DOWN ON THE FARM
– WHERE SCIENCE AND POLICY MEET PRACTICE

T. Mills[1], A. Hoggard[1], L. McKenzie[2] and P. Le Miere[2]

[1]Federated Farmers of New Zealand, P. O. Box 945, Palmerston North 4440
[2]Federated Farmers of New Zealand, P. O. Box 447, Hamilton 3240
Email: tmills@fedfarm.org.nz

Abstract

Pastoral farming in New Zealand remains at the centre of our national identity. As a nation we have been successful food producers for over 100 years and as a growing global population continues to require a secure and safe food supply New Zealand is well placed to continue to make a first world living from primary production. However, there are many challenges to the continued success of farming in New Zealand and an increasing knowledge base of what constitutes the sustainable management of pastoral systems is throwing up a growing list of potential risks to our core business of food production. Farmers must be well equipped to overcome the challenges that are emerging and the provision of integrated tools that balance the aspirations of the public with the requirement to retain the viability of farming must be developed. In this paper we illustrate a farmer's perspective of the practical space that farming occupies and which periodically slips into the gaps that exist between science knowledge and policy solutions.

Introduction

Pastoral based primary production has undoubtedly shaped the New Zealand that we now have. Its role has been central to our national identity of strong willed and capable go getters that get on with the job at hand. Historically, New Zealand farmers have overcome many challenges and will continue to do so as we move through the 21stC. Challenges of a hundred years ago included the clearing of indigenous vegetation and the establishment of pasture species. Clearing caused disruption of ecosystems and this along with chronic rabbit infestation accelerated erosion in the 1870s. Farmers adjusted practice and continued to farm. The development of refrigerated transport in 1882 was a big shot in the arm for NZ agriculture because it ensured that indeed New Zealand could become the off-shore farm that England sought. By the 1920s there was more pastoral land in New Zealand than in England and the import of phosphate from Naru ensured that many of the P limiting soils predominant in New Zealand could be more effectively farmed. The 1930 saw the emergence of the great depression and one third of the returned World War 1 soldiers who were assigned land for development walked off their blocks in some cases with significant debt. In the 1940s farmers were granted assistance by the government and aerial topdressing of super phosphate commenced giving a much needed boost to New Zealand agriculture. In the 1980s farming subsidies were removed and although tough for those who had to cope with the change pastoral farming emerged strongly again in the 1990s when dairy production started to grow significantly (Brooking, no date).

The challenges pastoral farmers face today differ from those overcome in the last 100 years. Challenges, both current and future, include the allocation of scare resources, suitable farm land and water being top of the list; the changing aspirations of New Zealand society; the public image of pastoral farming in New Zealand; and globally the volatile nature of commodity prices.

All these challenges must be faced with back drop of sustainable management as demanded by the Resource Management Act (1991). The complexity of this challenge is heightened by the changing criteria which constitutes sustainable management. As knowledge increases more informed judgment upon the sustainability, or not, of management practices can be made.

The conundrum of sustainable management is an excellent example of a wicked problem (Rittel and Webber, 1973). A wicked problem being defined as a complex problem with no obvious solution and any solution that may be appropriate is likely to have unforeseen consequences. Similarly, sustainable nutrient management also constitutes a wicked problem.

To tackle wicked problems requires solutions based upon robust science which is backed by policy that has regard for the four pillars of sustainable management: environment, social, cultural and economic.

We may perceive that the RMA is an attempt to give regard to the aspirations of all New Zealanders and that a balance between the four pillars is the most appropriate method to achieve these aspirations. It's a safe generalization to state that New Zealanders all seek the common goals of economic prosperity and environmental integrity. We also value our global image of a safe, clean society who enjoys the best that nature has to offer. We are proud of our reputation as a producer of high quality food and our tourist industry relies on our natural environments as well as our working landscapes. So in order to address these lofty aspiration of all New Zealanders we must ensure that there is suitable process in place that truly takes regard of the threats to New Zealand's aspirational goals.

In this paper we firstly propose a process whereby these complex aspirations of New Zealanders may be addressed with regard to the sustainable management of resources. The example used is water quality as this relates to productive land use. An on-farm case study illustrates the complexities of sustainable nutrient management as part of the puzzle that constitutes the sustainable management of a farming business. Given this on farm analysis the challenges that exist for both science providers and policy developers are highlighted and the tools and processes that farmers require are outlined.

Processes to address community aspirations

Aspirations are difficult to quantify but if values can be assigned to the resource which constitutes the aspiration then aspirations may indeed become goals. Water as a resource is an appropriate example to illustrate how the defining of value may assist in the realization of aspirations. Water resources have multiple values which may include life supporting, aesthetic, recreational, mauri, abstraction, natural state, trout fishery and many others. Many of these values may conflict one another so the defining of value in the first instance is challenging.

Although a significant challenge, the defining of a value is a critical first step if indeed the aspirations, as reflected within society goals, are to be realized. Step two constitutes the understanding of the factors that impact the value as defined. This is generally a science space where science expertise evaluates the impacts of activities upon the value of interest and then benchmarks those impacts which may define the starting point upon which movement towards the aspirational value may be monitored. The third step requires that the cost to achieve the value as desired is evaluated and balanced with the informed aspirational goals of the community stakeholders. It's critical to remember that farmers too are part of the community and desire both prosperity and environmental integrity. The final step is the development of solutions that address the impacts upon the values and which will then allow for the goals regarding the value to be achieved.

Below is an example where the process of developing an appropriate response to address aspirations as described above was not, in our view, followed and which in turn fell short of providing an appropriate solution.

Example – Water quality of the Manawatu river

It has been determined that the water quality of the Manawatu river is compromised by elevated N levels. Within the proposed One Plan as Amended (August 2010) Issue 1 is identified as surface water quality degradation and the example used to illustrate this is the nutrient enrichment of the Manawatu river resulting in excessive algae growth and a reduction in the recreational value of the water. A 'Value' is therefore defined.

1. <u>The defining of 'Value' - Value of Contact Recreation.</u>

Having now defined a Value, which is identified from the community aspirations for water quality, the second step involves the understanding of what factors impact the value as defined. Science expertise was employed to explore the factors that are impacting on N levels in the river system.

Science identified that based upon the current knowledge of N loading within the Manawatu river system and the understanding of N dynamics within the soil water system scientists were able to estimate the impact of land-use on the N levels in the river. Step 2. 'Understanding' impacts upon the 'Value' is achieved.

2. <u>Understanding the factors that impact upon the 'Value'</u>

What happened next was where we believe our proposed 4 step process broke down in this example and the temptation to jump from the understanding space at step 2. straight through to the solutions spaces as defined under step 4. occurred.

The solution as crafted incorporated high level community environmental aspirations and sought to devise policy that stipulated the N loss levels from productive land that were permitted in order to allow for the achievement of the environmental aspirations of the community regarding river water quality.

4. <u>Craft solution that addresses impacts upon the 'Value'.</u>

The jump between step 2. Understanding and step 4. Solution occurred in the initial development of the response to address aspirations. The critical 3rd step was missed. Under step 3. Practical farmer and industry expertise must come in to ground-truth the 'Costs' of attaining the values given the activities impacting the 'Value' as defined. If this does not occur then the 'Solution' ultimately crafted under step 4 is unlikely to be either realistic or well balanced.

Questions of the solutions appropriateness must be address if indeed all of the community aspirations of prosperity and environmental integrity are to be considered. It is also important to remember that farmers too are part of the community and in that regard aspire to the common goals shared by all communities.

By failing to address the 'Costs' space identified in step 3 regarding the cost to achieve the 'Values' it becomes impossible for the 'Solution' to be robust and appropriate. In our opinion this was the key flaw in the initial One Plan proposal to address issues of N loading within the Manawatu River system.

3. Determine 'Cost' of attaining the 'Value'.

Figure 1 captures this proposed 4 step process as it occurred within the initially notified One Plan and highlights the jump between Understanding and Solution that missed the critical 3rd step. By failing to address step 3 in the appropriate order the process which may ensure a sustainable solution was undermined.

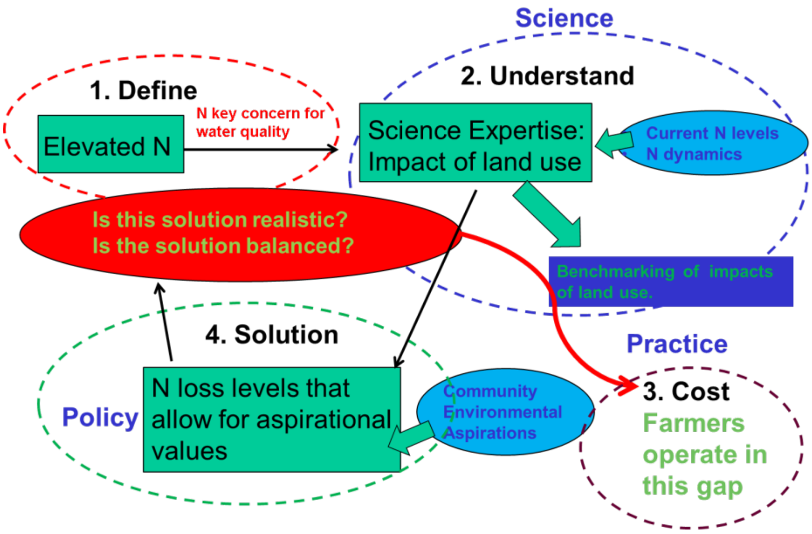

Figure 1. The process of policy development within the One Plan as initially proposed which highlights the lack of consideration initially given to the practical space the farmers occupy.

Retrospectively it was deemed necessary to address the issues of economic and social 'Cost' within the 'Solution' provided and with these considerations came a significant shift from the solution initially proposed to the solution as now proposed in the Amended Proposed One Plan.

Farmers strongly believe that if indeed the step 1-4 were followed in order the process of developing a robust planning document would have been significantly enhanced and considerable savings in both time and money would have resulted. Our hope would be that the lessons learned during the development of the One Plan will be used as other regions go forward and being the process of drafting both Regional Policy Statements and Regional Plans.

It is vital that step 3 is adequately done so that both the science and the policy space are firmly grounded with the practical space that farm practice occupies. The case study that is included here explores the nutrient management challenges on-farm from a practical perspective in the hope that the complexity of this space that farming occupies is adequately illustrated.

The Practical Space

Farm Case Study - Mati Awa – Waimara.

The following case study looks at Andrew Hoggard's farm Mati Awa – Waimara which is located at Kiwitea, 15 minutes north of Feilding in the Manawatu. The farm comprises 300 ha in total. The 560 cows graze 211 ha of this total with 55 ha used for dry stock and growing supplementary feed and the remaining 36 ha in a block of native bush and other areas including riparian areas, races and infrastructure.

The soil is a Kiwitea silt loam which produces and average of 1000kg MS per annum with a stocking rate of 2.7 cows ha. Current estimates of N leaching are on average 20 kg N ha yr and an Olsen P value of between 20-24.

When Andrew wakes up each morning at 3.50 am he must focus on optimizing every part of his farming operation. This includes nutrient management but this makes up just one small piece of the sustainable management puzzle.

On-Farm Processes

Effluent is applied to a land area far in excess of what is required by legislation and within the farm nutrient budget this area is regarded as a separate fertilizer block. The decision to apply effluent to a large area is purely so that returns are maximized on this valuable nutrient source. Grass grows poorly through a thick layer of effluent.

Nutrient budgets have always been done on this farm. The farm was a converted dry stock enterprise so it took a number of years to correct the soil nutrient profile to support good dairy production. Because fertiliser is a significant on farm expense only applications of fertilizer that will be effectively utilized is ever considered. Both timing and application rate have a big influence of the effectiveness of any fertilizer addition. Light regular dressings are most effective for N and it is always applied using a Fertmark accredited spreader with GPS technology. With regards to timing it is important that if any fertiliser is to be applied that the pasture cover is able to utilize it. Variable climatic conditions can stymy timing and compromise fertiliser efficiency so every effort is made to get the application window just right.

Soil health is central to the profitability of the farm so structural damage such as pugging is avoided. If winter conditions are likely to result in pugging damage then the cows are contained within a stand-off area and fed supplementary feed until soil moisture levels drop.

The farm borders the Oroua river and the entire length of the river is fenced off and planted. This is because firstly riparian planting lessens the likelihood of loosing land into the river during flood events but also because it is critical from an animal welfare perspective that stock get the correct dose of Mg every day which is supplied through the reticulated trough water.

With regard to stocking rate there has been times when more or less cows have been trialed on this milking platform but through experience, it has been determined that the magical number of 2.7 hits the sweet spot where marginal revenue equals marginal cost for this farming enterprise.

All of these on farm processes as described are done because they strengthen the bottom line of the farming business but all add to the environmental integrity of the farm also. It's a good example of how well managed and profitable farms can also tick all the environmental requirements.

To help make the on-farm decisions that need to be made there are various tools that are available. These include Overseer, UDDER and Cash Manager but farmers also need to rely heavily on ‘gut feel’ to do the ‘integration’ of these available tools that is necessary if the tools are to add value to the farming business. These tools can not solely assist farmers to make an environmental decision. They must also assist the farmer to make total farm management decisions which also include concerns such as animal welfare and financial viability.

To illustrate the multitude of questions that must be answered if indeed sound business decisions are to be made we have included the following case study as an example.

To apply or not to apply

The day is the 25th January 2011, at the farm we received 70 mm of rain over the weekend onto a farm that was in a state of drought. The grass was almost dead before this significant dump of rain but now it needs to be decided how best to utilize the rain that we have just received and attempt to get the farm back on track for the season.

About 140 cows have been either dried off or culled already meaning that returns for this season will already be down by between 15-25% irrespective of what happens next which means that there is some significant pressure on the budget.

So the questions that are being pondered include:

- If N was applied now would this help to boost grass growth?
- Considering the dry conditions up to this rainfall event is there a significant amount of N already stored in the soil?
- If indeed there is N in the soil already will there be a boost in growth even if no N is applied?
- If N is applied will any excess be wasted?
- Given the wet spring conditions has much of the N within the soil already been lost?
- If N is applied and then the forecasted follow-up rain does not eventuate have I wasted both N and money?
- Is an application of N even affordable?

In parallel there are other considerations that must also be balanced. These include:

- More feed must be on hand for winter
- Cow condition cannot drop any more and ideally should be raised by 0.4 before winter
- No more cows can be culled until final pregnancy testing is completed in another 4 weeks
- Money is tight and any that is spent must yield a return
- A new staff member is due to start so will need to have a contract sorted and training commenced.
- Off farm commitments including work for Federated Farmers as a dairy executive looking out for the interests of all dairy farmers.

- Other farm operations including weed management, equipment maintenance, feed management and milking cows needs to be slotted in.
- Time to be a father and a husband

Given the challenges of managing a farm as a successful business enterprise the current tools available to manage say nutrients do not provide the integrated package that allows farmers to made informed business decisions. Nutrient management can not be managed in isolation it must fit in to the puzzle as part of the components that contribute to success.

Farmers need the ability to optimize farm systems. Any gaps that exist that prevent this optimization must be addressed through robust science and a policy framework which balances community aspirations with the practical on-farm constraints.

So given that what farmers require is the ability to integrate many parallel processes in order to devise appropriate, efficient and effective responses to On-farm considerations there are a number of challenges that must be addressed within both the science and policy space in order for such tools to emerge.

The challenges

Science challenges

For science to provide what farmers seek a coordinated science effort is required. New Zealand science has suffered under a competitive science funding model which has in places resulted in a fragmented and therefore inefficient structure which see's multiple providers laying claim to the limited funding available. With regard to science provision in areas such as water and nutrient management a multi-provider system can effectively weaken the effort as all providers seek to purchase equipment and science expertise in competition with one another.

With a multi-provider approach data consistency is a challenge. Data consistency would aid the understanding of the science by farmers and therefore improve its efficacy in leading behavior change and benchmarking improvements. When farmers find conflicts or inaccuracies in science it undermines the strength of that science to modify behavior.

Farmers see nutrient management as just one part of the tool that will allow for the sustainable management of farms. Nutrient management tools must integrate with other tools which link economic and social considerations in with on-farm practice to allow optimization of the business from all aspects of sustainable management.

Policy challenges

Critical for farmers is the drafting of policy that is realistic. Policy must be informed by science but also by current on-farm practice and rules that are developed must support current thinking regarding good management practices. What constitutes good management practices will change as knowledge advances and industry is best placed to determine what does constitute good management. Good management solutions must therefore be devised by the industry for the industry and then accepted as good management by the regulators. This then ensures that any policy solutions that are developed have regard for current practice and the practical constraints are considered.

Actions into the future

From a farmers perspective the requirement to build science capacity that may provide the integrative tools that are needed to ensure sustainable whole farm management needs to progress. These integrative tools may then have the ability to add to the efficiency and success of farming businesses. The tools must not be viewed as yet another cost that adds little to understanding or to the practical business of managing a complex integrated system that represents a farm.

Science must be accessible to all. The fact that science is also a business in New Zealand can mean that the science that is purchased is done so in order to support the development of policy as policy makers would like to see it, rather than the way it actually is. Science is never finished and it is never wholly correct. This must be remembered when science informed policy is developed.

The current situation for many farmers and regulatory authorities is not one of collaboration but rather confrontation. This ensures a no-win. A truly collaborative approach is required if indeed the gap between science and policy is to be effectively addressed.

Finally New Zealand pastoral farming has struggled against a back lash of public disapproval fueled by a general press that is poorly informed and relies on 'dirty stories' to sell news papers. This damages our national and international reputation for high quality food produced in a sustainable manner. As a nation we can ill afford this poor coverage. Our prosperity relies on both export of food products and upon tourism. Both critically linked to our environmental integrity.

Conclusions

Successful farming is a complex business which requires a multi-skilled operator. The space that farming must operate within is a constantly changing landscape as legislation, public aspirations and science advances and new knowledge is added to the pile farmers already need to digest. Well balanced and integrated tools will assist our farmers to move with the changing times and indeed will assist in the sustainable development of our most important export industry. The view out the kitchen window of many farm houses throughout New Zealand is dynamic. Farmers need to effectively link with science providers and policy developers to ensure that this dynamic view remains an attractive one. Success of pastoral farming in New Zealand is critical for the prosperity of our communities and this success must balance the four sustainable management components. Tools that will assist in this also need to give regard to the economic, environmental, social and cultural requirements and gaps that currently exist between science and policy must be filled by consideration of the practical space that farming occupies.

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