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THE POSSIBLE IMPLICATIONS OF A NITROGEN CAP ON FARMING BUSINESSES WITHIN THE LAKE TAUPO CATCHMENT

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INTRODUCTION

The intention behind this project is to bring together the significant array of knowledge and data on the issue of sustainable farming within the catchment of Lake Taupo for existing and intending catchment landholders. The large number of contributors to the issue and the range of research objectives they are attempting to meet has made it difficult for catchment landholders to make informed business decisions. Put another way the project is not an attempt to bring new scientific knowledge to bear on the issue but rather to make what is already available more commercially useable. However the project does attempt to establish the dollar value of nitrogen credits should they become a tool in the management of nitrogen emissions. While the social and economic impacts of a nitrogen market have been subject to some discourse, to date I know of no research that has valued nitrogen credits. I believe landholders need such information before legislation is passed on the issue and before a nitrogen market is established, in order that they can prepare their responses.

In this report sustainable farming is defined as those farming practices that are carried out within the knowledge of their contribution to the catchment wide nitrogen emissions. It assumes the sum of all those activities will have returned Lake Taupo water quality to it’s year 2000 levels by the year 2080.

Declaration of Interest: I have been an elected a member of Taupo Lake Care Inc. since September 2004 and own a 142ha intensive beef breeding and finishing farm within the Taupo catchment.

1.0 PROJECT BACKGROUND

1.1 DESCRIPTION OF THE TAUPO CATCHMENT

Lake Taupo was formed some 1800 years ago following one of the largest known volcanic eruptions in modern times. The lake, the largest in New Zealand (area 620 square km, mean depth 95m) and its surroundings are

generally regarded as a significant tourist attraction and an iconic natural resource by most New Zealanders. It is a taonga of specific significance to the Ngati Tuwharetoa people in whom ownership of the lake bed, feeder rivers and streams is vested. Central government has identified the water quality of Lake Taupo as a national sustainable development issue and has prioritised action in its Sustainable Development Action Programme.

The catchment is physically defined by the Kaimanawa Ranges to the east, the Hauhangaroa and Pureora Ranges to the west. The mountains of the Tongariro National Park to the south and an area of low lying hill country to the north through which the only drainage from the catchment- the Waikato River exits.

1.2 HISTORY OF DEVELOPMENT and LAKE DETERIORATION(1)

> Lake Taupo's excellent water quality is derived from extremely low levels of plant nutrients and phytoplankton. Unlike many other lakes, nitrogen availability rather than phosphorus limits phytoplankton growth in Taupo. Increased nutrient flows, especially nitrogen, from intensifying rural land use and from urban growth in the catchment promotes algal and phytoplankton growth and threatens water clarity and the excellent water quality of the lake. Historically, the catchment of Lake Taupo was covered in tussock grassland and native forest (Leathwick,et al, 1995). Since 1840, much of the tussock has been replaced with pine plantations and pasture. In response to concern about erosion of pumice soils following the development of the Taupo catchment in the 1960s, many streams and eroding hillsides were fenced to exclude stock, and some riparian areas were planted with native wetland species to reduce nutrient runoff to the lake. Even so, nitrogen inflow has increased in all measured streams since the 1970s. Nitrogen concentrations are also increasing in the bottom waters of the lake, as are levels of chlorophyll A (a measure of phytoplankton biomass) (Gibbs, 2002).

Pastoral agriculture in the catchment is dominated by sheep and beef farming, but intensification and a shift to more intensive dairying began recently (Edgar 1999). Elsewhere in the Waikato, intensive pastoral systems, especially dairying, release high loads of nitrogen to surface and ground waters (Vant, 1999; Wilcock et al., 1999). In contrast, plantation forests yield very low nitrogen loads similar to those from indigenous forests.

(1) Paragraph from Petch. T.et al., 2003: Protecting an icon – managing diffuse sources of nutrient runoff to Lake Taupo, New Zealand. In: Bruen,M. (ed): Proceedings of the International Water Association 7th International Conference on Diffuse Pollution and Basin Management. Pp50-55, University College Dublin, Ireland.

1.3 LEGISLATIVE DRIVERS

Environment Waikato is the Regional Council with legislated responsibility for the protection of Lake Taupo via the Resource Management Act (RMA). The Proposed Waikato Regional Plan is the mechanism by which Environment Waikato outlines its intention to meet these legal responsibilities. Within this plan the current Draft Variation- Lake Taupo Catchment (14th September

2004) is a discussion document attempting to define the issues facing the lake and the possible options for their solution. Three key objectives are outlined in the draft.

Objective 1

Ecological health of Lake Taupo protected, by:

a) A Lake Water Quality Target-Nitrogen entering Lake Taupo being maintained at the level which reflects the Lake's total annual load of nitrogen (1200 per annum) by 2080

b) A Nitrogen Leaching Target – 20 percent of total annual manageable load of nitrogen leached from rural land uses and wastewater systems permanently removed from Lake Taupo catchment by 2019

c) Nitrogen Leached from land capped at present levels

Objective 2

Wastewater treatment and disposal does not cause an increase of nitrogen or wastewater pathogens in shallow near shore waters, relative to background levels of nitrogen or pathogens leached from existing land uses close to the lake.

Objective 3

Social costs of achieving nitrogen reductions are minimised and the financial costs are spread across local, regional and national communities

Objectives one and three are of primary concern to farming businesses within the catchment and are the focus of this project.

Following a lengthy process of submission and debate on the draft it is Environment Waikato's intention to gazette the Lake Taupo variation to the Regional Plan by July 2005. The compliance provisions for the achievement of the three objectives will come into effect 1st July 2006 and will be progressively enacted from that date.

1.4 POLITICAL/SOCIAL DIMENSIONS

From a farming business perspective the fundamental and concerning outcomes of this proposed legislation are:

1. That farming is no longer a permitted activity on any land that is classified Rural Environment in the Taupo District Plan but under section 3.10.5.6 becomes a controlled activity subject to standards and conditions.

2. That there will be a cap imposed on the amount of nitrogen able to be leached from each farming property. This in effect limits farmers from growing their business and therefore their income, while at the same time increasing their compliance costs. Many farmers have seriously questioned their ability to survive in such an environment. Any production gains in the future will reliant on science and technology producing tools, that are acceptable to Environment Waikato as reducing the nitrogen leached from farms.

Many farmers see these two legislative changes as an erosion of their property rights and fundamental to the ownership of title to land. In a Social Research Working Paper commissioned by Environment Waikato, Kaine & Higson (2004) state the following:

> The removal of the privileged status of the right to discharge nitrogen has further ramifications. The unrestricted right to discharge nitrogen was part of the parcel of rights attendant upon land ownership.To create rights to water quality that prevail over the unlimited right to discharge nitrogen implies that the attenuation of the parcel of rights attendant upon land ownership in this manner is justifiable……We have argued that the adoption of a water quality standard that constrains the discharging of nitrogen amounts to a redistribution of rights and wealth to the benefit of non-dischargers. This means the selection of a standard of water quality is not simply a technical matter. It is also a matter of informed social choice."

Equally what started out as an issue specific to the Taupo catchment now has every likelihood of setting a precedent for virtually all farming activity carried out on any land described as the Rural Environment by any regional authority in New Zealand. The precedent setting potential of this process is perhaps why both national and local government have been at pains, right from the outset of negotiations, to establish that no compensation for any losses suffered by farmers will be payable. The total cost of achieving a 20% reduction in manageable emissions has been estimated at $85million (Ministry for the Environment). Half of this amount will be funded by government and half by increases in Taupo District Council and Environment Waikato rates. This figure was established nearly three years ago and may now prove to be inadequate.

Note: It is to the credit of all parties involved in the debate to date, that the level of issue identification and solution that has been achieved has occurred in such a constructive manner.

1.5 NITROGEN TRADING

A nitrogen budget for Lake Taupo developed by Vant and Huser (2000) has estimated that the current nitrogen load is approximately 1,200 tonnes per year. The various sources are illustrated in Table 1.

Table 1: Source of Nitrogen into Lake Taupo

	Attenuated tonnes	% of total	Area (ha)
Rainfall on the lake	229.4	19.1%	63,932
Wetlands	3.7	0.3%	1,844
Tongariro Power Div.	80.5	6.7%	
Urban sewage	17.3	1.4%	
Urban Runoff	15.8	1.3%	
Bare ground & Tussock	62.2	5.2%	31,078
Indigenous forest/shrub	246.8	20.6%	123,388
Planted Forest	131.6	11.0%	65,819
Sheep/beef pasture	387.4	32.3%	51,967
Dairy Pasture	23.6	2.0%	933
Total	1198.3	100%	

Source: Vant, B. & Huser, B. (2000): Effects of Intensifying catchment land use of the water quality of Lake Taupo

Table 1 lists 'attenuated' nitrogen entering the lake as opposed to leached nitrogen. When nitrogen is leached into ground water and streams, it is further attenuated by in-stream processes. For example it is estimated that 709 tonnes of nitrogen is leached from pasture in the catchment yet nitrogen entering the lake from pastoral farming is 411 tonnes. As it is the leached nitrogen which can be monitored and controlled it is the leached nitrogen that would be traded, Journeaux et al (2004)

The possibility of establishing a market for the trading of nitrogen emission credits is outlined in the Draft Variation for Lake Taupo to the Proposed Regional Plan. All stakeholders agree that more research into the operation of such a market needs to be undertaken before it is implemented. Given there is sufficient probability of such a market being established it is would be prudent for any current or intending farmer to understand the factors influencing such a market.

While I have been unable to find any jurisdiction that has established a market for nitrogen credits specifically, Higson & Kaine (2004) have reviewed a range of market based mechanisms in relation to water quality and other natural

resources. In their view " the key factor in constraining the use of tradable permit schemes in natural resource management was the challenge of measuring the use of resources by diffuse sources". There is considerable difficulty in both measuring diffuse sources of nitrogen as they enter the lake and establishing accurately which farming practices that have contributed to those emissions (often decades earlier). It is generally accepted by all stakeholders that there is a need to estimate emissions in an open and transparent manner. Equally as the science applying to this issue improves, that new knowledge needs to be integrated into both the estimations and into the nitrogen market mechanisms.

The estimation process most likely to be used is the nutrient budgeting model OVERSEER, developed by AgResearch (Weeler et al 2003). OVERSEER is currently used by a number of farmers nationally as a means of managing fertilizer inputs. While the Lake Taupo catchment stakeholders have some reservations as to its accuracy it is generally viewed as the best option at the moment.

The nitrogen emissions market would be constructed on the basis that a gifting or grandparenting procedure would be employed to allocate initial permits among dischargers Kaine & Higson (2004). They further state

> Because permits can be expressed in terms of contextual characteristics then, in principle, permits can define constraints on the permissible combinations and levels of inputs into agricultural production processes such as livestock numbers and types. This allows the landowner to evaluate nitrogen permits in terms of the economic value of the combinations of production inputs and management practices possession of the permit allows. The inputs would be translated to give the emission equivalent of kilograms of N per hectare per annum to facilitate trading. …permits can be expressed in terms of the opportunities for using land they make available, which is precisely the basis on which landholders will value the permits.

Permits would be issued to existing landholders as part of a resource consent process for the life of the consent. Allocation would match the landholders historical emissions or be based on benchmarked values for the various farming practices. Kaine & Higson (2004) then detail the mechanisms for managing the market and argue for as little interference as possible in order to achieve a truly open market.

This is a valid approach if the objective is to establish a market for the generation of further economic wealth. In this case the market has the primary objective of managing N emissions within the catchment. Perhaps a more realistic view of the place a nitrogen market has in the management of Lake Taupo water quality was expressed at a recent stakeholders meeting by Tim Bennetts of the Ministry for the Environment –

> Truly free markets in natural resources have not proven to be successful in meeting environmental objectives elsewhere in the world. What they have done is ease the pain experienced by those most affected by environmental policy

On this basis I believe most farmers would consider participating in a nitrogen emissions market. Note: It is not the intention of Environment Waikato to use any possible market in Nitrogen emission to reduce the amount of nitrogen entering the lake. Rather the targeted 20% reduction from manageable sources (essentially farming and urban development) will be achieved by purchasing 20% of the farmed land in the catchment and retiring it, Environment Waikato (2003). The nitrogen market is intended to manage the remaining output.

Valuation of nitrogen credits has not to my knowledge been attempted to date. Section 4.0 attempts this and discusses some implications of various price levels.

1.6 A CATCHMENT MANAGMENT GROUP

Taupo Lake Care (TLC) is concerned that the ongoing impact of a nitrogen cap on farming business is adequately reflected in any final legislation and in any management structures established to manage emissions in the future. Equally opportunities to continue to grow farmer's businesses made available through new research and technology need to be represented in future versions of the OVERSEER nutrient modelling and approved by Environment Waikato. TLC received funding from the Sustainable Farming Fund to investigate and develop a sustainable environmental management system for the Lake Taupo catchment. This management system was originally to comprise two components- a management structure and an on-farm code of practice. With the establishment of farming in the catchment as a controlled activity requiring resource consent, the ability to utilise an on-farm code of practice was negated.

TLC retained Nimmo-Bell & Company to assist with the development of the environmental management system. Their report was completed and ratified by TLC in December 2004. The results have been presented to Environment Waikato and are being considered at present.

The report recommends the establishment of a Catchment management Group (CMG) and outlines the following functions that will benefit from ongoing farmer/landholder representation via the CMG.

- Monitoring the development of rules under the consent process
- Compliance
- Research & Development
- Education, advice and extension
- Audit/Review
- Dispute resolution/mediation process

- Public Relations and media management

It is recommended that the CMG should include representatives of Environment Waikato, Taupo District Council, Tuwharetoa, Forestry Interests and Pastoral Farmers. Landowners are recommended as having a higher level of representation and this is supported by Environment Waikato. The complex relationship between the CMG and Environment Waikato's legislative responsibilities is not discussed here but is well detailed in the report by Nimmo Bell & Co Ltd, (pp25-28).

2.0 IMPLICATIONS FOR LANDHOLDERS

Whilst the different classes of landholders, (foresters, farmers, developers and holders of undeveloped land) tend to have differing views as to the most appropriate method for allocating allowable nitrogen emission rates for their various types of land use, the implications for all of them are remarkably similar. Essentially there are two permanent constraints flowing from the proposed legislation.

Inability to initiate Land use change.
Future land use changes that will increase the amount of nitrogen leached could be specifically excluded. For foresters this means that they may not convert plantation forest into any form of farmland. Undeveloped land, (scrub, tussock, native forest) may not be converted to farmland or residential/lifestyle subdivisions. Sheep and beef farmers may not convert their land to more profitable options such as dairying. In theory conversions could occur where nitrogen credits can be purchased from other landholders in the catchment. Should a nitrogen market operate in the future the limited quantity of available credits and the cost of such purchases could possibly render such land use changes uneconomic.

Increases in profitability linked to approved technology availability.
Many catchment farmers are hoping that research and science will produce new products and technologies that will allow them to continue to grow their businesses and their profits. While this is possible, any such products or technologies will need to be approved by Environment Waikato and then incorporated into the OVERSEER software for nutrient budgeting. Given that the science of nitrogen cycles and nitrogen leaching in pumice soils is still in its infancy it is likely that Environment Waikato will take a cautious approach to the approval of such products and technologies. It is therefore unwise for Taupo catchment farmers to expect a "silver bullet" that will lift economic performance to pre N-cap levels from science. For example farmers hoped that a nitrate inhibiting agent dicyandiamide (DCD) branded as Eco-N and N-Care would reduce nitrogen emissions by more than 20%. It does appear to do this, but at a cost that makes its use uneconomic for sheep and beef

farmers while possibly economic for dairy farmers. (For greater detail see appendix one- Puketapu Group: Open Day paper.) A more realistic view could be that science may produce innovations that allow farmers to mitigate the ongoing erosion of profits from external cost increases under essentially capped stocking levels.

3.0 OPTIONS FOR FARMERS UNDER NITROGEN CAP

From the time that discussion on the deterioration of Lake Taupo began in earnest in 2000 a range of suggestions have been presented to farmers as possible options for economic sustainability within a capped nitrogen regime. Various specialist forestry crops, horticultural ventures such as blueberries and herbs such as Ginseng have been promulgated by those with an interest in the issue but who are not actually farming themselves. The reality is that converting enough farmland to high risk specialist horticultural crops, to significantly reduce nitrogen emissions, in the absence of valid business plans, is not attractive to most current farmers.

The overwhelming consensus from farmers at field-days organised to discuss the issue and at meetings held by Taupo Lake Care is that farmers want guidance on best practice farming techniques that allow them to stay farming and contribute to the solution of the Lake water quality. They have an emotional commitment to remaining as farmers and there are considerable sunk costs involved in their current farming regimes. For example it takes a number of generations to build high performing genetics into sheep flocks or cattle that are profitable within the Taupo climate and soils types. Capital infrastructure on farms, such as fencing type and facilities such as wool-sheds are not easily changed at the best of times. To expect farmers to risk new capital when they are unsure as to the future legislative environment is unrealistic.

It is perhaps for these reasons that farmer support, for research into their future options, has gravitated towards analysis of a range of conventional farming practices being tested via a Ministry of Agriculture and Forestry Sustainable Farming Fund (SFF) project. Known as the Puketapu Group Project and based on support from five large Maori Trust farms it critically evaluates new farm management options for the catchment. In addition to SFF funding the project is supported in cash and kind by ; Taupo Lake Care, FertResearch, Dairy Insight, Environment Waikato, Wrightsons seeds and Genetic Technologies.

The paper released at the public open day held on 28th April 2005 (Appendix one) reports on progress to date. Additional reports from work carried out by AgResearch, Ravensdown Ltd and Balance Ltd are included. A hypothetical sheep and beef farm of 480ha with annual pasture growth 9800kg/ha and stocked at 11.5 stock units/ha is used as the base farm. A total of 13 different farming options have been analysed and comparison made of their gross margin per hectare, the nitrogen leached (expressed as kilograms of nitrogen per hectare per year and the gross margin per kilogram of nitrogen leached. All options are at or below the likely maximum nitrogen emissions benchmark for sheep and beef farms of 12 kilograms N per hectare.

Table 2. Farming alternatives with profit calculations and N outputs.

Alternative	Farming Description	N fert. Kg/ha/yr	GM/ha $	N leached Kg/ha/yr	GM/kg N Leached $
1	Base, 117% lambing	0	464	11	42
2	Added N, 117% lambing	17	482	12	40
3	136% lambing	17	492	12	41
4	136% lambing, finish 3 crops store lambs	17	519	12	43
5	117% lambing, no cows, buy weaners April, sell as R2 steers	17	449	11	41
6	117% lambing, no cows, buy weaner August, sell as R2 steers	17	390	11	35
7	117% lambing, sheep only, no cattle	17	549	11	50
8	Finishing cattle only, no sheep	17	386	8	48
9	117% lambing, DCD giving 5% pasture response	17	380	10	40
10	117% lambing, cattle stand off (winter)	17	460	11	42
11	Grass silage harvesting & sale	17	280	4	70
12	Pine trees, contractors used, no annuity paid	17	470	3	157
13	150% lambing, fewer cows, 10% in pine trees	17	621	12	52

Adapted from work by Bruce Thorrold(Dexcel) Duncan Smeaton, Stewart Lidgard of Rex Webby (AgResearch)

It is not the intention of this paper to recommend which options should be taken up by farmers. Each farming business is unique and a range of decision making criteria need to be applied by the owners in order to establish which option suits their particular set of values. To this end the post doctoral research into Multi Criteria Decision Making (MCDM) being carried out by Dr Liz Dooley of AgResearch could well be of use to some farmers. Her project is not specific to the Taupo catchment but participants in the issue, including scientists, legislators, private farmers and Maori Trust Farmers have been invited to take part in the research. While the results are yet to be published my own participation in the model has shown that it is a useful tool for ensuring you consider all the factors that influence your decision making. Perhaps more importantly, it encourages you to focus on the factors that others involved in the broader water quality issue need to consider. Some interesting comments/conclusions are emerging from both MCDM project and from workshops carried out on the Puketapu Project open day.

- Most farmers are not keen to consider options 11 (grass harvesting and sale) and option 12 (forestry). They wish to stay farming livestock

- While the sheep only option (7) is very profitable many consider that this is unworkable as cattle are needed to maintain the pasture quality necessary to finish lambs and to minimise the parasite burden and drench resistance common to sheep only systems.

- Option 8 (no sheep) has the one of the lowest gross margins per hectare but one of the higher gross margins per kilograms of nitrogen leached. The mismatch of feed demand and feed growth curves associated with this option is one of the factors producing these seemingly contradictory results.

- Option 13 (150% lambing, fewer cows and 10% of the less productive land planted in pine trees) fares very well using all three performance measures. This option is only attractive if farmers can withstand the cash flow difficulties associated with trees. Equally the environmental benefits may be negated by increasing stocking rates on the better land to compensate for grazing retired for forestry. Payment for carbon credits generated by the trees or annual payments from the lake quality fund to farmers to convert part of their farm to tree production may be a possible solution. Neither option is on the table at present and cannot be part of any business plan.

- Because of the contour of much of the farmland within the catchment it not suitable for many alternatives to livestock production. Machinery required for economic grass harvesting or for horticultural production could not negotiate most of the land area.

4.0 THE VALUE OF A NITROGEN CREDIT

To date I am not aware of any attempts to establish the value of a nitrogen credit should such a market exist in the future. I am aware that the Ministry for the Environment is intending to commission further research on the impact of such a market and this may provide for some estimates of the value of a nitrogen credit. In the interim, legislation allowing for the establishment of such a market within the District Plan Variation is shortly to be debated and possibly challenged before the Environment Court. To ask farmers to accept or reject such legislation in the absence of Nitrogen credit value information is "unfortunate" at the very least. The calculations following are not presented as anything more than an attempt to encourage debate on the specific value of a credit and hopefully more detailed modelling of nitrogen markets.

Sheep and Beef Regimes

Income per kilogram of nitrogen Leached.

The gross margin per kg of N leached per hectare from the various farming options in Table 2 above range from $35.00/ha to $52.00/ha. The average is $42.50 per kg of nitrogen.

The cost of reducing nitrogen leached

The trials involving Eco-N provide one view (admittedly limited at this stage) of the cost of reducing nitrogen outputs. Under a sheep/beef regime (capped at 12 kg N/ha) the product has been initially assessed as achieving a possible 20% (2.4 kg N) reduction in nitrogen leaching. (This figure is from the Puketapu Group trials; other research has shown reductions of 30% -60% but over limited scale and time frames.) At an applied cost of $126.00/ha this equals $52.5 per kg of nitrogen removed. As this is greater than even the best gross margin/ ha for this class of farming it is unlikely to be used.

Note: Under a Dairying regime a similar percentage reduction in Nitrogen leaching is achieved. But as a proportion of a much larger figure (25kg N/ha reduced to 20kgN/ha, appendix 1) for the same applied cost of $126.00/ha this equals $25.20 per kg of nitrogen removed. It may therefore be economic for Dairy farmers to use Eco-N.

Dairying Regimes

Work by Bruce Thorrold (Dexcel) and Duncan Smeaton, Stewart Ledgard and Rex Webby (AgResearch) on Diary Farm systems modelling for managing nitrogen (see appendix 1) shows gross margins per kg N leached ranging

from $26.00 to $66.00. The average of the four systems modelled was $49.00- very similar to sheep and beef systems.

Grass Harvesting for Sale outside the Catchment

While this option can only be applied to the small area of flat to rolling farm land it does provide an indication of the possible maximum income per kilogram of nitrogen leached from grass production at $70.00 (table 2).

Conversion to Forestry

Pruned pine trees showed the highest return per kilogram of nitrogen leached at up to $157.00 per kg N per hectare and a gross margin/ha similar to most of the farming options(Table 2). However, very few farmers in the catchment wish to exit livestock farming and convert to forestry. Equally there are many examples, outside the catchment, of pine forests being converted to livestock farms either at tree harvesting time of while the trees are still relatively young. The cash flow implications and the uncertainty of log prices 30 years out from planting have provided enough problems for major corporate foresters let alone individual farmers.

Given that forestry leaches 9 kg N less than the 12kg N for a capped sheep/beef enterprise the establishment of a nitrogen market where a farmer could receive an annual income for the 9kg N/annum may provide incentive for some to convert. As the market would be restricted to other land holders in the catchment who are farming one could reasonably assume they would not pay more than the $44.20 average gross margin/kg N. This could mean a possible income of 9 x $42.20= $380/annum from other farmers. This takes no account of any reasonable margin for risk/profit for the nitrogen credit purchaser. Without testing the market over time it is impossible to determine the number of likely conversions resulting from such a market.

Discouraging farm Subdivision and Lifestyle Property development.

It is generally accepted by Environment Waikato that small lifestyle type farming properties do not contribute as much nitrogen as intensively farmed large properties. The scale and rate of subdivision of large farms to 2-4 hectare lifestyle properties within the Taupo catchment is an issue for both Environment Waikato and the Taupo District Council (TDC). This is perhaps best evidenced by the recent moratorium by TDC on further subdivision between Taupo Township and the Kinloch area because of concerns over uncontrolled growth and its impact on services and infrastructure. Even the best possible farm incomes are not sufficient to match the prices subdividers are prepared to pay for farmland close to Taupo and with lake views. If the returns from the bulk of farms within the catchment under a capped nitrogen regime fall below a certain point (this will vary according to individual

circumstances and preferences) then the option to subdivide becomes increasingly attractive.

To be effective in maintaining the visual “landscape” that both the public and tourists seem to prefer and is an objective of both Environment Waikato’s Regional Plan and theTaupo District Plan, the value of a nitrogen credit needs to be sufficient to compensate for income reduction caused by the cap. Assuming that farm income will stay relatively static under a cap and that costs (currently between 50% &60% of gross income/ha) will erode profitability at the rate of inflation, say 3% per annum, it will not take many years for most farms to become unprofitable. The target of 20% N reduction will be reviewed after 10 years as part of the consent process and may need to be revised upwards. Applying this ten year time frame to increasing costs could mean a likely gross margin/ha of less than 20% by year 10 to a capped farmer. If they had any debt servicing costs at all they would have long ago sold to a developer. I am not sure a nitrogen market would solve this dilemma, because in theory the farmer, by continuing to farm has no nitrogen credits to trade. It may therefore be necessary to “gift” nitrogen credits to farmers over each ten year review period in recognition of their future contributions by way of forgone income. This process would further complicate the establishment of the value of a nitrogen credit and likely destabilise any such market.

The value of a Kilogram of Leached Nitrogen

Assuming that there are willing sellers and there are willing purchasers and a nitrogen market, restricted to those in the lake catchment, has been established. The likely range of values drawn from the discussion above also assumes that the greatest demand will come from sheep and beef farmers as they represent the largest pool of potential purchasers. Should farmers be the only sellers then it is unlikely that nitrogen credits will be offered at less than minimum farming return of $35.00/credit/annum. Equally farmers are unlikely to offer to pay more than the cost of reducing nitrogen leaching from their current system. That is- $52.50/credit/annum (using Eco-N)

Giving a range of: $35.00 - $52.00

To apply this to a sheep and beef farm with an initial allocation/cap of 12 credits of nitrogen/annum that was converted to forestry (making available say 8 credits). This would give a potential income range from nitrogen credits of $280.00 to $416.00 per hectare per annum in the early stages of a nitrogen market. A similar calculation would apply to those farmers with suitable land contour that chose to harvest grass for sale outside the catchment. Further points to consider:

- Dairy farmers may be willing to pay slightly more than sheep and beef farmers but their low numbers are unlikely to influence the market to any great extent.

- If foresters and holders of undeveloped land are given an allocation of nitrogen credits under any final legislation, as an incentive for them to

remain as low level contributors of nitrogen emissions, and they chose to make them available this could effect the price paid.

- It is impossible to predict the impact that reducing margins, (resulting from capped stocking rates and uncapped costs), would have on the value of a nitrogen credit. It is likely to be negative if farms become less economic over time- causing land use changes that release more credits onto the market, while lower margins reduce the price purchasers can afford.

5.0 SUGGESTED FURTHER RESEARCH

The current research, referred to in this project as the Puketapu Group, into nitrogen leaching under various farming systems within the Taupo catchment is due to continue for at least two more years. Given the significance of this issue to the long term viability of farming within the catchment it would seem critical to continue research into long term/sustainable strategies for maximising farming profitability without increasing nitrogen emissions. Ways must be found to achieve farm productivity increases that at least match cost increases in a capped environment.

The fact that the Taupo catchment is both highly sensitive and clearly defined has allowed a clear focus on the water quality impact of farming systems. Similar concerns have emerged over other central North Island Lakes such as Rotoiti and Rotorua. The reality is that all farms in New Zealand drain into either lakes or rivers. Therefore the water quality impacts of farming will become a concern for all farms over time. At the same time farming businesses are increasingly required to lift production to stay competitive in a global marketplace and to counter rising costs. Knowledge of the interface of these two conflicting drivers is still limited. It seems reasonable over time to encourage all research into productivity gains for farming systems to be carried out in conjunction with research into the nutrient impacts of such productivity gains. Farmers and those responsible for maintaining the quality of our national waterways need this information in order to make informed choices. The range of soil types and differing climatic conditions through out New Zealand adds further variables to effective decision making by both parties.

The need to fully understand the social and economic impacts of nitrogen credit trading within the Taupo catchment has been outlined. Research into these impacts has been mooted by the Ministry for the Environment- in my view it is critical to achieving the goal of fair legislation. Again economic modelling, on a national scale, of the risk to New Zealand's economy of nitrogen emission controls would seem at the very least valuable if not essential. As consumers' world wide become increasingly aware of the environmental consequences of their food purchasing choices, they are likely to demand evidence of the sustainability of the farming practices that produce the meat, wool and dairy products that form a significant proportion of our GDP. Without information on this issue New Zealand will not be able to establish a significant point off difference over emerging low cost agriculture producers such as South America. Evidence of environmentally benign or

sustainably produced food may, in the future, be the minimum necessary for New Zealand's continued participation in world markets. Equally it could well represent a significant branding opportunity and provide enhanced returns.

The research by Liz Dooley into the effectiveness of Multi Criteria Decision Making (MCDM) is to be continued. I would like to see the tool made available to every farmer within the catchment. It may not significantly alter their final decisions but could well help them come to terms with the range of conflicting drivers imposed on them by a capped environment.

6.0 CONCLUSIONS/SUMMARY

If you will excuse the pun - livestock farming within the Lake Taupo catchment is at a watershed point! The achievement of long term economic viability for farming businesses while permanently securing the water quality of the Lake is a significant challenge. The precedent setting impact of the final legislation and its eventual impact on farming businesses throughout New Zealand should not be underestimated.

The debate between the various parties to the issue over the last four years or so has been remarkably constructive. Largely because there has been a genuine attempt by all to maintain dialogue and explore solutions. The reality is however that this has been the consultation phase of the process. As we now move to the implementation phase and the enactment of legislation the dynamics will undoubtedly change. The issue will almost certainly result in challenges by a number of parties before the Environment Court. Political agendas and pressures will likely assume more significance than the current evidence and science based drivers.

My interpretation of the early results into farming options under a cap by the Puketapu Group project suggest:

- That farming businesses can improve gross margins per hectare by manipulating stock classes and improving lambing percentages.

- That farmers consider a mix of forestry for poorer classes of land on their farm and intensive livestock on the balance to maximise returns.

- The option of removing livestock from farms during the critical nitrogen emission months (May- July) will significantly reduce leaching. The real costs of this option lie in the loss of access to winter premiums for finished stock and the increased cost of restocking during the period of high nationwide demand for stock in spring. A mechanism for recognizing and rewarding the nitrogen credits achieved from this approach would need to be implemented to offset this and encourage uptake.

- Because of the contour of much of the farmland in the catchment livestock farming is the only option for most farmers. Conversion to horticultural crops is not realistic and large scale forestry is generally unattractive.

Operating a farming business within the Taupo catchment is an individual choice subject to a complex set of values and drivers. The decision to continue is perhaps most confronting for those who were encouraged to farm in the catchment by government departments/policies over the last forty years. A sense of betrayal is common amongst this group. For those who have recently chosen to move to the catchment, with an awareness of the issue, the challenge is more about acquiring enough knowledge and information to make sensible and viable choices. For both groups of farmers it is important to recognise that in order to protect their investment in farming, they will need to become actively involved in debating and influencing the implementation phase. I have chosen to farm within the catchment recently, because I believe it is possible to run an economically viable and environmentally benign farming business in the medium term. The challenge will be to make it happen in the longer term!

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