BEFORE THE COMMISSIONERS APPOINTED ON BEHALF OF THE OTAGO REGIONAL COUNCIL

UNDER	the Resource Management Act 1991 (the **Act** or **RMA**)
IN THE MATTER	of an original submission on the Proposed Regional Policy Statement for Otago 2021 (**PRPS**)
BETWEEN	**OTAGO WATER RESOURCE USER GROUP** **Submitter OS00235 and FS00235** **FEDERATED FARMERS NZ INC** **Submitter OS00239 and FS00239** **DAIRY NZ** **Submitter FS00601**
BETWEEN	**OTAGO REGIONAL COUNCIL** **Local Authority**

EVIDENCE IN CHIEF OF EMMA CRUTCHLEY

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EVIDENCE IN CHIEF OF EMMA CRUTCHLEY

Introduction

1. My full name is Emma Crutchley, I am a sheep, beef and arable farmer at Puketoi Station, 1838 Puketoi-Highfield Road, RD4 Patearoa. I am a mother to two children Evelyn (9) and Reuben (7), a wife and farmer with my husband Kyle. I have farmed in the Maniototo, where I grew up, since 2009.

2. I hold a Bachelor of Agricultural Science (Hons) from Lincoln University. I have previously worked as an agronomist for PGG Wrightsons and Landcorp (Pamu).

3. In 2018 I graduated from the Kellogg Rural Leadership Program. This included a research topic around effective environmental policy, and freshwater governance.

4. In 2019 I graduated from the course 'An introduction to New Zealand Greenhouse Gas Emissions and Management' through Massey University. I follow closely along to all developments in this space including the Primary sector Partnership He Waka Eke Noa and the Climate Commission's advice around emissions pricing.

5. In 2021 I graduated from the Agri-woman's Escalator Program. This is a well-respected and established leadership and governance program for women in primary industries and/or rural communities.

6. I am co-founder of Upper Taieri Wai's Tiaki Maniototo Project. Tiaki Maniototo is a project initiated through funding from the Freshwater Improvement Fund to carry out riparian fencing, native planting, weed and pest control, enhance native fish habitats and recreational areas and improve walking access, across the wider Upper Taieri Catchment. It is also intended that a catchment-wide management plan is developed around the vision and values of the community, stakeholder groups and the regional council. The freshwater improvement fund has provided $4.5M in funding, with a further $1.5M commitment from the community and wider stakeholder groups such as Otago Regional Council, Fish and Game Otago,

Department of Conservation and The New Zealand Walking Access Commission.

7. This project began in August 2021 and took 1 year, of largely volunteer time, to build. The vision is to create environmental outcomes that go above and beyond what any policy framework can do for the betterment of future generations in our community.

8. In 2022 I was elected as Otago Arable chair of the Otago Federated Farmers executive. As of October 2022, I was elected director of Irrigation New Zealand.

9. I have previously been a director (6 years) and Chair (2.5 years) of the Maniototo West Side Irrigation Company Limited ("West Side"). And previously was a representative director of Maniototo Irrigation Company ("MIC**"**). My work with MIC included the environmental portfolio, working with environmental policy as well as with Trustpower and consultants on the management of minimum flows in the Taieri River.

10. West Side is effectively half of the Maniototo Irrigation Scheme. The other half being the Maniototo East Side Irrigation Company and Waipiata Irrigation Company. The Maniototo Irrigation Company owns the headworks of the combined scheme including the Loganburn reservoir.

11. The various permits for this scheme will expire in 2034. It currently operates to maintain minimum flows at the Paerau Weir and Waipiata (The green bridge). It is anticipated that these minimum flows will be reassessed when the new Land and Water Plan is promulgated. Although, at this point in time we do not know what the change might look like.

12. This year I have also contributed to Ministry for the Environment working groups around Freshwater Farm Plans and Biodiversity Incentives. For Freshwater Farm Plans I have contributed to the national practical implementation working group. Puketoi is also

participating in the mock farm plan implementation to see if the plans are practical and valuable when applied to the real world.

Executive Summary

13. This evidence draws on my experiences on farm at Puketoi Station, the Maniototo and in the sector generally.

14. Any understanding of our farm management relies on an appreciation of the region's extremely complex climate, which I address first.

15. I then discuss the farm's vegetation, pests and weeds and techniques and challenges used for controlling these. This provides a gateway into a discussion of the rural community's inherent ability to manage their own challenges and meet limits and thresholds developed by authorities.

16. The community is often willing to go further than the minimum requirements and head towards a much higher level of compliance with environmental standards. However, these limits and targets need to be clear, achievable and work towards a desired outcome. Pressures including pest control and water shortages are not going away. Increases in regulatory requirement need to consider this.

17. Transition takes time even under normal circumstances, as is shown through the process undertaken at Puketoi to adapt irrigation since 2000, which I discuss in this evidence. This adaptation has built resilience to all areas of the farm but also demonstrates the time and willpower required to adapt irrigation storage and systems. This is even before considering the finance required to undertake such a change.

18. A combination of extensive regulation and incorrect perceptions of the sector has led to an increasingly unrewarded and burnt-out rural leadership. The only option has been to leave councils to provide for environmental outcomes. Councils often lack the on the ground knowledge and can be unreliable. This has resulted in rules and regulations that lead to undesirable outcomes. One example I

discuss is the stock exclusion regulations, which in some cases have resulted in the proliferation of exotic grasses.

19. Uncertainty slows down decision making because choices must be made about what to invest in. Regulatory compliance requires cost input. So, if one rule is uncertain, then another will be prioritised rather than risk a wasted investment.

20. Changes on farm cannot be immediate. They require time, progression, and adaptation. Farmers need more information to make better changes. The best results are achieved when change can be sustained and you can give people time to process, plan and implement it at their pace.

21. The hearts and minds of rural communities have a big role to play in managing our environment:

> We pride ourselves on Kiwi ingenuity, having a number eight wired attitude, a love for DIY and the unfailing sense that everyone should be given a fair go.[1]

Puketoi Station

22. Puketoi Station is a ~3000 ha property consisting of hill country and flat. Ranging from 300 meters above sea level (masl) to 1000 masl at the top of Rough Ridge. It can be broadly broken into the following parts:

    (a) ~1350 ha hill and high country.

    (b) ~820 ha of flat to rolling dryland country including 2 ephemeral creek beds (Waitoi and Dingo Creeks).

    (c) ~475 ha of irrigation 98% Centre pivot and K line spray. 2% Border dyke / flood to supply a storage dam.

    (d) 350 ha of Upper Taieri Scroll Plain and wetland complex.

23. We run 6500 crossbred ewes and 180 stud Angus cows. All lambs born on the property are finished. This means they go direct from us

[1] Brookes, E. (2014) Its Academic: Tailoring the message. Safeguard. Sept/Oct 2014.

to meat companies at a weight and size that fits the carcass specifications for export. We buy in a further 1000-2000 small lambs from other farms in January that are grown out and finished. Twenty-five Angus bulls are sold for breeding each year, with the remainder sold store or finished.

24. The New Zealand climate favours pasture growth, which means that efficient livestock systems here are unique from an international perspective. The Puketoi livestock system is based around matching pasture supply to animal demand – a typical NZ farming system.

25. Stock numbers of sheep and cattle are considered carefully and balanced, so that they complement each other. Breeding cows are a tool to control unproductive areas, weeds and lower quality pasture to improve growth rates of sheep and lambs and younger cattle.

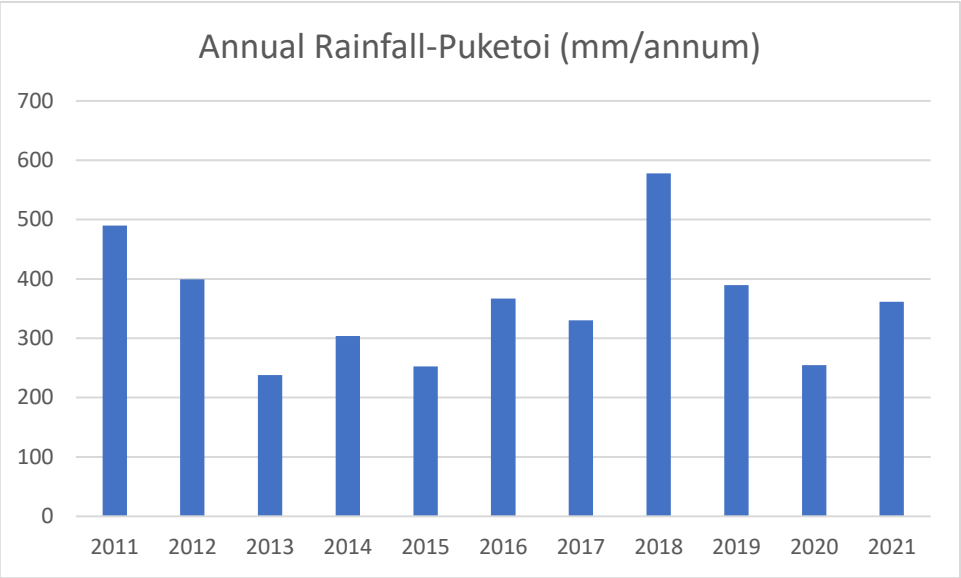
26. We annually grow 240 tons of barley for livestock feed. Most of this is sold to other farmers locally while a small amount is kept to feed our own sheep in winter. Also, 60 tons of rye corn seed is harvested and sold for greenfeed to farmers in our region. 95% of this is grown under irrigation.

Climate

27. Temperatures can be as low as -8^{0}C frosts in winter. Sub-zero temperatures commonly occur between May and October, and it is not uncommon to experience temperatures above 30^{0}C in summer. Summer evapotranspiration rates (ET) are up to 9mm per day, which can mean that even with irrigation (generally 4.5-5mm/day) soil moisture levels reduce.

28. Our natural rainfall is extremely low with 350 mm average annual rainfall relatively evenly distributed throughout the year. As a comparison Makarora, Otago's most western point receives 2447mm annually, areas in North Otago receive 500mm average, whilst most areas in Clutha received in the order of 800mm. Soil temperatures allow pasture growth from September until the end of

April, but soil moisture deficit can occur all year around - peaking from November until March due to ET rates.



29. This dry climate alongside high sunshine hours and lower internal parasite pressure means that stock health and growth rates are of a high level.

30. This is an extremely diverse climate, matching the summer temperatures of northern areas in the North Island but with much longer and more extreme winter temperatures. Figure 1 below depicts the mean monthly air temperature of Alexandra (close to us in Central Otago) and Dunedin and the estimated sea surface temperature off the south-eastern coast of Otago. Figure 2 showing the nation's average temperatures alongside Northland and Southland. [2]

[2] Sourced from Climate and weather of Otago. Available at: https://niwa.co.nz/sites/niwa.co.nz/files/Otago%20Climate%20book%20WEB%202021.pdf and Climate and Weather of New Zealand https://niwa.co.nz/static/web/NZ_Climate-NIWA.pdf

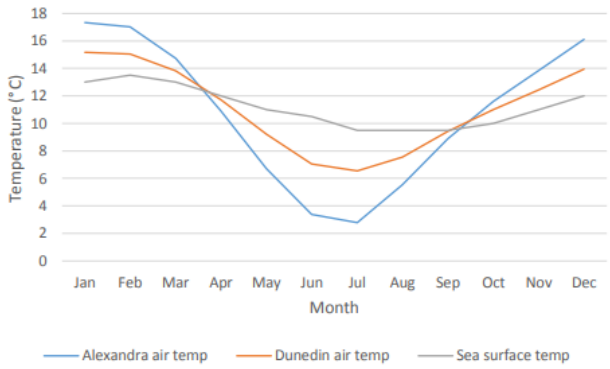


Figure 1. Mean monthly air temperature (Alexandra and Dunedin) and estimated sea surface temperature (off the south-eastern coast of Otago).

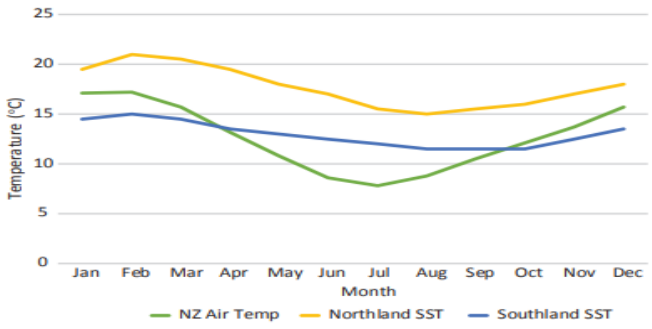


Figure 2. Mean monthly air temperature (New Zealand) and estimated sea surface temperatures (off the coast of Northland and Southland).

31. Soils are a mixture of yellow grey, and yellow brown sedimentary soils with a moderate to low ability to hold water (soil water holding capacity). This means less frequent higher rainfall events or water applications; water will run off or move through the soil profile to ground water rather than be held by the soil to support plant growth.

32. Irrigation provides the farm system with resilience to respond effectively to extended periods of low rainfall and resulting soil moisture deficit.[3]

[3] Soil Moisture Deficit: 'The difference between the amount of water actually in the soil and the amount of water that the soil can hold'. See Figure 3.

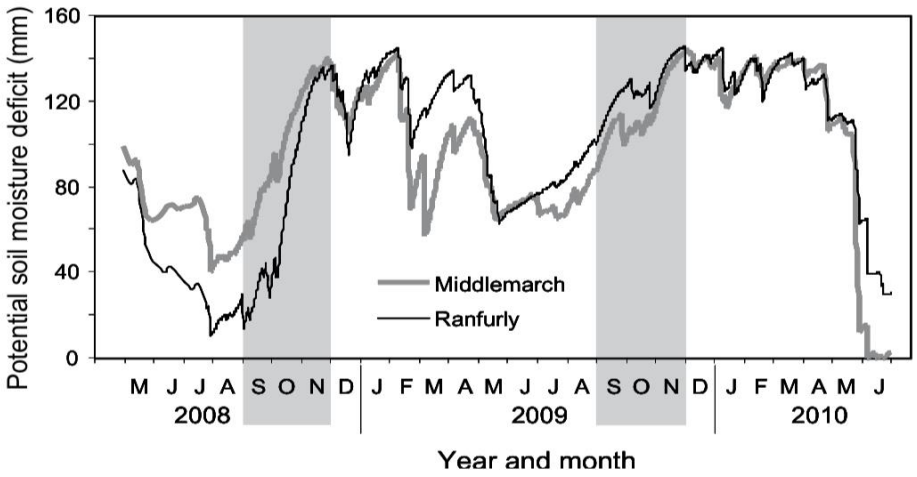


Figure 3: Potential soil moisture deficits (SMD) from May 2008 to June 2010. Shaded areas indicated the main spring growth period (NIWA, 2010).

Pests and weeds

33. Pests such as rabbits thrive in this climate and in the past have reached plague proportions. This has created a huge amount of economic and environmental damage. Individual efforts to control rabbits are typically unsuccessful as they are not contained within a property boundary.

34. Rabbits have been successfully kept at low numbers by a community owned and operated pest company for many years now. Maniototo Pest Management takes a whole community co-ordinated approach to controlling Rabbits and is one of the most successful pest management schemes in New Zealand.[4]

35. Pests such as white geese cause damage to pastures and impact water quality on the 350 ha of Upper Taieri Scroll Plain on Puketoi. In future Wallabies' may also become a problem. The founding and implementing of a local pest control company is evidence that these challenges are best tackled at a local, catchment level.

36. Every year we also invest in the control of weeds on the property, such as crack willows, broom, and briar.

37. This shows the ability of rural communities to manage their own challenges and meet limits and thresholds developed by authorities

[4] https://www.newsroom.co.nz/bright-spot-in-souths-rabbit-war

and go further to achieve a much higher level of compliance. However, these limits need to be clear and achievable. Pest pressures are not going away so any proposed increases in input and regulatory requirement costs need to appreciate this.

38. When communities are given the opportunity or are incentivised to work together this pulls the thinking from an individual level to a catchment level. Tackling the problem at this level creates the opportunity for better/higher level outcomes. This reduces the risk of the tragedy of the commons dilemma. As an individual that person will likely pursue their own self-interest, but in a group situation the dynamics require that the focus shifts to shared outcomes.

Maniototo Irrigation Scheme and irrigation at Puketoi

39. The Upper Taieri catchment is protected by 5 minimum flow resource consents. These include conditions that upstream users/schemes cannot take water once levels drop below the downstream minimum flow.

40. The Loganburn Dam at the top of the catchment supports these minimum flows through consents held by the Maniototo Irrigation Scheme. These consents are tied to flow levels at the Paerau Weir, and the Waipiata Minimum Flow setting.

41. Minimum flows were historically set through a rigorous community consultation process to allow for aquatic ecosystems and natural character values and allow for the sustainable taking of water (Otago Regional Council, 2015). Sub catchments within the Upper Taieri also work to maintain residual flows (established through a similar process) on smaller rivers such as the Kyeburn.

42. This will be revisited through the Otago Land and Water Plan. Water for irrigation will be reviewed as part of the consent process when they are renewed in 2034.

43. Any reduction in allocation for water use would not result in extra water during periods of low flow because of the consent attachment to minimum flows that are already met. Compliance with consents is

often exceeded. Currently the community works together to maintain flows that exceed these minimum flows during dry periods.[5]

44. Flush flows are an important part of maintaining in stream values and natural character of the river. Irrigation takes have had little influence over this because generally irrigation water is at low demand when weather conditions create the flush flow. However, there is a case that water taken for storage can impact these flush flows.

45. Below 95% security supply for existing infrastructure is unreliable. Irrigators will develop infrastructure using scientific data (Aqualinc reports) to use their set allocation with around 95-100% security. This means they will be able to fully irrigate that developed area, gaining benefit from the expense.

46. If there was less water available for irrigation, we would likely need to find ways of compensating for this by establishing more storage. This might be at a catchment level, or it might be on farm. If we need to build on farm storage it will take several years to find a suitable site (if one could be found), design the storage system, construct it and change the way our existing infrastructure operates to accommodate it.

47. All of this is also contingent on being able to carry it out at a pace that can be financed. The ability to obtain and service debt can influence the speed at which some of these changes can occur.

Irrigation at Puketoi

48. Puketoi has a 9% shareholding in Maniototo West Side Irrigation Company Limited ("West Side"). This equates to 403 shares and allows a maximum allocation of 7.5 mega litres per share. 10% of that maximum allocation is allowed to be extracted within a 20-day period.

[5] https://beeflambnz.com/news-views/farmers-keeping-eye-downstream

49. Allocation is charged on volume used. This means the overuse of water is disincentivised because of extra cost ($/ML). Unused allocation remains in the river or in storage, that can then be used to support minimum flows in the Taieri.

50. Puketoi does not have private water rights and takes all its irrigation water from West Side.

51. When the scheme was built in the late 70s and early 80s, we converted 350 ha of dry land to border dyke irrigation. This added resilience to our farming system, but it soon became apparent that it was not the most efficient use of an allocation of water because of our soil type (light soils) and the environmental impact. Water was applied on a 20-day rotation with no regard to climatic conditions, soil water holding capacity or farm management constraints.

52. Since 2000 Puketoi has been through a long process of investment in irrigation efficiency upgrades. Between 2009 and 2019 alone Puketoi Farming Company spent approximately $3.1 million on converting surface flood irrigation to spray. That has only been possible against the surety of supply of irrigation water through the term of the MIC permits.

53. In 2012 a 100-ha block was purchased of which 80 ha was irrigated meaning we irrigate 475 ha in total.

54. Today we irrigate mainly using centre pivot irrigation and 80 ha of K Line systems which apply water to match soil water holding capacity. 98% of our water is applied via spray.

55. This investment has built resilience into the farm system. This means we are less likely to run short of feed or get in a position where we need to sell store stock or borrow capital to deal with an adverse event (financial or environmental). Store stock are animals that are sold to other farms at a lower value because of limited feed or ability to get to meat work specifications.

56. In 20 years, breeding cattle and sheep numbers have increased by 0.5 Stock Units per ha. This is roughly 1 extra sheep per 2 ha. Efficiency gains include the following:

(a) We are more easily able to match feed supply with demand. Drymatter (feed) production on our irrigated area has increased from around 8t/ha/year to around 10t/ha/year. This means surplus is carried through to plug periods of feed shortage.

(b) Smaller spray applications of on average 5-7mm every 30 hours are better suited to keep soil moisture at an optimum range for pasture growth (this matches the timing and amount applied with the soils ability to hold the water). A border dyke system involves applying an excess amount of water all at once (every 20 days), so most of the water applied is lost through the soil profile or run off over land. Soil moisture levels then reach deficit levels again within a few days and limit pasture growth.

(c) Today 98% of our irrigated area is spray. This means we only take irrigation water when it's needed, as opposed to being on a roster system where if you don't take the water you lose the opportunity and have to wait another 20 days. This means that even if we do not quite need the water, we are best to take it.

(d) Conversion to spray systems has reduced irrigation run-off (often with high *E.coli* and DPR levels) to the Upper Taieri Scroll Plain and wetland complex and reduced modelled kgN/ha lost to ground water from 25 kg/ha to ~5kg/ha (Overseer figures for irrigated area).

(e) The 2% of irrigated area that is still border dyke runs off into a storage dam and is used for an 80-ha pivot irrigator further down the farm.

(f) We can reliably supply 100% of finished lambs to market 10-12 months of the year.

(g) An irrigated area has greater benefit as part of an extensive dryland system as opposed to a standalone area because of its complimentary effect. It makes both the irrigated area and the dryland area more efficient because each can be used strategically to better utilise the other.

(h) We can farm through extended dry periods without needing to access store markets to reduce stock numbers. This benefits the whole supply chain as we can state with surety the number of lambs we will have to a particular weight, 3-4 months in advance.

(i) Due to consistent feed supply, we finish lambs to a heavier specified carcass weight and faster. This is because livestock never take a check in periods of feed shortage. There is also a reduced carbon footprint from lambs never having to be shipped off farm and finished by someone else.

(j) We can consistently have enough winter feed (silage/balage) on hand to last through two winters meaning we can respond effectively to a weather event without needing to purchase feed in. Winter brassica crops can be grown to a consistent yield with reliable water allowing us to feed budget well in advance of the winter. With dryland crops yield can be unreliable depending on soil moisture levels.

(k) We have diversified into seed and grain production which adds another source of income (and another level of resilience to the business). As noted above this is restricted by climate and late frosts.

(l) We employ a whole extra labour unit on the farm.

57. For the income generated from a sheep and beef operation each pivot required borrowing capital to finance the investment. Following this it takes 3-5 years of time and investment to fence, build soil fertility and regrass the area. Below is the typical process that we ran through as we converted our borders to spray:

Year	Action
Year 1	• Pivot installation, power supply • 50% of the fencing • 33ha (1/3 area) planted with spring crop. -spray, cultivate. level, capital fertiliser, seed • 33 ha Autumn greenfeed Crop -spray, fertiliser direct drill
Year 2	• Remaining 50% of the fencing • 33ha into spring crop (ex greenfeed) -spray, cultivate, level, capital fertiliser, seed • Previous years brassica crop (33 ha) -direct drill, fertiliser short term ryegrass pasture • 33 ha – Autumn Greenfeed - spray, fertiliser direct drill
Year 3	• 33 ha into spring crop (ex greenfeed) - spray, cultivate. level, capital fertiliser, seed • 33 ha into permanent pasture (ex brassica crop) -spray, direct drill, fertiliser, seed
Year 4	• Short term pasture back into brassica crop • Last 33 ha to permanent pasture (ex brassica crop)
Year 5	• Crop into permanent pasture

	• Enters normal pasture rotation

58. Main points from this

(a) Doing all the development in one year would mean borrowing extra capital.

(b) It would be too much of a risk to the feed curve and feed supply to spray out 100 ha at one time.

(c) Regardless of available capital, and feed supply it also takes time to break down soil thatch and raise the soil fertility of a biological system.

(d) As I mentioned previously, we spent a total of $3.1M on irrigation upgrades. The costs of pivots installed in 2016 has now doubled (regrassing costs are not included in the 3.1 million).

(e) It would also face additional costs of consenting today which takes time.

59. The transition from border dyke irrigation to the spray system and operation that we have today with the positive environmental, economic, and social outcomes has been a 20-year journey. Having the time and access to the tools we needed to do this allowed us to plan and investigate the most cost effective and environmentally sustainable and efficient pathway to get where we needed to go. We were then able to work around seasonal changes, family requirements, and income to achieve a positive outcome for the business, our environment, and our rural community.

Environmental Challenges and the Changing Dynamics of Farming

60. New Zealand Agriculture is unique from an international perspective because we farm animals outdoors using pasture-based systems. We can achieve this because of our temperate climate. This allows us to efficiently match a pasture growth and crop rotation system to

animal demand. It is efficient and unique on an international scale allowing us to access key high-end markets.

61. Effective environmental policy creates behaviour or practice change in a way that is suitable for the needs of rural communities. Nature, freshwater, biodiversity and pests move across boundaries. Freshwater quality on one property may be good, but if it is not downstream then the outcome has not been achieved.

62. How we achieve environmental outcomes is dependent on the ability of landowners to work together to find solutions across boundaries. If policy is focussed on individual farmers, it results in siloed behaviour where compliance levels are reduced to individual properties.

63. For example, the landowner at the top of the catchment may farm within his environmental limits for sediment discharge but the compounding compliant level of sediment loss means that the farmer at the bottom of the catchment is not compliant.

64. Rural communities in Otago are built around the economic gains from pasture based agricultural systems. The systems create employment not only on farms, but to all rural services including contractors, rural supermarkets, hair salons, and local schools. The economic system that rural communities are built around is strongly interconnected with the environment. All actions interact with that environment (not always in a negative way).

65. Currently, we are facing a period of unprecedented change across the world and the food and fibre sector is no exception. For farming communities this is a great opportunity, but also a challenge as we navigate being interlinked so strongly with the environment around us. Because of this interconnectedness, changes to address environmental challenges in the agricultural sector need to be mindful of the flow on effects or unintended consequence of this change to businesses and the wider community.

66. Environmental Challenges such as Climate Change, Biodiversity, and Freshwater quality and quantity are considered 'Wicked Problems'. A 'Wicked Problem is a problem of such scale and complexity that it can defy solution.[6]

Figure 4 Characteristics of Wicked Problems (adapted from Rittel and Webber, 1973)

[6] https://www.researchgate.net/figure/Characteristics-of-wicked-problems-adapted-from-Rittel-Webber-1973_fig10_332669251

67. Central Otago Sheep and Beef farming are commonly low input extensive systems that are interconnected with the natural environment and as a result highly complex. Some examples of the challenges include:

    (a) Nature is not restricted to boundaries or property rights. Water and pest species move across boundaries between public and private land.

    (b) The nature of freshwater resources is that they are complex and unpredictable, such as interactions between groundwater, surface water and irrigation can occur over many distances. This can lead to arguments around the ‘facts’.

    (c) Agricultural grazing systems can impact soil structure but can also enhance the natural environment through weed control and control of introduced grass species.

    (d) Stock access to waterways can cause water quality issues but they also control aggressive pasture species and weeds - enhancing natural character and hydrology.

    (e) Cattle graze differently than sheep and are much more effective at controlling aggressive and taller pasture species. Though they are heavier and can cause bank erosion and pugging of sensitive areas such as SNAs and Wetlands.

    (f) Aggressive introduced pasture species can outcompete native plants if allowed to grow, leading to loss of native fauna.

    (g) Cultivation and winter cropping can cause sediment loss to water ways. But done right as part of a pasture rotation it is an effective tool to control weeds and is also a cost-efficient low emissions way to bridge a feed shortage compared to alternative all grass systems.

68. Income generated from farm systems enable investment in pest and weed control, riparian planting and biodiversity enhancement. Sheep and beef are low footprint, but are also much lower income

systems. Increase in cost reduces net income, meaning less investment in these initiatives.

69. The role and character of rural communities needs to be carefully considered when setting regulation. Jobs for Nature has invested $1.2 billion in funding. This has fed environmental outcomes across Aotearoa above what regulation will ever achieve.

70. However, this has focussed on funding tangible things like fencing and planting with little recognition for the communities and leaders that make it happen.

71. Neglecting the recognition of community leadership, coupled with a high level of top-down rules and regulation has left leadership burnt out. The role of achieving environmental outcomes is increasingly being seen as that for our regional councils. This limits the opportunity to go above bottom-line compliance and leaves a much higher cost to rural communities.

72. It is important not to lose sight of opportunities, for example water storage opportunities for irrigation can be coupled with solutions around renewable energy and hydroelectric power. Renewable energy is an important element of New Zealand's journey to lower our greenhouse gas emissions.

Regulatory change in recent years

73. There has been a massive amount of regulatory change in the past few years. One example is the application of national wetland regulations to the Upper Taieri Scroll Plain.

74. The Scroll Plain is ephemeral in nature. In an extreme rainfall or snowfall event water will spread over the wider scroll plain like a large slow-moving lake. This mitigates the impact of flooding downstream as the flow is slowed down and trapped in ox bows and ponding areas. Trapped flows will then buffer downstream flows well into a dry summer. Tussock areas also have the same effect through their water retention properties, as well as reducing soil erosion and sediment loss into water ways. Dense introduced

grasses and infestations of crack willows interfere with this hydrological balance by channelling flows and interrupting its character.

75. The Upper Taieri Scroll Plain is home to over 25 species of birdlife and is an important waterfowl habitat. The Taieri River is also home to native fish such as short and long fin eel, common bully and lamprey.

76. The Upper Taieri is a regionally significant brown trout fishery and game bird destination: most of which is accessed through private land with access granted from the good will of local farmers. Our property is very popular for both locals and people from further afield because access is not hindered by deep undergrowth and weed invasions.

77. Threats to the Scroll Plain include:

    (a) Crack Willows – changing the hydrological values of the scroll floodplain, most effectively managed by grazing, and strategic spraying in areas that have had stock excluded.

    (b) Broome and gorse – managed by us.

    (c) Canadian geese and feral pigs – managed through a community owned pest company but stock exclusion and dense exotic undergrowth is some areas is making this uneconomical.

    (d) Blunt inappropriate national rules which limit the tools in the toolbox to manage this unique landscape for positive ecological outcomes for freshwater, biodiversity and in the face of a changing climate, for whole of community outcomes. An example of this is the infestation of introduced grasses from cattle exclusion on large areas.

78. We manage our wetland in line with our farm environment plan:

    (a) Wide riparian (50-200 m) buffer fenced since 2001 excluding cattle from the Taieri Riverbank.

(b) Sheep are used to lightly graze sensitive areas at a low stocking rate.

(c) Cattle and sheep graze the remaining area of wetland/floodplain at a low stocking rate.

(d) Cattle are a vital tool to supressing the growth of introduced fescues, cocksfoot grasses and weeds to allow the native tussocks and rushes to grow over large areas. This cannot be achieved with sheep.

(e) Grazing management also aids pest control and maintains the natural hydrology of the floodplain.

(f) In previous years with public perception around stock accessing sensitive areas we have backed off on stocking rate only to be dealing now with a resurgence of introduced exotic grasses, weeds and pests (crack willows and feral geese).

(g) A sustainable well managed grazing regime is essential for the control of plant pests on the scroll plain.

79. Over the past few years, we have:
   (a) worked to supply reticulated water to all scroll plain areas where cattle are grazed;
   (b) fenced off more sensitive areas;
   (c) extended riparian margins; and
   (d) created a 7 ha reserve to be planted with native plants.

80. Much of this work is currently on hold because of the uncertainty around national policy regarding wetland management.

81. Adjacent areas to Puketoi which have had cattle excluded for many years are largely inaccessible by foot, limiting recreational use and pest control (see Figure 5 and 6).

Wetland Regulations

82. Wetlands are covered in the NPS Freshwater, NPS Biodiversity and the National Environmental Standards. Under these rules:

(a) There is one national definition of a wetland that is being implemented across diverse catchments and environments across NZ.

(b) Cattle must be excluded from wetlands.

(c) To remove a weed from a wetland you must notify the council.

(d) You need to get a resource consent to do earthworks within 100m of a wetland.

83. We farm 350 ha of Upper Taieri Scroll Plain, this area is covered with hundreds of wetland areas amongst open tussock scroll plain. National rules state that we must have cattle excluded from these areas by mid-2023.

84. As mentioned in paragraph 77 this is an example of cattle exclusion from the scroll plain that has resulted in a loss of natural character, crack willow infestation and limited access (see photos below).

Figure 5: Strategically grazed.

Figure 6: Cattle exclusion – ungrazed.

85. Fencing off individual wetlands is unachievable, and fences would be prone to flooding. The easiest pathway for us is to remove cattle from the whole flood plain. Sheep will not be able to control the more aggressive pasture species and willows resulting in loss of native species, natural character and hydrology.

86. The Upper Taieri Scroll plain mitigates the impact of downstream flooding events by slowing the flow of water and catching water in ox bows and bogs in the 3500 ha of scroll plain across the Maniototo and Styx basins.

87. During periods of low flow, the water stored in the scroll plain during a flood moves back toward the main stem via surface flows or groundwater to buffer minimum flows during extended dry periods.

88. With more extreme weather events expected with climate change, the natural character and hydrology of the scroll plain is an increasingly important feature of how the catchment operates. To maintain these features this area needs a separate approach including use of tools in the toolbox to maintain the natural environment, character and hydrology of this landscape.

Change for the future, The He Waka Eke Noa (HWEN) – Primary Sector Climate Action Partnership and Unintended Consequence

89. As changes in consumer priorities shift and farm input costs rise, we must think long term about what the most efficient use of the land is: incorporating economic, social, and environmental values.

90. Emissions pricing is probably one of the most significant areas of change for the food and fibre sector for the past three decades. In 2019 the government passed legislation to bring agriculture into the Emissions Trading Scheme (“ETS”) unless the primary sector action partnership He Waka Eke Noa could come up with an alternative pricing mechanism.

91. If the primary sector partnership cannot meet its milestones and come up with an acceptable pricing proposal, then legislation is in place that will incorporate the primary sector into the ETS from 2025. The ETS would have catastrophic impacts on the primary sector and rural communities across New Zealand.

92. In May 2022 the Partnership put a proposal to government, then in October 2022 the government responded with alterations to HWEN and a 6-week submission process.

93. I am supportive of progress to reduce our agricultural emissions and we have already started on this journey over the past few years. There are unarguable positives that come from these changes although there can be no doubt about the challenges they present.

94. To achieve positive outcomes on farm, farmers are thinking across complex systems unique to our own environment, including the dynamic and changing climate. Within an interconnected ecological system one change can have a ripple effect and create unintended outcomes in other areas.

95. An example of this is the Governments recent response to the HWEN pricing proposal. This proposal took out much of the vegetation eligible for sequestration. The government proposal disproportionally impacted the Sheep and Beef sector, which is a low impact, lower income land use and makes up a significant area of land use in Otago.

96. When we plant vegetation on farm we are thinking across the scales of challenges and what is the best use of that tree or plant such as shelter in an extreme climate, water quality, food production or bank stabilisation.

97. With the original He Waka Eke Noa industry proposal both shelter belts and unfenced native vegetation held a sequestration value. This value was much lower than the ETS eligible forestry, but it still meant that this effort and value was recognised, and, in some areas, we could still justify three important environmental gains with one planting.

98. With the government's proposal it separates the value of investment across these important issues in favour of one siloed challenge which is ETS forestry.

99. The below Venn Diagram shows three ecosystem gains we are considering when investing in farm plantings and existing vegetation:

    (a) The green dot shows where are aiming without emissions pricing.

    (b) The blue dot shows the impact of the original HWEN industry proposal.

    (c) The red dot shows the impact of the Government proposals.

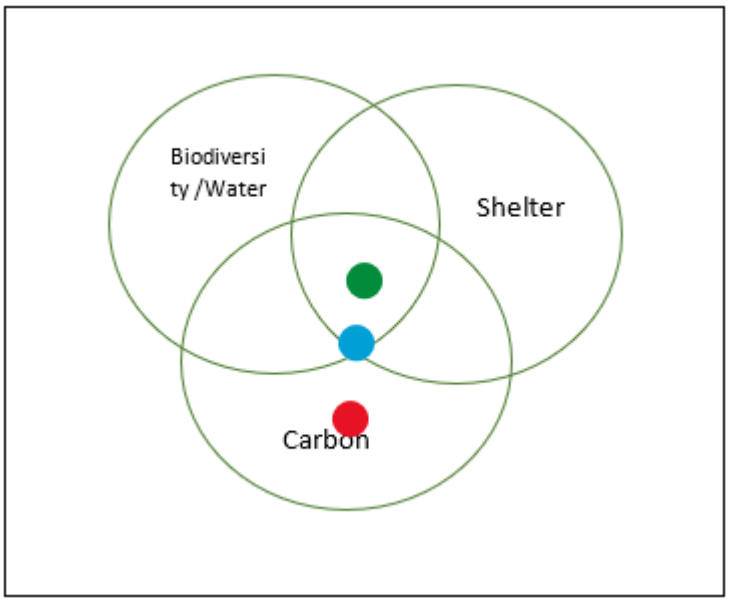


Figure 7: ecosystem outcomes for different levels of carbon regulation

100. It is important to recognise that if we took away agriculture, the land would never go back to the way it was before agriculture. Future legislative and environmental changes require regulations that allow for feedback loops that identify and address unintended consequences as they arise.

101. For feedback loops to be successful, it requires engagement with the hearts and minds of people across our diverse rural communities.

102. Sheep and beef properties like Puketoi are low input and low-income compared to other land uses, such as Dairy. Data from Marlborough suggests that viticulture can bring in $11,832 earnings before interest and taxes per hectare per annum. National data

indicates that these numbers are approximately $2527 for Dairy and $155 for Sheep per hectare per annum.

103. Input costs for sheep and beef properties have increased by ~30% in the past 3 years. This means a decrease in net income that can be invested back into the farm for costs including pest control and riparian fencing. High compliance costs add to this.

104. Increasing costs and pricing emissions can drive behaviour and practice change, but this is not always the right way. It can drive land use to the most economically profitable, and limit profit full stop for land types that have limited options. This assumes that the most economical land use is the most sustainable and that it is socially and/or environmentally friendly. This is not always the case and needs to be considered when policy is developed.

105. Alternative land use options for us include dairy which would enable us to finance higher input costs and compliance costs. Other options include more arable crops but with this we are limited by climate, and access to merchants and local processors. So, this takes time.

106. Many important changes to improve environmental outcomes are already underway or in the pipeline, but sometimes the hinderance is uncertainty around regulation, or the unintended consequence of a rule set to solve one problem that can restrict a landowner from a sustainable alternative.

107. All of this combines to require a significant amount of change over a short period of time. I anticipate that there will be significant further changes required in pursuit of meeting the Freshwater Visions set out in the Regional Policy Statement. For many of us this will all coincide.

108. Change on farm does not happen immediately. It is typically progressive, iterative and occurs over many years as resources (both financial and human) allow. Changes will require a lot of adaptation on farm. Just one example will be the many kilometres of riparian planting that will be required and that will require a lot of

time for sourcing and preparing native seedlings before distributing and planting them in appropriate areas. These changes will require focus to be taken away from the main farming operations, which will inevitably result in either increased cost or reduced productivity.

How do we manage uncertainty and change?

109. As I mentioned above the water that we rely on is secure until 2034. After that we do not know how water availability is likely to change, although we can perhaps anticipate that we may have less of it, or that it will be less reliable. At this point in time, we don't know enough to proactively commence changes. We must wait and see.

110. Regardless of the outcome, it will take time to adapt. Once there is certainty about the likes of water access and emissions pricing, we can work to develop a plan to adapt. Often this will require significant change.

Conclusion

111. I am by nature an optimist and I do believe that our communities will find a way to adapt to the changes upon us. The reality is that we already are. However, it needs to be done in a way and at a rate that can be sustained by the sector.

112. I know from working with Tiaki Maniototo that change can be difficult. Individuals move at different speeds for various reasons. But the best results are achieved when change can be sustained and you can give people time to process, plan and implement change at their pace.

113. The direction of travel is clear – the trick now is not to rush the journey; engage the hearts and minds of rural New Zealand and we can achieve far greater than minimum targets.

Date: 23 November 2022

E Crutchley

Puketoi Station