

Introduction

My name is Katherine Robertson. I grew up on sheep and beef farm in North West Nelson. I have been involved in farming or associated with it all my life.

I have a Trade Cert in sheep farming Advanced Farm Management through TCI. I have a B Com (Ag) from Lincoln Uni majoring in Farm Management and Rural valuation. I am a registered Rural Valuer (currently non practicing) I have a Professional Masters from Lincoln majoring in Ag Business. I have completed the Intermediated and Advanced Sustainable Nutrient Management from Massey Uni and I have done the 2 day course with the Waikato Regional Council, Soil Conservation and Land Management Training Course for Farm Consultants and Rural Professionals.

I have worked on a sheep and beef farm in Nelson, Dairy farm in Gore, Cropping farm in Blenheim. Been in a farming partnership for 12 years, sheep and beef and for the last 10 years run a sheep and beef operation in the King country on my own. I ran 620 ha's which increased it to 1100 ha's and now I am running 560 ha's.

I have also worked for Valuation NZ as a Rural Valuer and for banks as a Rural Manager. I have been over a lot of different farms and seen a lot of different areas of NZ. It has given me a good understanding of different farming systems and a working understanding of how natural systems are interlaced together.

Introduction of topic

In farming you have to work with nature. Farming is about working with all parts of nature like Soils, plants, animals, water, and weather. You are also working with the economic reality of markets, social requirements and regulation. Farmers have very little control over any of it.

I have as you know put in a number of different objections to the Waikato Regional Plan Change 1. I will touch on all of them but I am going to start with the nitrogen cap set by Overseer and the sources of nitrogen. I am quite passionate about legumes and how they benefit the ecology of the soil. The nitrogen cycle is naturally occurring and is a vital part for the soil, plant and animal health.

Nature is a complex interwoven entity which works in ways we only vaguely understand. There are examples all over the world where the 'do gooders' have created negative outcomes and bigger problems due to their short sightedness and lack of understanding. NZ included.

Legumes

I really think councils should be embracing legumes and promoting them not criminalizing them. And here is why. Their ability to 'fix nitrogen' means that they can live in relatively nutrient-poor habitats. They enrich the soil around them and thereby allow other plant species to regenerate.

Legumes grow all over the world. No where have I read anything about how you can not drink the water here, because a high percentage of legumes grow in that area. I have heard of councils who are going to spend thousands of dollars to kill the gorse growing along the river banks to reduce the N₂ build up in the soil. In Nelson gorse covers whole valleys. Big old man gorse and it has been proven that gorse can fix up to 200kg/ha (-1) of nitrogen annually. But the streams which flow out of the area are pristine clean with no nitrates or weed. It has been like this since the 1950's when gorse was planted. I have drunk straight from the stream with no ill effects. Has any one ever tested the water out of these areas? Perhaps you should look at testing in isolation to help the issues.

Legumes have been created by nature. They operate in the natural system and they find a balance. The legume takes nitrogen from the atmosphere and fixes it onto its root nodular. There it stays until it can be exchanged for another cation. The key here IT MUST BE EXCHANGED, therefore a cation attached to the soil particle must be exchanged for the N₂ attached to the legume root. This way the plant uptakes nutrients and the N₂ is attached to the soil particle.

The legume does not fix the nitrogen then waves goodbye to it as it sails away in the soil solution. It has to be exchanged. For another cation. So the N₂ is locked in the soil ready to be used by another plant or by the microbes to help break down dead matter.

This has been backed up by my personal experience. I had a lucerne paddock which I had to spray out after 5 years due to weeds. It was then direct drilled into winter start which is a short term annual lasts about 6 months. Normally you need to apply 2 to 3 applications of Nitrogen to it as it is a nitrogen hungry plant. In this case the paddock did not need any nitrogen. It grew prolifically, dark healthy leaves and I had trouble controlling it. It reseeded and lasted for 2 years. For that to happen the nitrogen fixed by the lucerne was held in the soil.

The total area in Lucerne was 8 ha's and all of the run off went into a dam at the bottom of the slope. This dam was used to pump water for stock. The water remained clean and clear and maintain a population of Azolla. It was also full of frogs and leaches both of which need good quality water.

When you plant a clover and ryegrass paddock you are often advised by agents to apply N₂ to it to get it going. Well when you do that you suppress the clover development. When large amounts of nitrogen are applied, the plant literally slows or shuts down the nitrogen fixation process. It is easier and less energy consuming for the plant to absorb nitrogen from the soil than to fix it from the air. It is well documented that externally applied N inhibits both nodulation and N fixation in legumes (Dixon & Wheeler 1983; Goergen et al. 2009). In other words, as N levels increase, nodule weight, density and fixation rates decrease and dependence on mineral N₂ increases (Streeter 1985).

So you apply N₂ to the soil which is not attached to any plant or soil particle so its free to go where it wants. If the plant can grab some as it flows past then that's great but other wise it flows through the soil profile and into the water ways. Then you have to apply more N₂ to keep the grass growing and we are into the nitrogen fertilizer bind.

The overseer program has a fixation on the amount of Nitrogen which is applied via fertilizer, animal urine or fix by legumes.

It does not differentiate between the different sources of nitrogen, it groups them all together in a total and this is incorrect. Therefore a farmer who has high percentage of legumes is penalized compared to one who applies a large amount of N₂ via fertilizer.

Fertilizer is applied by assessing the state of the plants by eye or by the need for a flush of growth. In many cases this may not be the limiting factor. Legumes supply N₂ to the soil as required as detailed above.

Summary of Legumes

Councils want legumes reduced on farms and in areas of exposed land. This is because there is no distinction in Overseer as to the sources of nitrogen. It can be artificially applied or from natural source. To achieve this they are prepared to spend thousands of dollars killing gorse growing along water ways.

Now I am no fan of gorse having spent thousands of dollars killing the plant, but you have to admire it. It grows in difficult areas, steep bare open areas. It has a strong root system which stops sediment reaching the water ways and it slows the water down which reduces the erosion. It also provides a very good nursery plant for natives to establish and in the King country it has protected the Giant Weta from extinction.

Well if you are going to kill gorse and you want legumes on farms reduced then you have to be consistent and not just pick and choose. So here's a list of native legumes to NZ that should be on your hit list.

Kowhai (I notice that councils are planting these)

Kaka beak

NZ broom (both abundant in NZ forests until the possums got hold of it)

Matagouri

and best of all

Azolla Rubra plant Now this plant grows in the water. God help us.

Under field conditions this plant can accumulate up to 2-4 kg's of nitrogen per hectare per day, That's 1.1 tonnes of nitrogen per hectare per year, and almost three times the performance of legumes such as clover at around 400 kg of nitrogen per hectare per year. Now it is all through the North Island and the South Island and we also have the Australia Azolla pinnata which is quite invasive, which is currently located in Northland and Auckland areas only.

This plant species is so good at fixing nitrogen in the water that the Chinese farmers 1500 years ago used it in rice paddies. It also takes up phosphate.

So it really should be on your hit list. Lets ignore the fact that it has been here fixing nitrogen before man arrived same as all the other legumes from around the world with no negative effects on the water ways but many positive results. Overseer counts it as bad so it must be and you all know more about nature than nature does it self.

Overseer

Overseer is a model. It is a very extensive one which pulls a lot of information together. However it is still a model. If you tie regulations to a model then you are asking for trouble. They get upgraded as new research is done. Just ask Horizons about the mess they are in

because it was all tied to Overseer. I know you also have issues with Overseer in the Taupo area. I have not used the new version yet but I have used the 6.2 model. The system could not cope with my farming system. I had to fudge details like putting a block into a 'cropping block' because it couldn't cope with 3 crops in a row and then 8 years in grass. This immediately affected the carbon levels in the soil according to Overseer which then affects the amount of nitrogen leached. I use crops which do not exist in Overseer so had to try and pick another crop which appeared to be closest in comparison. I have stock which did not exist in the system. All of which gives inaccurate results.

But the main problem is that we place all of the data into the overseer find a suspect result and then work backwards to try and change it to get the result we want. This places a huge ask on the program and a massive reliance on the ability of the operator. All open to error.

We do all of this work and data gathering to find a supposedly correct result of how much nitrogen is leaching from the system but in the final analyses the biggest influence is rain.

The amount of rainfall and the timing of it has the biggest influence as to how much water is traveling through the profile and therefore according to your models how much nitrogen is leaching into the water ways.

Oh wait the legumes bind the nitrogen to soil particles so it is not leached and then we have the nitrogen fixing plants which actually live in the water ways and do no harm. Yet you count them in the supposed leaching outcome.

I know everyone is struggling to reach positive outcomes and trying to find some way to place a measurement on the systems but please do not tie it all to a single model.

There are better models currently being used like Lucci. But these should be used as a tool not as a black and white answer. I know people want a system which is easy to use and has yes, no responses. That is how our society now operates so people don't have to think.

It makes your life easier and allows you to put regulations and penalties around the outcomes which is how you have operated. It allows you to have a set of rules which you can arm your staff with, to send into the field. Perhaps you should spend more time training your staff.

Nature is complex and for all of us to find a workable solution we have to work together and trust each other. We all have to be open to all the information available and recognize that not one system is right. If this does not happen then, you will fail on so many levels.

The issue with the water ways deteriorating has only really surfaced since the expansion of the dairy industry and the intensification of the dairy farming. The requirement by the government to milk on the shoulders of the seasons (when its wetter) which has required increased use of nitrogen fertilizer plus purchased feed. This has all resulted in a much higher rate of nitrogen applied per hectare. Other farming operations have also got more into the nitrogen application in their moves to increase productivity. The pasture management of rye and clovers which is what NZ pastoral system was based on and our advantage is being lost. Its easier to ring up the fert truck.

We used to laugh at the UK applying nitrogen to their pastures and the issues that they had

with their water. Not any more.

The Nitrogen cap, Grand parenting and Stocking rate

As I have explained there is a large variability between years driven by weather patterns. The weather has the biggest influence on the farming variability between years. After that it is the world and domestic markets. Sheep and beef farmers must be flexible in order to survive

Here's why

I run a sheep and beef operation which includes many classes of stock. Cows, heifers, weaners, bulls, steers, ewes, ewe hoggets, finishing lambs, winter lambs and rams.

The stock numbers vary between years based on the stock market, weather conditions and now M Bovis effects things as well. The pasture management alters between years due to the variations in seasons.

I have had 3 droughts in a row and this is not uncommon. It affects you stocking rate your feed and cropping policy.

The cost of bull calves may be low so I could buy them instead of ewes.

The bulls may be sold at 18 months but if it's a drought I may sell them at 2 years old because the price is so low. To carry them through I may have to plant some short term crops and or apply nitrogen.

I may plant a nitrogen demanding annual to fill a feed gap or I may have a paddock with a high legume concentration.

I may have to apply nitrogen in spring cause I am short of feed cause spring is late but other years I haven't.

These are all management decisions made regularly over different years. Farming is a long term business. It takes 2 years before you get a calf from your heifer Then if your policy is fattening steers it will be another 2 to 2 1/2 years before you can sell that steer from the heifer. That's 4 to 4 1/2 years before you are in a stable state. Now if that was your policy but the drought forced you to sell your R1 steers for 2 years then you will have a gap while you wait for your steers number to build back up. (Repurchasing R1 steers could be to expensive so you wait). The reduced stock numbers could be filled with fattening lambs. If the nitrogen cap is set over this period then once you get back to your 15 year policy you will find yourself in breach of the cap even thou this is the policy the farm has run successfully for years

This could send farmers broke as they will lose their flexibility to match the feed and stock to the season and markets.

In my case I have ran 140 Friesian bulls on a 18 month policy for a number of years. I sold them out about 3 years ago and didn't replace due to a drought and price. Since then I haven't replaced because of the risk of M- Bovis. I have a cattle stud and cannot risk being put under movement control by MPI. To fill the gap I am fattening winter lambs. I have been lucky because the price has been positive for lambs.

These are all decisions that are consistently made by sheep and beef farmers in order to match feed and markets. You remove that flexibility and you will effectively strangle them financially.

The stocking rate the nitrogen cap and grand parenting all come back to the nitrogen being leached from the farm based on Overseer. Taking data from one year and saying that is your maximum and limit is not a true indication of the farm's performance. It must be taken over a 5 year period and Overseer itself works on a 5 year period. One year is simply unworkable and will leave people in unreasonable situations.

Nitrogen limit for Sheep and beef farms

Wow You set the limit for sheep and beef to be 15kg/ha/yr Wow. Do you want us to actually exist.

I have completed an Overseer report on the farm which I run. Version 6.2 It showed a net loss of nitrogen to the water ways of 22kg/ha/yr. As you know this includes the measurement of the legumes in the pasture.

Just to show how unrealistic this program is, here is an example. I have high clover content in many pastures but when I ticked high clover in the Overseer screen my nitrogen leaching jumped dramatically so I ticked medium and the answer became more acceptable. I talked to a consultant and they said they always tick medium otherwise their clients would be out of business.

I would not be able to actually function with a limit of 15kg/ha/yr. In order to try and meet that limit I would have to sell stock, stop cropping and stop fertilizing. Effectively the farm would become undeveloped and back to growing summer grasses which have very little feed quality and no winter growth.

And yet you want us to meet our requirements like rates. I pay \$19,000 rates a year plus the regional rates of \$2300 that's a total of 21,300/yr.

Don't underestimate the amount sheep and beef contribute to the economy and the health of the regional economy. We are the largest employers in the agricultural industry. A Westpac study dated 2016 found that the meat and wool industry employed 103,000 full time equivalent and the next closest was Dairy who employed 50,000 full time equivalents. Shut us down and you will have a massive unemployment problem and we all know what that leads to. Just look at Northland and what they are struggling with.

Our contribution to the national economy for the year of 2016 2017 was 6.7 billion for the red meat sector. This does not include wool. The dairy industry contributed 13.6 billion for the year 2016. That's a total of 20.3 billion for the red meat sector and the dairy combined.

Shutting us down would cause a large social unrest in the rural communities and have a flow on effect to the cities.

Winter crops grazed in situ

I winter my cows and weaners on winter crops. This allows me to maintain my stock numbers through winter ready for the spring growth. If I had to winter them on a stand off pad the costs would simply be uneconomic. If I could not winter them on crops my stocking rate would have to be dropped and I would become unviable.

By feeding them on a crop the plugging is limited to one area which ensures the rest of the farm is not damaged by heavy animals. The area in crop is then regressed and left in grass

for another 8 to 10 years. I use the crops to improve the fertility of the soil and pasture species. It also allows me to focus on any weed problems in that area. Some crops require a full cultivation but many only need to be direct drilled. This has little impact on the soil structure and reduces the runoff.

Fencing off water ways and grazing land > 15 degrees

I have got a map supplied by Super air showing the slope categories of the farm I run. As you can see, parts of it all over the block are steeper than 13 degrees.

You want them fenced off so that the stock do not graze those areas. What a mess that will create.

A lot of the farm is Ash soil but some of it is Papa. I am also in a high wind zone like a lot of the area. Just check the wind shape of the tree's. The more tracks you put in the more you open up the land to water and wind erosion. Short fence lines do not hold their strain and the movement of the ground is going to affect the life of the fence. You will end up with broken fences doing nothing other than creating a trap for animals. You will also end up with more sediment being washed down the hills by run off. The leaves scars on the hills will remain open with the constant effect of the wind.

On Papa soil it is constantly moving and the more you open it up with tracks the more it will move. You are just creating more damage and increased run off. When you put a track or a fence line in, you are removing the supporting soil on the bank. The soil above the cut slumps and it just gradually moves up the slope. Result the whole slope slumps into the creek at the bottom.

Stock like to drink out of water troughs. They don't like drinking out of shallow water. So if offered a choice they will travel to a water trough past a wet spot to drink. Neither do they like standing at awkward angles which is what they have to do to drink out of a gully. You will have less damage if you simply put in water troughs and leaving the streams on the steeper slopes alone.

I know that there is a movement to remove cattle from steeper land due to damaged caused by their movement. Well did you know that when a cow urinates on a slope the urine runs down the hill as it seeps into the soil. In doing this it effectively spreads the urine patch. As you drive around you can see strips of dark green grass where the cows has urinated on a slope. This reduces the amount of nitrates released into the water ways.

It is spread over a bigger area so more plants get a chance to use the nitrogen and the surface area is larger therefore the microbes in the soil can break it down faster. When a cow urinates on the flat it is all in one smaller area and it travels down through the soil in one spot, therefore more of it runs into the ground water.

Therefore cows on steeper hills have less of an impact on the ground water than those on the flat.



Area is calculated as Surface Area based on 15m DEM (NZDEM_505_v1.0 - University of Otago)

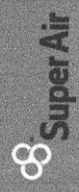
Legend

- Slope Categories
- 0 - 12 Degrees (460.3 Hectares)
 - 13 - 25 Degrees (154.6 Hectares)
 - Over 25 Degrees (22.7 Hectares)

Map Information

Date 15/02/2017
Property SAP ID
Nutrient Specialist Amy Tomsett
Scale 1:14,128
GPS Projection New Zealand Transverse Mercator

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Tree's

These are the flavor of the month. The government wants you to plant them. Overseas buys can own them. Pine forest only leach 2 to 3kg/ha/yr so they are just wonderful. Now we have the forestry saying how good they are at employing people.

I was working in Masterton when large tracts of land was planted in tree' They were supposed to supply employment to the area No that didn't happen. They bought in outside gangs who planted. Then they came back to thin and then to harvest. Locals got nothing. The forest industry is becoming more and more mechanized due to health and safety plus the problems of getting qualified labour. The result is even less people will be employed and forestry is not a large employer to start with.

In Masterton schools closed, small towns closed and unemployed soared. Benefit to the locals none.

The councils had problems. All of their roads were damaged with the logging trucks. Gisborne is having the same problems now. Rates dropped as the value of the land dropped. The number of rate payers dropped. Overseas owners didn't maintain the firebreaks or remove trash. Major fire hazard just look at Nelson fires or the Port hills.

I grew up in Nelson which is a major forestry area. They are onto their 3 to 4 planting. Guess what When you keep harvesting logs the ground runs out of nutrients. So they are now applying boron, nitrogen and phosphate to the soils That's what happens when you plant and keep harvesting. Now pines are a mono culture. It becomes unbalanced and you are selling all of the nutrients overseas.

It is recommended that you don't apply more then 30gN/pine tree when young and that when they are older normally at thinning your application of nitrogen shouldn't exceed more then 200kg/ha. The actually forests may require up to 400kg/ha of nitrogen. I wonder what the leaching from the forests is when they apply the nitrogen? This is from a study carried out for the Waikato Regional Council.

Pines also a major user of water. In the Moutere the streams were dry most of the year. When they harvested the tree's the streams ran again until the tree's reached about 8 years old. Then they all dried up again. I wonder how that goes with maintaining water levels in streams?

Summary

I have struggled at times to write about stuff which I consider basic information. It feels a bit like trying to tell you how to such eggs. All of this information is out there easy to be accessed yet you come up with a plan that is so far removed from realty it isn't even workable. None of us exist in isolation and neither does this plan. Objecting to one point of the plan is very limiting and I consider unproductive. Farming has been taking place for over 2000 years and if it was as bad as we are projected to be then we wouldn't be here at all.

It is important to look to the knowledge of the past as well as the future. The future is built

on the actions of the past. Sheep and beef farms produce less nitrogen than dairy farms and the water ways have been very healthy for many years. I am located in the Piopio area and currently swim in both the Mokau and Mangaotaki rivers. I even have fresh water mussels in the river. They only exist in high quality water. Yet the surrounding land has been farmed for generations. Now you want to make major changes which have long reaching results on the fabric of our society based on inconclusive research.

Please don't play god and pretend that you know how nature works better than it does itself. Accept the fact that if it is natural then it really is not doing any harm to nature. After all the Azolla plant is an example. On your plan you should be out there killing it by spraying with nasty chemicals. That plant is credited with sequestering enough carbon to cause a 80% drop in the CO2 concentration from 3500ppm to 650ppm in the atmosphere 49 to 47 million years ago.

I know that new research is taking place all the time which in some cases disputes some of 'knowledge' used today. Don't make sudden and radical changes. Work with nature and all of the parties. This is a long term goal and the results will not be available for a long time. You are working in the dark with no real answers.

I have covered the topics which I think are most useful and which I firmly believe the council should take into account. I am constantly blown away by the belief of people in power that they have a better understanding of nature than nature does it self. We all only know a small amount of how the world operates.

I know that you are all struggling to find a solution but lets work with nature not against.

Thank you