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Stock water management
The dollars and sense

Developed by:

AGFIRST

Ministry for Primary Industries
Manatū Ahu Matua

In conjunction with:

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WORKSHOP AGENDA

Introductions and overview of workshop
Introduction to stock water reticulation in hill country from two case study farmers
Economics of stock water reticulation
Farmer commentary from stock water reticulation study
Engineering and technical information for stock water reticulation
Farm systems design and environmental considerations
Detail of a case study
Workshop session
Q&A and wrap-up

Introduction

Water is essential for life. Its availability has a major impact on farming productivity. Sheep, beef and deer farmers have faced pressure on land-use for a number of years and much of this farming is now restricted to hill country. As a result, farmers have been striving to increase productivity on their hill country, and water is a critical component of this. Along with land-use pressures, farmers are expected to maintain or improve water quality on their farms, all the while maintaining or improving their economic performance.

Despite anecdotal evidence supporting the investment in stock water reticulation systems in hill country, no formal, publicly-available study had been completed in New Zealand. In 2016, AgFirst were contracted by the Ministry for Primary Industries, Ministry of Business, Innovation and Employment, and Te Puni Kokiri, along with Beef + Lamb New Zealand to conduct an economic analysis of stock water reticulation in hill country. The study itself involved 11 case study farmers around New Zealand and assessed the economics of a stock water system by analysing the farm system before, and after the system was in-place. The total capital investment was considered, including sub-division fencing (where relevant).

This workshop presents the findings of the report. Participants will gain an understanding of the potential economic, environmental and social benefits of a reticulated stock water system. It also helps participants consider stock water reticulation systems in the context of the whole farm system.

Summary of economic findings from the stock water reticulation study

Key points

- Economic returns were significant, with the rate of return averaging 53%
- Average payback period was 3 years
- These returns are based on a combination of increased stock numbers and improvements in stock performance
- Management during a drought was significantly enhanced
- Most of the farmers had also reduced their environmental impact.

The general sequence of events leading up to improved stock numbers/ performance were:

- Installation of the water reticulation scheme
- Increased subdivision
- Better grazing management
- Improved pasture utilisation, and/or better pasture production, and
- Improved stock numbers and/or performance.

The investment was analysed by calculating the NPV (Net Present Value) and IRR (Internal Rate of Return) over a 20-year period, using a discount rate of 8%. The cash flow considered the capital costs involved, including subdivision fencing (a crucial component of achieving the lift in productivity) and any increase (or decrease) in capital stock numbers, changes in farm operating costs, and benefits from increased stock numbers and stock productivity.

A key driver of the productivity gains was the subdivision fencing, which allowed for better grazing management. But, the subdivision was not possible without the provision of water. Thus, the analysis considered both water and subdivision fencing together.

Net Present Value: effectively today's value of an amount of money in the future accounting for all cashflows over a period of time (in this case, 20 years). A positive NPV is good.

Internal Rate of Return: is similar to an interest rate at the bank. You can use IRR to compare the value of investments, it accounts for long-term cashflows and provides you with a rate of return on your investment.

The result of the analysis shows a significant return on the investment:

Farm	NPV ($000)	IRR	Effective ha	Stock units
Horizons 1	$1,057	47%	610	6,358
Horizons 2	$465	22%	590	5,287
Horizons 3	$282	14%	761	8,258
Horizons 4	$817	52%	1,112	9,455
Horizons 5	$809	23%	850	6,556
Northland 1	$506	80%	366	3,348
Northland 2	$1,525	40%	485	5,004
East Coast 1	$1,821	36%	1,850	21,614
Wairarapa 1	$1,358	76%	680	6,755
Canterbury 1	$4,759	85%	5,000	34,431
Canterbury 2	$519	23%	2,100	9,454
Weighted average*		53%		
Raw average		45%	1,309	10,593
Median		40%	761	6,755

**Weighted on effective area of the farm.*

The payback period was also relatively short:

	Payback years
Horizons 1	2.75
Horizons 2	4.5
Horizons 3	7.5
Horizons 4	2.25
Horizons 5	4.25
Northland 1	1.75
Northland 2	4.0
East Coast 1	3.5
Wairarapa 1	1.5
Canterbury 1	1.5
Canterbury 2	4.75
Weighted average	3.0

Across the case study farms, stocking rate increased by 0.5 SU/ha, and lambing percent by 12% after the installation of the water reticulation scheme. Most farms also significantly increased the proportion of animals sold prime versus store, and increased the weight of animals finished.

Summary of farmer comments

Farmers gave various reasons for installing a water reticulation scheme:

- Many stated their main reason was because the current stock water system was inadequate and limiting production.
- Many cited problems with dams; water quality was poor, they often dried up during dry periods, and they were constantly rescuing stock stuck in the dams.
- All of the farmers noted issues with drought which often left areas of the farm ungrazable due to a lack of water. Providing a reliable water supply would rectify this.
- Many wanted to better graze hill country areas and saw better water supply and subdivision as a necessity to achieve this; and
- Some wanted to finish more animals and recognised they need a reliable source of water to achieve this.

While none of the farmers directly analysed the financial returns from the investment in the stock water system, they observed the benefits via better grazing management, better stock performance, increased stock numbers and improved animal welfare. They also noted that with the provision of reliable water and good subdivision, other options were opening up with respect to cropping and pasture renewal.

All the farmers noted the "peace of mind" that the water scheme gave them (and their staff). Many noted that in a drought they only had to worry about feed, not water. All commented that they were very pleased they didn't have to spend time dragging stock out of almost empty dams.

Most of the farmers had environmental plans and noted that the stock water reticulation and subdivision made implementing the plan easier, especially with fencing off waterways.

When asked what advice they would give to farmers contemplating installing a stock water reticulation scheme, the overwhelming comment was "just do it".

Implementation guide

The following are issues/items you need to consider when investigating/installing a stock water reticulation system. The items below are not necessarily in sequential order.

- [ ] Identify requirement for water—how much water is required, whereabouts on the farm?
- [ ] Identify a source of water. Will it provide a reliable enough supply over the summer period?
- [ ] Consider the energy source for any pumps. Is the source of water near an electricity line? Will a diesel motor be required? Is solar a possibility?
- [ ] Get a farm map and identify:
  - [ ] Source of water
  - [ ] Source of electricity if this is to be the energy source
  - [ ] Storage areas—where is the best place on the farm to pump to, to allow for gravity-feed over the rest of the farm
  - [ ] Identify which areas of the farm need to be reticulated
  - [ ] Identify post-water scheme subdivision.
- [ ] Identify any environmental components with your scheme, ensuring that you have consent to take water (if required) and that environmental opportunities are optimised in your sub-division plan and farm system design (e.g. fencing sensitive areas such as waterways or wetlands).
- [ ] Talk to a stock water engineer/pipe company—consider the specification requirements for the system; pump requirements, size of storage tanks, pipe density, size/number of troughs and break pressure tanks.
- [ ] Do a financial analysis on the proposed scheme—estimate of costs and benefits. Identify implications for farm system/change in stock numbers/type.
- [ ] Prepare a loan proposal for your bank.
- [ ] Finalise the design of the system—order the required pipes, troughs, tanks etc. Better to over-spec than under-spec.
- [ ] Organise a contractor to install the system.
- [ ] Install the water system.
- [ ] Check the system is working and check for any leaks.
- [ ] Start on any new fencing subdivision.
- [ ] Destroy previous dams as required.

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Farm system design and environmental considerations

The economic analysis of stock water reticulation demonstrated significant benefits from the investment for all the case-study farmers. These gains came from improved grazing management, which led to better stock performance. The farm system design was generally altered to allow better grazing management – and in looking at farm-system design – environmental management could also be considered.

Key elements to consider with farm system design:

Fencing

- How many paddocks do I want/need?
- Where should my fences go? Consider contour, tracks, stock-flow, erosion-risk, flooding-risk.
- Can I fence-off flatter areas to utilise them better?
- What type of fence do I need? Cattle-proof, sheep-proof, electric, conventional, battens, netting, etc.
- Can I fence off waterways, gullies, or native bush as part of my fencing? If so, are there subsidies available from Regional Council to help with this?

Water (other than reticulation system)

- Where is the best place to locate troughs?
- Do I still need dams? If so, where?
- Can I utilise existing dams better by fencing them off, planting them and improving the water quality with reticulation to a nearby trough?

Tracks and yards

- Do I have adequate tracks and yards to manage more stock (from either increased capital or bought-in trade stock, or improved performance)?
- Are tracks located to minimise risk of erosion?
- Do I need to stabilise tracks with planting?
- Will tracks and yards work with stock-flow?
- Where does the run-off from my yards go? Can I buffer it before it gets to a waterway?
- Do I need to improve or build satellite yards?

Fertiliser

- What are my current fertility and nutrient levels?
- What quality of feed do I need for my stock classes?
- What are the historic fertiliser applications?
- How will I utilise feed produced from improved fertility?
- How is fertiliser applied and can I improve the accuracy of placement through farm design, use of maps, use of precision-technology?
- What other forages or crops am I using and what are their nutrient requirements?

- Am I advising pilots or spreaders to avoid tracks, waterways and bush areas with their applications?
- Do I need a nutrient budget or would it help my understanding of nutrient-use on-farm?
- Am I avoiding heavy rainfall forecast when applying fertiliser?
- Am I applying the right amount to avoid wastage?
- Do I regularly soil test across the same transect line and track trends in soil test results?

Forage (e.g. crops, herbs, annual grasses)

- Am I utilising the feed I am currently growing?
- Do I have land suitable for different forages?
- Do I have adequate nutrient levels to grow specific forages?
- How will I graze forages and with what stock class? Think about where soil run-off will go, graze from top to bottom to minimise sediment loss.
- What method will I use to plant my forage and what preparation is needed?
- How will I look after my soil structure and protect my organic matter?
- Do I need expert advice from an agronomist?
- Do I need to be using a feed budgeting tool (e.g. FARMAX)?

Animals

- Am I matching my stock classes to land class to optimise my farm system?
- Are there other stock classes that would be more profitable and work with my objectives?
- Do I have the right balance of stock classes?
- If I increase the amount of feed I produce, do I have the right animals to utilise it?
- Are my animals reaching their full genetic potential? Do I need better genetics?
- Do I have adequate shade and shelter across the farm?

People

- Do my staff or team understand the development plan and the implications?
- Do they have the capability to manage more and/or higher performing animals?
- Do they have the capability to manage more intensive grazing management?
- What do I need to do to help them up-skill or improve their understanding?
- Do they have experience from elsewhere that we can utilise?
- Do I have the skills and capability to manage the changes to the farm system?
- Do I have a sound business plan integrated with a farm environment plan?
- What resources can I access from industry to help with my management decisions?
- Do I need to utilise specialist input?

Environmental considerations

Improving environment management alongside animal performance and economic returns is a major opportunity for the agricultural sector and for New Zealand. While there is a strong focus on water quality at present, as a sector, we also need to understand how we can improve biodiversity on-farm and be aware of our contribution to greenhouse gas emissions as we face pressure to address these also.

Water quality is primarily focused around the impacts of nitrogen (N), phosphorus (P), sediment and pathogens. Aside from pathogens, the loss of N, P and sediment from our farm system is not just an environmental cost, but also an economic cost to our farm business. While there are no easy-wins, there are ways we can improve our farming practices to minimise the risk of damaging our previous water resources.

The average nitrogen discharge for the sheep and beef sector is relatively low in comparison to other land uses. The sheep and beef sector is primarily focused on addressing contaminants which flow over land such as phosphorous, sediment and pathogens. These contaminants can be managed through Critical Source Area (CSA) identification and tailored farm specific plans. Evidence[1] indicates that up to 80% of these contaminants can be reduced while maintaining on-farm profit with significant environmental benefits. The sector is also supportive of excluding cattle from waterways; especially in intensively farmed situations. Hill country farmers can reduce environmental impacts by looking at riparian management and exclusion of critical and sensitive habitats using tailored farm environment planning.

N can be leached at any time of year but is particularly vulnerable when soil concentrations exceed plant demand and when rainfall exceeds evapotranspiration and soil moisture status is high. The current focus of mitigation to reduce N leaching in New Zealand explores a number of factors including plant species mix, time on crops and pasture when soils are vulnerable to leaching, minimising bare soil time following cropping, smart use of fertiliser, managing hot spots at a paddock, farm and sub catchment scale as well as understanding the potential to breed for within animal differences and nutrient conversion efficiency. For more information, see Beef + Lamb New Zealand fact sheets 127, 128 and 129, available to download on the B+LNZ website www.beeflambnz.com. These discuss good winter grazing management practices.

There are some advances to be gained from the precision application of fertiliser from aeroplanes and this is an active area of research in New Zealand. Many of these technologies are on the verge of mainstream use and this approach to nutrient balancing in hill country has the potential to transform both pasture and animal production along with minimising nutrient loss. There is still huge potential to continue to develop and optimise sheep and cattle farming throughout New Zealand—through the adoption of whole farm planning, focusing targeted actions, and management and adoption of technology to continue to reduce contaminant loss and soil damage.

[1] B+LNZ fact sheet 128 – Winter forage crops: management during grazing.

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Case study farm

This Rangitikei hill country farmer had previous experience with installing three water reticulation systems before he invested in this case-study" one. Aiming to improve the profitability of his farm system by finishing more bulls and lambs, he recognised that water supply and quality was a limiting factor. In addition, he lost stock in dams during dry periods which was a cost to the business and a significant contributor of stress.

To achieve his production goals, he needed better grazing management without stock having to walk long-distances for water and to be able to utilise the feed he was already growing better. With his experience, he designed the water system himself and used a contractor to install it.

The system uses a small diesel-powered pump which pumps water from a creek into a 5,000-gallon tank. A larger diesel-powered pump then pumps 150 m up to two 5,000-gallon tanks at a central high point on the farm. Water is then gravity fed to troughs from there.

After just three years, he has seen economic returns from the system. His Net Present Value is $1,057,000 with an Internal Rate of Return of 47% and a pay-back period of 2.75 years. He improved his lambing percentage by 25% (some of which will be general improvements in genetics and management), he went from selling 10% of lambs prime, to 90%, and prime weights of lambs and cattle also increased. Overall, he has increased his stocking-rate by 0.9 SU/ha.

While he was rotationally grazing before the system went in, he needed to set-stock cattle in summer over a large area. Since putting the system in he has been able to increase the number of paddocks and has all stock on a year-round rotation (apart from set-stocking of ewes and hoggets for lambing and set-stocking of cattle in the winter). He has also been able to crop some areas of the farm.

Animal welfare has visibly improved with animals not needing to be pulled out of dams, and animals being able to access water more readily. In a drought, he is not worried about water supply which significantly reduces stress levels. He has confidence to carry cattle through summer now, even when it is dry, giving him more flexibility.

The water system has helped with the implementation of a whole Farm Environment Plan, particularly in fencing off gorges and significant waterways. There is potential to fence off streams in future, particularly if he does more cropping. He no longer sees animals standing in waterways as they can access water in troughs.

In terms of advice to other farmers, he says good water is critical for finishing lambs and carrying a lot of cattle through summer. However, if existing water is plentiful and the farm is not managed intensively, or not intended to be, then it may not be worthwhile investing in a water system. From a technical perspective, he suggests having the water-source close to the power-source for ease of maintenance and ensuring pipes are over-spec to maximise the investment. His key piece of advice to other farmers considering putting in a water system is “just do it!”.

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