control the discharge of contaminants to the environment.

Since 1991, the discharge of contaminants to air, water and onto land within the New Zealand environment, has been regulated by the Resource Management Act 1991 (RMA). Under the RMA, regional authorities are responsible for managing natural resources within their region (New Zealand is broken into 16 regions).

To date, regional regulations have largely focused on dairy shed effluent management, with rules in place for storage and application of effluent to prevent raw effluent directly entering the waterways. Installation of new and upgraded effluent systems cost farmers anywhere upwards from NZD 250,000.

In the decades since the RMA became operative, New Zealand's agricultural production has significantly increased through increased nutrient use, livestock intensity and use of irrigation. Intensification has provided growing wealth and economic benefits to New Zealand. However, increased production has also had an impact on New Zealand's waterways.

In response, the National Policy Statement for Freshwater Management ("NPSFM") was introduced under the RMA in 2011. The NPS directs regional authorities to establish water quality targets and set enforceable limits to maintain or improve water quality in waterbodies within their region.

Regional authorities have until 2025 to implement the NPSFM. Authorities across New Zealand are currently at different stages in the policy and limit setting process. While some

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authorities already have operative regional plans that either fully, or partially, implement the NPSFM (including Waikato, Horizons, Environment Canterbury, Otago and Hawke's Bay), other authorities (including Southland, and Northland) are still in the early stages of developing limits and rules to implement the NPSFM. As a result, farmers in different regions (and even different catchments within regions) can expect to be impacted by water quality limits and the methods used to achieve them at different times over the next decade.

As contributors of contaminants to our waterways, New Zealand farmers are impacted by the limits and rules being established under the NPSFM. Specifically, limits and rules regulating the loss of contaminants from farming systems to waterways, via run-off from farmland, have the potential to significantly influence how New Zealand farms are operated in the future.

If done well, appropriate regulation, in conjunction with audited self-management systems and continued major investment in research and extension activities, will deliver sustainable farming systems that both protect New Zealand's land and water resources, and environmental reputation internationally, while also achieving efficiencies in production and increased profitability. Ultimately, this will create farming systems that are more resilient to both volatile commodity prices, and changing growing conditions due to climate change.

In addition, international studies consistently indicate that consumers want to eat food that is produced in an environmentally sustainable manner. North America and Northern Europe are two regions that are particularly conscious about how their food is produced. So, regulatory changes that require New Zealand farmers to adhere to robust environmental standards will provide processors with the opportunity to demand recognition of this improved environmental performance from these markets, in the form of price and/or preferred market access.

However, the introduction and enforcement of strict limits and rules over a short period, without the appropriate level of education and support for farmers, could result in a range of negative unintended consequences including increased production costs, limits on future production and land use, less flexible/adaptable farming systems, reduced capital value, and emotional stress at both an individual farmer level, and at the community level.

That is why it is important that the introduction of any new regulation is reasonable and appropriate for the specific environmental issues facing the local communities, and is not imposing unnecessary costs/restraints without providing the desired environmental benefit.

What are the implications for farmers, land values and banks?

Famers

In order to meet future water quality targets and limits, regional authorities are in the process of introducing a raft of new environmental regulations. Unlike traditional regulation, which has dealt with point source discharges (where it is possible to identify the point at which

a pollutant is entering a waterbody, such as a drainage pipe), new regulations are predominately focused on addressing the issue of non-point discharges (where nutrients leach into surface waters and groundwater as a result of rainfall, soil infiltration and surface runoff).

Controls are being placed on the amount of nitrogen, phosphorous and sediment that can leave a farm's boundary. As phosphorous and sediment loss occurs via runoff across the surface it can largely be controlled through riparian planting, fencing of waterways and grazing management systems. These are practices that New Zealand dairy farmers largely understand and have generally already implemented.

Regulation of nitrogen leaching poses a much greater challenge. Because nitrogen leaches down through the soil and into the groundwater system, it is a difficult pollutant to both measure and control. However, due to the potential negative impact nitrogen can have on New Zealand's waterways, regional authorities are now setting enforceable nitrogen leaching limits at a farm boundary for farmers.

All farming systems are affected by increasing levels of environmental regulation, however the livestock intensive nature of dairy farming makes it more susceptible to the impacts of environmental controls. Dairying is also unique in that, unlike most other agricultural commodities, the export of dairy products globally is dominated by developed, first world countries. These developed countries are imposing stricter environmental regulations, and are all competing for the same export market growth, however the particular regulatory regime local dairy exporters operate under will have a direct impact on international competiveness.

The global nature of dairy trade also means that dairy products are often consumed a great distance from where production occurs. This makes it very difficult for exporters to pass higher environmental compliance costs on to consumers, as these consumers receive no direct benefit from improved environmental conditions in the exporting country. As a result, most dairy exporters have found that the increased costs associated with compliance are rising much quicker than any market price premium that might exist now or in the future from meeting these higher standards.

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Because implementation of the NPS remains in its infancy, it is too early to exactly quantify the impact on production systems and land values. However, it is possible to identify ranges of changes that farmers may be required to make in order to meet these new regulations.

As mentioned above, regulation of nitrogen leaching poses the greatest challenge to New Zealand dairy farmers. Because there is a strong correlation between N leaching and the productive capacity of land, the particular approach a regional authority takes to setting and allocating N leaching limits will have repercussions for individual farmers, different farming sectors, and local communities.

In catchments/regions that have good water quality (i.e. the cumulative amount of existing N leaching from individual properties does not come close to reaching the total N that the receiving waterways can no longer handle and therefore the catchment is under allocated for N), the N limit setting process should still provide individual farmers with some flexibility and some scope to intensify their existing operations.

The real challenge will come in those catchments/regions that are either fully-allocated (or near full allocation), and need to cap overall N leaching at existing levels, or are over-allocated and need to reduce N leaching from their existing levels. In these catchments/regions, the right to leach N will become a limited resource. Creating, the headroom for low leaching land users, like sheep and beef, to increase their N leaching profile, or new land users that increase N leaching losses, while maintaining the same overall N load for the whole catchment/region has become a contentious issue in these fully, or over allocated catchments/regions.

A wide range of options have been advanced for allocating N limits to individual properties to achieve water quality outcomes. These fall into two main groups; those linked to current land use (good management practices, grand-parenting, sector averaging) and those independent of use and linked directly to land (land area (equal allocation), spatial location of land, natural capital of soil). Of these, there are three frameworks currently in use in regional plans, and others proposed in draft or proposed plans.

Grandparenting in Lake Taupo catchment (Variation 5 to Environment Waikato Regional Plan) is an allocation of nutrient leaching "rights" based on current (or past) leaching levels. If this is an over-allocated catchment/region these limits would need to be reduced in some way, over time, to 'claw-back' the excess N that is leaching into the local waterways.

Land allocation – All land (regardless of land use or past leaching levels) gets the same allocation of N/ha/yr. For example, in Otago, Plan Change 6A stipulates that nitrogen leaching is a permitted activity, providing that from 31 March 2019, leaching (as calculated by Overseer) does not exceed the following levels:

- 15 kgN/ha/yr in large lake catchments
- 20 kgN/ha/yr in sensitive aquifers, and

- 30 kgN/ha/yr in the rest of Otago.

Natural Capital in Manawatu – Whanganui (Horizons Regional One Plan) is an allocation of nutrient leaching "rights" based on the natural capital stocks of the soil. The proxy for natural capital stocks is taken from the extended legend of the LUC, which is based upon factors including soil type, parent material, slope, erosion risk, and climate. Under this approach, more of the N allocation is given to highly productive Class 1 than less productive Class 7 land, with the actual numbers based on the water quality outcomes. For example, a farm that has 50% Class 1 land which is allocated 30 kgN/ha/yr, and 50% Class 6 allocated 10 kgN/ha/yr, would get an overall farm allocation of 15 kgN/ha/yr.

Depending on the rules imposed and the level at which N limits are set, farmers will need to either:

- do nothing, as they are already compliant, or
- refine their farming system (perhaps needing to lower environmental impacts by 10-15%), or
- reduce production intensity (i.e. destock, less inputs), and/or
- rebuild (change the farming system, e.g. build feed pad, or some form of housed facility).

The proportion of farmers that fall into each category will ultimately determine the overall impact on production costs and milk production growth. It will also have a strong influence on how land values are impacted.

Land values

It is difficult to quantify exactly what the impact of environmental constraints has been on land values to date (in areas already operating under limits), or, to predict likely impacts in the future as limits are progressively introduced across all regions.

One reason for this is the large amount of uncertainty that surrounds the setting, implementing, and enforcement of limits. Without knowing the level at which limits will be set, the timeline by which farmers will have to meet those limits, and ultimately the approach taken by regional councils to enforcing those limits (e.g. strict enforcement that immediately penalises any breached limit verse a lenient approach whereby regional councils issue resource consents

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that allow farmers to progressively bring their leaching down over an extended timeframe), it is not possible to identify the likely impact on on-farm productivity.

The other uncertainty is the role that new technologies and farming systems will have in providing farmers with the ability to reduce their environmental impacts over time, without reducing their corresponding productivity. As more of these tools come on line, limits that previously may have had significant impacts on productivity, may become much more achievable/realistic.

As productive value is one of the fundamental drivers of land value, uncertainty around how on-farm productivity will be impacted by limits, correspondingly means there is uncertainty about the impact that future limits will have on land values.

While it may not be possible to quantify the exact degree of impact on land values across New Zealand, it can be expected that environmental constraints will have some impact. This is already evident in those regions that currently do have certainty around limits, and are operating under those limits now, namely Lake Rotorua and Lake Taupo catchments.

In November 2015 Phil Journeaux (AgFirst Waikato) released a report entitled "The Effect of Environmental Constraints on Land Prices" where he quotes analysis from Telfer Young (http://www.telferyoung.com) which shows a 27% discount for dairy farms, and a 37% discount for drystock farms within the lake catchment as a result of restrictions on nitrogen leaching (although it is pointed out these figures are based on very limited data) (TelforYoung, cited in Journeaux 2015, p.22).

These findings are consistent with Journeaux's theory that drystock farmers could in fact bear a proportionally higher cost of environmental constraints than dairy farmers as they will be unable to convert to a higher/more profitable land use. Journeaux points to the fact that traditionally, New Zealand farmers have been willing to accept low cash returns in return for the assumption that they will be compensated by good capital gains in land value (or speculative value). For many drystock farmers this speculative value has been driven up by the opportunity to intensify production, both in-situ and via land use change. However, if environmental constraints are implemented that restrict or prevent, intensification, this speculative value previously enjoyed by drystock farmers could be significantly reduced. The impact on dairy land values is more likely to be driven by constraints that affect productivity/profitability (Journeaux 2015, p.5).

Banks

Just as it is important that farmers understand how these new environmental constraints will impact their businesses, so too must banks understand what regulations mean for how they

need to operate in the future. Specifically, banks must decide if/how to address environmental factors within their lending policies.

The challenge for banks (like farmers), is dealing with the uncertainty surrounding impending regulations. As discussed above, it is impossible to exactly quantify what impact regulations will have on production levels, production costs, and farm values; all factors important when considering a lending application.

Essentially, when considering lending applications, banks will need to assess what risk environmental regulations pose to both:

1. A client's ability to service their debt – So are regulations likely to impact the profitability of the farming operation, e.g. if a client has to significantly reduce cow numbers to meet limits what is the impact on production levels vs production cost?
2. And a client's equity position – Will their asset value be negativity impacted because of constraints that affect profitability (both realised and potential)?

For the most, farmers' environmental constraints shouldn't have a fundamental impact on either of these factors.

The key for banks will be identifying those situations where farmers will be required to make significant reductions/farm system changes, and have limited mitigation options available (e.g. no equity to invest in extra infrastructure like feed pads, or locked into a high cost structure that prevents reductions in stocking rates). In these situations it will be important that banks work with their clients to ensure the risks are fully appreciated/understood, and (if possible) help develop a plan ensure that risk is adequately addressed.

Regulation driving innovation

New Zealand is largely adopting an effects based regulatory regime – based upon regulators setting standards or limits that must be met, but it is primarily left to the individual business owner to determine the most efficient or effective way of getting there. For example, most regional authorities are setting nitrogen limits, but are not telling farms how to farm, i.e. what stocking rate they must have; how they should be applying fertiliser; volume of supplementary feed required. BUT farmers must meet the set standards.

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Controlling effects rather than inputs creates greater incentive for innovation. This results in business owners approaching the issues by trying to determine what is the most efficient, cost effective means of meeting or exceeding requirements. The most competitive and successful producers will be those that can best adapt e.g. they can identify why a herd home suits their situation better than a low intensity model or vice-versa.

To take advantage of the flexibility New Zealand's regulatory approach provides, it is important that investment is made into building knowledge, science and new technologies to drive innovation. It is also likely there will be increased reliance on environmental consultants, as their skills and knowledge will be in demand from a greater range of farmers. Environmental management will become a core function, similar to livestock management or pasture management, and this transition will need to happen quickly. It is in the interests of all producers to adapt quickly to minimise environmental impacts and avoid the risk that regulators eventually pursue the inputs model approach to achieve the desired outcomes.

The effects-based model has a disadvantage in that it can create uncertainty and fear for producers as many are unsure exactly what changes need to be made to meet standards. Under an inputs model, it is simply a case of doing what the rules say you are allowed to do. This further reinforces why the investment in building knowledge is a critical component of a successful effects-based regulatory approach.

One of the main reasons New Zealand farmers are world-leaders is due to their ability to innovate and adapt to adverse situations. While compliance with new environmental standards will present challenges for New Zealand farmers, it will also create exciting opportunities to develop new technologies and farming systems that improve farm performance, both economically and environmentally.

We have already witnessed significant advances in technology in precision agriculture over the last few years. Innovations such as variable rate irrigation have provided multiple efficiency gains, in terms of water use, and production, whilst also reducing environmental impacts (by reducing leaching and surface run-off).

We are now starting to see the development, and delivery, of decision-making tools that provide farmers with detailed information about how their, land, water, environment and farming systems interact. These new tools will help farmers optimize the use of their farms' natural resources in order to maximise profitability, whilst still operating within defined environmental limits. FARMAX and MitAgator are two good examples of such a tool.

Future proofing – What Can Be Done Now?

In reality, different agricultural sectors and individual farmers will vary significantly in their ability, and desire, to implement the necessary changes. Topography (e.g. soil conditions,

number of water bodies on the farm), financial situation (e.g. debt levels, farm cash flow), and farm ownership status (e.g. lease, multiple owners via equity partnerships), are all factors that will influence the particular approach a farmer takes to complying with environmental standards. It will be important that individual farmers understand these factors, and develop practices based upon their particular circumstances.

Before making any major investments or system changes, farmers should be developing an understanding of their existing farm-specific environmental footprint (i.e. by what pathways are containments moving from their farming system to the waterways) to determine what (if any) are the major environmental issues that need to be addressed. Reviewing Overseer reports, taking in-stream water quality samples, and observing water movement during high rainfall events (e.g. where is water ponding and channelling into waterways, such as tracks, laneways and depressions in paddocks) are all useful actions to help develop a picture of a farms environmental performance.

Once farmers have a solid understanding of the issue/s they need to address, there are a large number of mitigation options already available for minimising contaminant loss. For a summary of the key mitigation strategies available go to http://ecan.govt.nz/publications/General/good-management-practices-2015.pdf. In addition, the DairyNZ website lists some useful dairy system-specific practices for reducing N leaching http://www.dairynz.co.nz/environment/land-and-nutrient/nutrient-management/.

The effectiveness and cost of each of these mitigation options can be variable due to differences in soil type, climate, topography, land use and farm management systems. As there are significant variations in both the cost and effectiveness of different GMPs, it will be important that farmers develop robust strategies for implementing GMPs within their farming systems.

For different farming operations, the relevance of the exact mitigation strategy required will differ, however, the key principle is that, when developing a mitigation plan, farmers must identify and implement the most cost effective mitigation strategies that should be targeted first (i.e. picking the low hanging fruit), before moving onto the more expensive or less cost-effective strategies next. It is important that each mitigation strategy is matched to the particular

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contaminant loss that is being mitigated, and to the physical resources and current farm system of the existing farm.

A particular strategy's cost-effectiveness can be further improved by targeting it to a farm's critical source areas. Critical source areas are those areas of the property that are responsible for the highest proportion of contaminant losses due to their high source and transport potential. For example, targeting riparian planting to sections of a waterway where the paddock topography channels the majority of surface runoff through, rather than having an even strip of planting along an entire water body (where large sections of that planting will not intercept any surface run-off).

These considerations reinforce the importance of implementing a whole-of-farm mitigation plan, which entrenches individual mitigation strategies within the wider farm system, and avoids taking a piece-meal approach to mitigation which focuses on individual mitigation practices. By mixing and match appropriate strategies to fit their farming systems, farmers will maximise the cost-effectiveness of each mitigation strategy and not needlessly impair farm profitability.

It is also essential that environmental factors are taken into consideration when any decisions are being made about changes to production systems and/or land use changes, so that a true and accurate cost/benefit analyse can be conducted.

Changing farm systems can involve both capital requirements and a period of adjustment to produce optimally and profitably. Farm businesses, their bankers and other advisors need to start considering these issues now and make good decisions that safeguard their viability for the long-term.

The farmers who will be most successful at adapting will be those who can take a whole business approach to managing environmental issues, incorporating environmental practices into core day-to-day management decisions, and understating how they environmental factors impact their long-term planning.

References

Journeaux P. 2015. The Effect of Environmental Constraints on Land Prices. AgFirst Waikato.

A study funded via the Farmax/DairyNZ Consultant of the Year Award.