

2021

Freshwater Nitrate – 2.4mg and Economic Impact for Ashburton District



Ashburton District Council

10/20/2021

Freshwater Nitrate – 2.4mg and Economic Impact for Ashburton District

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Executive Summary

The implications of achieving a freshwater soluble Nitrate level of 2.4mg N/L, are not well understood at a farm level nor are the effects on a district's economy. The Ashburton District Council commissioned the '**Freshwater Nitrate – 2.4mg and Economic Impact for Ashburton District**' report to understand the effects of achieving this aspect of the freshwater regulations more fully.

An understanding of the impact on the Ashburton District has been established by analysing the effects of three mitigation interventions, on-farm nutrient loss mitigations, coupled with ground water supplementation, and land use change to forestry. Forestry was used as an intervention because it is a low nitrate crop known to Canterbury plains.

The report makes no claim that these interventions are the most suitable land use change nor are they proposed as the most likely response by farmers to achieve the freshwater regulations. These interventions have been used to represent change that can be quantified and are used in this report to demonstrate the potential economic impact of achieving the freshwater regulations.

This report shows that at a farm level, the interventions will result in a reduction of dairy farming and dairy support land use by over fifty percent from current levels. This is replaced with forestry land use. The remaining dairying, dairy support, arable and red meat farming land uses will change their operations significantly by implementing all nutrient loss mitigation measures available. This will involve widespread changes to farm systems and increased investment in farm infrastructure and technology. This will result in a decline in farm profitability across the Ashburton District by -62% even though farm expenditure declines by 11.7%. The decline in farm profitability and changes to land use lead to a decline in land values of \$25,306 per hectare or \$7.4B districtwide.

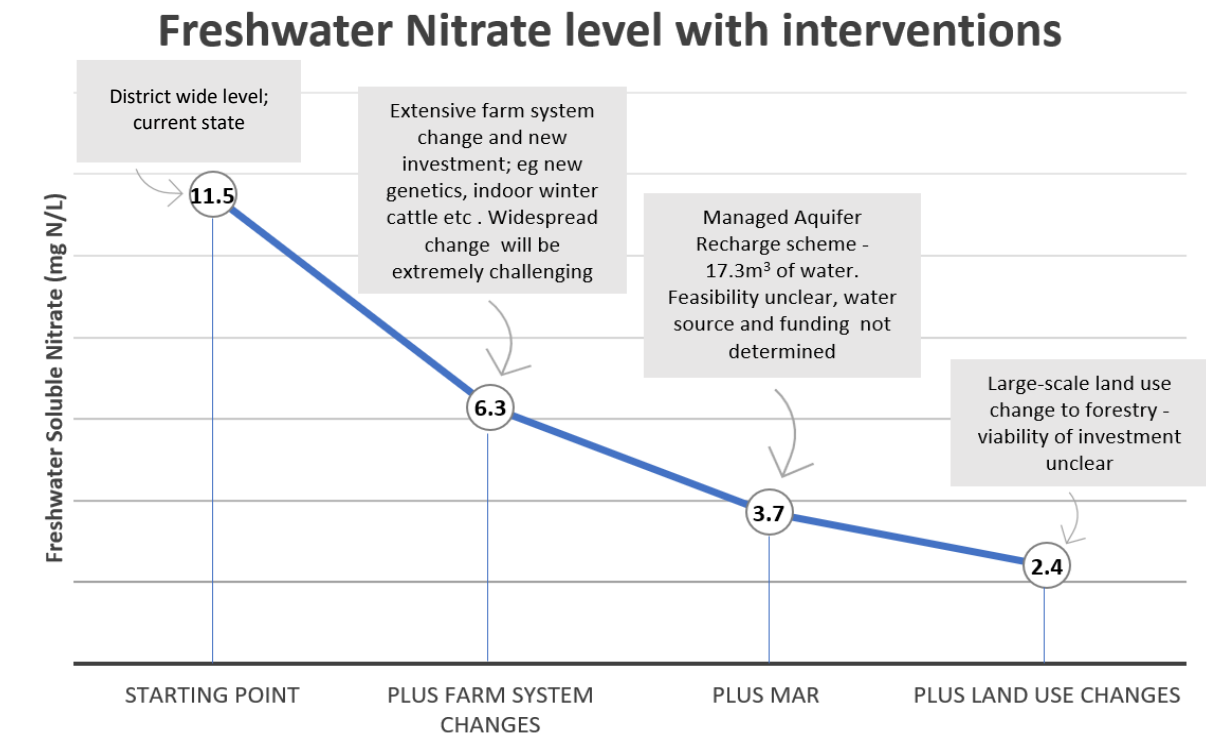
Agriculture is a significant contributor to the district's GDP and the decline in farm productivity and financial performance flows through to agricultural support businesses and the wider economy. The reduction in livestock numbers and lower volumes of produce result in a decline in the transport industry by -25.9%, reductions in irrigation because of land use change shows that water services will decline by -20.7%, and businesses which provide vehicle and equipment maintenance will experience reduced demand for their services leading to a 37.0% decline.

As a result, the Ashburton District's GDP is calculated to decline by \$409M or 23%, with the loss of 1735 jobs and the tax take from the district will decline by \$72M.

The regulations do not define the timeframe by when they must be met. A short timeframe will exacerbate the negative effects while a longer timeframe will enable businesses to adjust and adopt new science and technology to meet the regulations.

By applying the interventions, the freshwater Nitrate levels will shift from the weighted average starting point of 11.5mg N/L to 6.3mg N/L when all the on-farm nutrient loss mitigations are applied. Additionally, when the Managed Aquifer Recharge scheme and land use changes are also included, the freshwater Nitrate levels shift from 6.3mg N/L to 2.4mg N/L.

Summary of the effect of the interventions on freshwater Nitrate levels.



Importantly, meeting the freshwater regulations requires all the interventions to be implemented fully across the district. An underperformance of any of the interventions means that the freshwater targets will not be achieved.

This will be challenging.

Challenging because farmers are businessmen and women and as such, are unlikely to invest where there is a negative return and unclear benefits. They will act when they understand the connections between the problem and the solution. They will act when they are engaged in the change process and are able to provide their expertise to help shape the future for their farms and their community.

They will also act when they are confident about the risks and benefits of change, and to achieve this further research is crucial to fill gaps in current knowledge.

All the Ashburton District community want good environmental outcomes and a strong and healthy economy for them and their children, so do all farmers. The real challenge is not about trading off one against the other, but rather it is about achieving good outcomes for the environment, businesses, and the community.

To achieve that future, government, industry, and the farming community need to work collectively and solve the problems together.

Introduction

Land and Water management is a hot topic of discussion throughout New Zealand. After a period of community consultation, the National Policy Statement for Fresh Water Management (NPS-FWM), the National environmental standards for Fresh Water Regulations, and Stock Exclusion Regulations were passed into law in 2020. The regulations are intended to address a range of issues associated with freshwater quality and environmental management. The regulations will influence the impact primary production has on the environment. Since the implementation, several aspects of these regulations have attracted debate about workability and economic impact.

A desktop review of relevant research papers was undertaken by the Ashburton District Council to better understand the impacts of the NPS-FWM. The report 'Land and Water Management in the Ashburton District – Economic Impact'¹ was completed by the Economic Development unit of the Ashburton District Council in late 2020. This report studied the economic impact of achieving a freshwater soluble Nitrate level of 6.9mg Nitrate per litre (mg N). The results showed there is a risk of significant decline in farm profitability causing a decline in employment in the district.

The report did not capture the full impact of NPS-FWM because the NPS-FWM requires a freshwater level of 2.4mg N, which is significantly more stringent than the 6.9mg N levels examined in the Ashburton District Economic Impact report. A follow up report was commissioned by the Ashburton District Council to gain a clearer understanding of what achieving a level of 2.4mg N means to the Ashburton District's economy.

Overview

This report, '**Freshwater Nitrate – 2.4mg and Economic Impact for Ashburton District**' explores the impacts of achieving a freshwater soluble Nitrate level of 2.4mg/L at a farm level and the associated effects on the Ashburton District's economy. It was commissioned by the Ashburton District Council to better understand the potential implications of achieving the freshwater regulations.

This report firstly analyses two research papers. The first research paper, 'Land and Water Management in the Ashburton District – Economic Impact' (referred to as the '*Freshwater Nitrate: 2.4mg/L - appendix 1*' paper) was prepared by MacFarlane Rural Business. It models farm system change (in Farmax) with resulting nutrient loss analysis. Importantly, this research paper includes farm systems budgets and cashflow assessments to determine the financial implications of the changes. The second research paper, 'Economic Impact of freshwater environmental standards in Ashburton District', (referred to as the '*Economic Impact of 2.4mg/L – appendix 2*' paper) was prepared by Infometrics. It uses the output data from the farm systems and budget cashflow modelling (presented in appendix 1) to calculate the economic impact for the Ashburton District. This report then analyses the findings and presents them in the context of the Ashburton District. It will identify the farm and district economic cost of achieving a freshwater soluble Nitrate level of 2.4mg/L.

The Scope

The purpose of this report is to present a high-level analysis of interventions that decrease the impact of agriculture on freshwater nitrate levels. This is to understand what achieving a freshwater Nitrate level of 2.4mg/L looks like on-farm and at a community level. It examines how to achieve the freshwater regulations and considers changing on-farm practices, supplementing ground water, and substituting land use to forestry as a low nutrient-loss land use.

¹ Land and Water Manager in the Ashburton District – Economic Impact (2020). Ashburton District Council.

The report encompasses the plains area of the Ashburton District only and is only focussed on achieving the Nitrate aspect of the freshwater regulations and identifying the costs associated with the achievement. It does not consider the economic impact of other aspects of the regulations such as wetland protection, and achieving other freshwater attributes etc. The high-country areas are not accounted for in the study as they represent a relatively small contribution to the freshwater quality issue compared to farm systems on the plains. Additionally, determining the practicality and achievability of the interventions are outside the scope of this report.

The report does not attempt to quantify the benefits or value of improved ecosystem health, which should be a focus of future research.

Assumptions

This report recognises the complexity of the interrelationship between farm systems, human behaviour, and the environment, and as such, there are limitations as to how this mix of factors can be accurately analysed and quantified. Several assumptions have been utilised to develop interventions that are plausible, however, the report acknowledges that the likelihood of all interventions being enacted, is open to be challenged.

Expert judgement has been utilised to ensure validity of the assumptions used in the analysis of the interventions. The analysis is undertaken in several steps, each step is an intervention that theoretically decreases soluble Nitrogen in freshwater. The interventions include changing on-farm systems to minimise nutrient losses, a district-scale Managed Aquifer Recharge scheme, and land use change to largescale forestry. The steps of analysis are carried out in a linear manner, adding the reduction of soluble nitrogen to the outcome of the previous intervention. The purpose of this is to demonstrate the scale of interventions needed to reach the freshwater targets outlined in the NPS-FWM. It can be assumed in practice the interventions will not occur one after another but instead develop omnidirectionally, therefore the rolling tallies are arbitrary but still highlight feasible outcomes.

It should be noted that significant value would be gained from undertaking hydro-geological research to better understand the relationship between soils, climate, land uses and water movement in Ashburton District's natural environment.

The Analysis

This section summarises and analyses '*Freshwater Nitrate: 2.4mg/L - appendix 1*' and '*Economic Impact of 2.4mg/L – appendix 2*'. The '*Freshwater Nitrate: 2.4mg/L - appendix 1*' identifies three interventions that can be utilised for agriculture to achieve the NPS-FWM regulations. These are; (1) the implementation of practice change on-farm and capital investment (including technology) that would mitigate nutrient losses, (2) the implementation of a district-scale Managed Aquifer Recharge scheme, and (3) changing land use to a lower nitrogen loss farming system. The analysis will consider the impact each intervention has on decreasing the soluble Nitrate levels as well as the economic impact.

For each intervention, the change in individual farm financial performance and the impact on the Freshwater soluble nitrate level is calculated. The results of the first intervention are carried through onto the next to give a rolling tally of the financial and environmental impact of undergoing each intervention. Extrapolated to the district level, this helps determine the economic impact these interventions could have on the Ashburton District's economy.

Changing On-Farm Practices

'Freshwater Nitrate: 2.4mg/L - appendix 1' identified that changing and adopting different on-farm practices and further investment resulted in a reduction of freshwater soluble nitrate levels. However, these changes come at a cost. The research paper considered most mitigation practices currently available to agriculture, for example, housing cattle (including dairy) during winter, the utilisation of different farm practices, and the use of the latest technology such as precision irrigation technology. To assess the impact of changing on-farm systems, the research paper 'Freshwater Nitrate: 2.4mg/L - appendix 1' calculated the baseline financial and environmental 'Starting Point' for each type of farming. From there, the theorised changes which reduce nutrient losses that can be implemented on-farm were modelled and the cost of implementing these changes, calculated. The recalculated financial and environmental status of each farm system was shown in the 'Forecast' farm system.

Table 1 summarises the impacts at a district level and highlights the change in farm performance resulting from changes to the farm practices. Refer to appendix 1 paper - 'Freshwater Nitrate: 2.4mg/L' (p20).

Table 1 District wide financial impact of changing on-farm systems

Farm Performance area – Ashburton District	Pre changes (\$1M)	Post practice changes* (\$1M)	Change impacts** (\$1M)	Change Impact*** (% change)
Nett farm income	1,779	1,984	205	+11.5%
Farm working expense	1,221	1,545	324	+26.5%
Earnings before interest and tax (EBIT)	558	439	-119	-21.3
Interest	26	33	7	+26.9%
Tax	107	45	-62	-57.9%
Plant replacement	148	204	64	+37.8%
Nett profit	277	144	-133	-48.0%

*Figures are derived from 'Freshwater Nitrate: 2.4mg/L - appendix 1' paper. They are calculated by multiplying 'starting point' land uses on page 14, figure 8, with the 'forecast' figures on page 20, table 5.6.5. These figures only consider the on-farm system changes, and do not account for MAR or land use change.

** Figures are calculated as the difference between 'pre changes' and 'post practice change'.

*** Figures are calculated as the percentage change from 'pre changes' from 'post practice change'.

Table 1 demonstrates an increase in farm income with associated increases in farm expenditure. The expenditure increases greater than income, leading to a decline in EBIT of -21.3% (-\$119M). The decline in EBIT leads to lower tax payments.

The on-farm changes result in increased operating expenditure of 26.5% (\$324M) on different management practices such as pasture renewal, nutrient inhibitors, and plant genetics. These changes deliver a negative cost benefit while reducing the amount of nutrient loss; for every \$1 dollar of increased operating expenditure, farm income increases only \$0.63. Additionally, farms show an increase in capital expenditure with investment in farm infrastructure such as winter barns and precision technology, resulting in a decline in farm profitability of -48.0% (-\$133M).

Table 2 summarises the impacts at a district level and highlights the effects on freshwater Nitrate levels because of on-farm practice and system changes. Refer to appendix 1 paper - 'Freshwater Nitrate: 2.4mg/L' (p10. Figure 2).

Table 2 District wide effect on freshwater nitrate levels from changing on-farm systems

District wide effects	Pre system changes level (District weighted average)	Post system changes level*	Change impacts**
Freshwater Soluble Nitrate Level	11.5 ppm N/L	6.3 ppm N/L	A decline of 5.3ppm N/L

*The figures show the change from the current state of farm system nutrient loss, and the loss after the nutrient loss reduction farm system changes.

The widespread change to farm systems and investment in new technology is calculated to achieve a reduction in freshwater soluble Nitrate levels from a starting point of 11.5ppm N/L to 6.3ppm N/L, after all possible on-farm system mitigations are implemented.

It should be noted that the breadth and scale of change identified in the report will be very disruptive to all farm businesses and achieving unilateral commitment amongst all farmers to this magnitude of change will be extremely challenging.

Managed Aquifer Recharge

The Hekeao/Hinds area currently has a Managed Aquifer Recharge (MAR) scheme in operation which recharges the ground aquifers in the area. It is speculated that this may be scaled up and extended across the district to provide the same benefits. The '*Freshwater Nitrate: 2.4mg/L - appendix 1*' paper does not assert whether this is feasible or not, nor does the report assess the effectiveness of this intervention on freshwater Nitrate levels. The rationale of using a MAR intervention is based on a modelled catchment N load which will receive the same flow rate of 0.055lps/ha as per the current MAR scheme. The volume of water required to supplement a district scale MAR scheme is calculated at 17.1m³.

The expenditure associated with a district scale MAR (capital and operating costs) is accounted for in the '*Freshwater Nitrate: 2.4mg/L - appendix 1*' paper. The costings are derived from the Hekeao/Hinds MAR scheme and scaled up to meet the theoretical needs of an Ashburton District scale scheme. Importantly, the analysis does not determine how or by whom such a large-scale MAR scheme will be funded. For this reason, the capital and operating costs are not incorporated within the farm budget calculations.

Table 3 shows the cost of establishing a MAR scheme that supplements ground water by 17.1m³ as per the paper '*Freshwater Nitrate: 2.4mg/L - appendix 1*' (p14).

Table 3 The estimated cost of establishing and operating a MAR scheme that supplements ground water by 17.1m³.

Effect of a District Scale MAR	Impact
Capital cost	\$23,528,906
Operating cost (annual)	\$1,368,000

The table shows the initial one-off cost of building the MAR scheme and the annual operating costs. These operating costs include overheads such as personnel and scheme maintenance.

Table 4 shows the effect on freshwater soluble Nitrate levels after the introduction of 17.1m³ of water through a Managed Aquifer Recharge scheme as well as the on-farm system changes. Refer '*Freshwater Nitrate: 2.4mg/L - appendix 1*' (p 12. Figure 5).

Table 4 District wide effect on freshwater nitrate levels from introducing MAR and changing on-farm systems

District wide effects	Pre MAR level *	Post MAR level*	MAR impacts
Freshwater Soluble Nitrate level	6.3ppm N/L	3.7ppm N/L.	A decline of 2.6ppm N/L

*The figures include the effects of on-farm system changes.

The implementation of intervention one, widespread change to farm systems and investment in new technology, and intervention two, a district scale MAR scheme is calculated to achieve a reduction in freshwater to a soluble Nitrate level of 3.7ppm N/L.

It should be noted that it is unclear whether a district scale MAR is feasible. It is undetermined where 17.1m³ of water will be sourced, nor how the scheme will be funded. It is recognised that the lack of clarity of key pieces of information is problematic for assessing the merits of this intervention.

Land Use change

The 'Freshwater Nitrate: 2.4mg/L - appendix 1' report evaluated the impact of widespread land use change to forestry. It is recognised that land use change is not simple and will take many forms involving different land use options. However, forestry was chosen for modelling because it has historically been a land use on the Canterbury Plains and is one of the lowest nutrient loss land use options.

Several land use options were considered for analysis, but none were as suitable for modelling as forestry for agronomic reasons This report does not propose that forestry is a recommended land use change for the Ashburton District.

Table 5 identifies the area of land that would need to be converted to meet the freshwater soluble nitrate levels. The economic impact of the conversions was calculated by determining the value of the forestry land use plus the value of the remaining land uses in the district (arable, dairy, dairy support, and red meat).

Table 5 summarises the impacts at a district level and highlights the total impact of all mitigation measures, farm system changes and land use change, required to meet the freshwater regulations. Refer to 'Freshwater Nitrate: 2.4mg/L - appendix 1' (p14 and p20).

Table 5 The financial and environmental impact of land use change to forestry – refer to 'Freshwater Nitrate: 2.4mg/L - appendix 1'

Land use change	Change to area – hectares (ha)
Arable area - change	-3,522 ha
Dairy area - change	-57,659 ha
Dairy Support area – change	-31,967 ha
Red Meat area - change	-9,877 ha
Forestry area - change	+105,079 ha
<small>ppm</small>	
Farm Performance area – Ashburton District	Farm systems change impacts (\$1M)
Nett farm income	-409
Farm working expense	-143
Earnings before interest and tax (EBIT)	-267
Interest	-3
Tax	-72
Plant replacement	-19
Nett profit	-172

The paper '*Freshwater Nitrate: 2.4mg/L - appendix 1*' identifies that land use change to forestry would occur across 35% (105,079 ha) of the district to achieve the freshwater regulations. This change would impact all types of land use with dairy farming, (a reduction of -57,659 ha), and Dairy Support (-31,967 ha) the most affected.

Collectively, the interventions will result in a decline in all the farm financial performance areas. Nett Farm Income will decline -23% (-\$409M), Farm Working Expenses will decline -11.7% (-\$143M), and EBIT will decline -52.1% (-\$267M). The Tax take from farming will decline -68% (-\$72M) and farm profitability across the whole district will decline -62.2% (-\$172M).

Table 6 shows the effect on freshwater soluble Nitrate levels after land use change to forestry after the implementation of a Managed Aquifer Recharge scheme as well as the on-farm system changes. Refer '*Freshwater Nitrate: 2.4mg/L - appendix 1*' (p 13. Figure 6).

Table 6 District wide effect on freshwater nitrate levels from land use change along with MAR and changing on-farm systems

District wide effects	Pre land use change *	Post land use change*	Land Use Change impacts
Freshwater Soluble Nitrate level	3.7ppm N/L	2.4ppm N/L.	A decline of 1.3ppm N/L

*The figures include the accumulated effects of farm systems change and the use of MAR

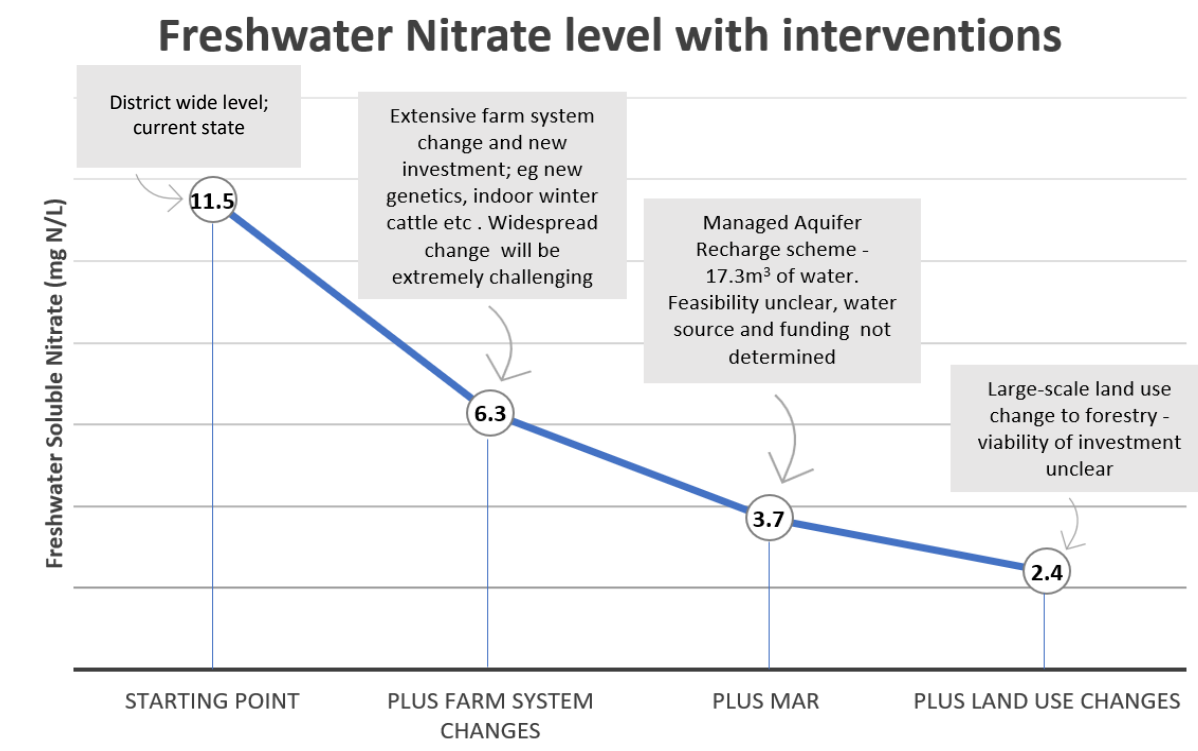
The implementation of intervention one, widespread change to farm systems and investment in new technology, and intervention two, a district scale MAR scheme plus intervention three, land use change to forestry is projected to achieve a reduction in freshwater to a soluble Nitrate level of 2.4ppm N/L.

It should be noted that currently for several reasons, forestry land use occupies a small area on the plains of the Ashburton District eg fire risk, windfall, timber quality. Under climate change, which is forecast to become drier and hotter, forestry land use will be less attractive as an investment option. Going forward, this is likely to limit the merits of forestry land use as a nutrient loss intervention unless additional value emerges for forestry as a carbon sink.

Summary of the effects of interventions on freshwater Nitrate levels

Table 7 summarises the changes to freshwater nitrate levels resulting from each of the three nutrient loss mitigation interventions.

Table 7 Summary chart of the district wide effect on freshwater nitrate levels from all mitigations – changing on-farm systems along with MAR and land use change.



The Economic Impact

The 'Economic Impact of 2.4mg/L – appendix 2' paper details the economic impact of the NPS-FWM regulations on the Ashburton District. Calculated from the farm level modelling, district scale MAR, and a land use change to forestry, the district's GDP will reduce by 16.3% (\$409M) and employment will decline by 9.1% (loss of 1735 jobs). Furthermore, the district will contribute -\$72M less in taxes to the national economy.

The decline in farm profitability and changed land use will flow through to land values and a projected decline in value of \$7.4B district wide (or \$25,309 per ha). A decline of this scale will have significant implications for the equity position of many farms as well as bank security. Minimal or negative equity will be problematic for farm succession.

Including the direct, indirect, and induced effects, the analysis shows a decline in all areas of the economy except mining (due to the positive effect of gravel extraction to build the MAR scheme). The Agricultural GDP will decline -44.1% with 1475 fewer employees as farms change their systems to forestry, which has a low labour requirement. Changes to forestry will lead to reduced irrigation use affecting the Electricity and Water Services which will decline by -20.7% (-\$27.8M) resulting in -7.8% (18 personnel) fewer employees. Other Services, which includes vehicle and equipment maintenance, is affected through reduced demand for maintenance from the agriculture industry, leading to a 37.0% reduction in GDP and Transport Services will decline by -25.9% (-\$13.2M) as fewer livestock are farmed and volumes of farm output decline.

Discussion

The analysis shows that the district's GDP, employment, and farm productivity and profitability will decline significantly. Given the significance of agriculture to the Ashburton District's economy and the targeted approach of the regulations, it is unsurprising that the impact is large. Reducing farm productivity (intensity) without a corresponding reduction in farm profitability can be challenging unless there are viable high value land use alternatives. There currently exists very few high value alternative options for land use in the Ashburton District. This may change under climate change and new options for land use should be explored. Further research in this area is recommended.

To achieve the nutrient reductions as per the regulations, all farms will need to undergo a comprehensive change to their farm systems. This will involve a significant change to how these farms operate, significant changes to the operating cost structures, and significant changes to their capital investment programmes. Some of this expenditure, such as wintering all cattle indoors, will move New Zealand agriculture away from all-natural farm systems for which New Zealand is well recognised which may have market implications. An aging agricultural workforce will be further challenged by the need to adopt a wide range of mitigation technologies.

Supplementing ground water through a district-scale MAR is untested and may not be feasible. It is unclear where the water will come from for such an exercise, and it is unclear who will fund it.

Large-scale plantation forestry will employ fewer staff which will impact rural communities and affect student numbers in rural schools. Climate change will bring increased droughts and fire risk making forestry an increasingly riskier option.

Achieving the freshwater regulations will be extremely challenging and as highlighted by the papers '*Freshwater Nitrate: 2.4mg/L - appendix 1*' and '*Economic Impact of 2.4mg/L – appendix 2*', all three areas of intervention must succeed to achieve the requirements of NPS-FWM. The underperformance of just one of the interventions will put the freshwater Nitrate level of 2.4mg N/L out of reach.

The on-farm mitigations will be very difficult to implement, and they will reduce the viability of the remaining businesses unless there is new technology or viable alternative land uses. MAR may not be feasible and forestry, while it is possible, may be unlikely and will have a significant negative impact on the social cohesion of the Ashburton District community.

The timeframe for achieving the freshwater regulations is critical. A shorter timeframe is likely to exacerbate the downside of changes, whereas a longer timeframe will enable business practices, science, and communities to adjust to the regulations. A longer timeframe will enable a more cohesive transition to alternative land uses for all.

The purpose of the freshwater regulations is to establish good environmental outcomes, of which all in the Ashburton District would agree is the right thing to do. The risk is that, in the pursuit of this outcome the financial, social, and cultural domains are lost sight of.

Summary

The implications of achieving a freshwater soluble Nitrate level of 2.4mg N/L, are not well understood at a farm level nor are the effects on a district's economy. The Ashburton District Council commissioned the '**Freshwater Nitrate – 2.4mg and Economic Impact for Ashburton District**' report to understand the effects of achieving this aspect of the freshwater regulations more fully.

The research approach in this report utilises several assumptions that help quantify impact figures and identify the scale of the challenge, and the issues that exist for achieving a freshwater Nitrate level of 2.4mg/L.

By analysing the effects of on-farm nutrient loss mitigations, coupled with ground water supplementation, and land use change to forestry, a picture of the potential impact on the Ashburton District has emerged.

The mitigation interventions will lead to a significant decline in farm performance which flows through to a greatly reduced district GDP and over 1700 job losses. At a farm level, all the key performance metrics show a negative shift, and the viability of many businesses will come under scrutiny.

The purpose of the freshwater regulations is to establish good environmental outcomes and all people in the district want a healthy and prosperous future. The challenge is how the community gets there and what does a good future look like. It will take a unified approach with all community, iwi, business, and government, working together with good practices, science, and innovation to realise that future.

A future that is informed by research and supported by central government working together with the community to achieve positive environmental, financial, social, and cultural outcomes for all the community.

Where to next?

Tensions are emerging between achieving the freshwater regulations and maintaining the standard of living enjoyed throughout the district. Achieving good environmental outcomes are important, so are strong businesses and thriving communities. The real challenge is achieving good outcomes for the environment, businesses, and the community.

To move forward, empowering agriculture to deliver on the four domains is vital (environment, financial, social, and cultural) but it will not happen by chance. Collaboration across the district is key. By harnessing leading science and smart innovative solutions that are implemented by knowledgeable and skilled farmers, the Ashburton District will be able to seize opportunities and make them happen. A structured and joined-up approach will enable this by engaging farmers, scientists, experts, regulators, the government, and community stakeholders who will learn from each other and develop down-to-earth solutions.

Through a structured community collaboration, smart people will wrestle with and resolve the challenges facing the district through innovative agriculture. Like a district wide living laboratory, farmers, scientists, and industry will identify and act on opportunities and front foot issues such as land use change, climate change, greenhouse gasses, new crops, and value chains.

This will create place where practical solutions are developed based on sound knowledge, tested, and implemented on-farm, and where innovation and technology enable agriculture to support a healthy environment and where its people, its businesses, and its economy are resilient.

Recommendations

There are two recommendations from this report:

1. This report was commissioned by the Ashburton District Council to understand the potential impact of the NPS - FWM at a farm level and the flow on effects to the Ashburton District's economy. This report will help the Council understand the effects of achieving the freshwater nitrate requirements of the NPS - FWM.

Recommendation: That the Ashburton District Council receive the report.

2. The report highlights the economic impact of achieving a freshwater nitrate level of 2.4mg per litre. The findings of this report, in principle, can be applied to other territorial Authorities to help them understand the emerging challenges and potential opportunities of the NPS - FWM.

Co - ordinating with other territorial authorities will enable more effective engagement with central government to achieve better outcomes both environmentally and economically. This will be achieved through an aligned voice, a deeper and more consistent understanding of the issues and opportunities, alignment of resources, and greater reach and influence for positive change.

Recommendation: That the report be referred to the Canterbury Mayoral Forum and other relevant stakeholders (both political and industry organisations) for consideration and comment.

Appendix 1

Economic Impacts of Achieving 2.4ppm N in Ashburton District Surface Water

Final (version 2.3)



8 August 2021

Prepared by Macfarlane Rural Business Ltd

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1. Glossary

ADC	Ashburton District Council
MAR	Managed Aquifer Recharge
PC2	Plan Change 2 to the LWRP
LWRP	Land and Water Regional Plan
Start Point	Proxy water quality and farm system position that could have been implemented by the community under ECan's LWRP to achieve a catchment water quality target of 6.9ppm.
Forecast	The proposed catchment model to achieve the 2.4ppm N in ground and surface water under the National Environmental Standards 2020.
GMP	Good Management Practice
Horticulture	Representative term for high value perennial horticultural and viticulture crops
AM1	Advanced Mitigation Level 1 (practices from PC2 catchment modelling)
AM2	Advanced Mitigation Level 2 (practices from PC2 catchment modelling)
AM3	Advanced Mitigation Level 3 (practices from PC2 catchment modelling)
DCD	Nitrification Inhibitor
Farmax	Bio-physical farm modelling software
VL	Very Light Soil (PAW= 60mm water per 600mm soil depth)
L	Light Soil (PAW = 81mm water per 600mm soil depth)
MH	Medium Heavy Soil (PAW = 110mm water per 600mm soil depth)
DPD	Deep Poorly Drained Soil (PAW = 105mm water per 600mm soil depth)
PDL	Poorly Drained Light Soil (PAW = 92mm water per 600mm soil depth)
IC	In Calf
LUC	Land Use Change
N	Nitrogen

2. Introduction

This report has been prepared for ADC to examine the economic impact of achieving a freshwater Nitrogen level of 2.4ppm to the Ashburton District.

This report “version 2.3” considers the community impacts for land use change required to meet the 2.4ppm Nitrogen standards. The primary land use change considered is forestry in this report.

The primary intention of this analysis is to think laterally and try and implement farm system and management changes required while preserving some profit on farm with the current farm systems.

When identifying land use change as a mitigation tool, forestry was chosen to quantify environmental, economic and community impacts. It is recognised that there are alternative land use options other than just forestry, however, preliminary investigations into regional viability indicated implementation of these options would likely be nominal due to poor previous performance, lack of processing and handling infrastructure and/or constrained industry/market growth at a time that other areas of New Zealand will also be considering them as viable options. Therefore, in this report forestry was considered a credible land use change scenario to consider.

This report has been a collaborative effort by the following contributing authors:

- Jamie Gordon (livestock systems)
- Trevor Gee (dairy systems)
- Anton Nicholls (arable systems and agronomy)
- Reuben Edkins (nutrient management)
- Nicole Mesman (nutrient management)
- Mark Everest (livestock systems, project supervisor)

This report and prefacing analysis have been undertaken without a hydrology model. Hydrological modelling was outside of the report scope. The limitation of this approach is that without a robust hydrology model overlaid by land use data, we are unable to ascertain which parts of the catchment could be focused on (with respect to water quality) to get the best water quality results while preserving community prosperity.

Without this hydrology, we have assumed that all farms in the catchments would need to observe the same production and financial reductions. It is therefore possible that we are at risk of overstating or understating the regional economic impacts of achieving the 2.4ppm water quality policy objectives.

If you have any questions, please contact the writer.

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3. Summary

While it is technically possible to change the farming landscape in Ashburton (291,000ha farmed) to give effect to 2.4ppm N in surface water, the actions we take to achieve the target will have a material effect on the style of farming and the physical landscape.

Ashburton Districts farming community could expect to see:

- Significant and widespread changes to farming practices, particularly housed cattle.
- An increase in the forestry area by 102,691 ha (35% of the catchment)
- Using 17.1 m³/sec alpine river water for additional Managed Aquifer Recharge.

The scenario modelled hinges on the above three items all being achieved. Without one of them, the chances of achieving the desired 2.4ppm N in surface water is unlikely as farm management cannot achieve N losses low enough.

Nett farm revenue will decline significantly under the modelled scenario and farm working expenses will also decline, but at a lower rate leading to a reduction in regional farm profit of at least \$173m p/a (\$592/ha).

Reduced business profitability ultimately ends up resulting in de-valuation of the business assets. In this instance the main asset is land. We could expect to see the erosion of \$25,309/ha in land value (\$7.4 bn for whole catchment).

The reduced business profitability on farm and land use change will have significant downstream consequences for the surrounding industry. The biggest changes likely are:

- 3,522ha less arable land available for seed multiplication and vegetable production.
- 85,000,000kg less milk solids produced.
- 185,000 head less cattle killed annually.

Attempting to meet a water quality target of 2.4ppm N would be extremely financially, physically and psychologically challenging for most Ashburton farmers and could have material sociological impacts on the wider community.

4. Methodology

4.1. Farm System and Nutrient Loss Modelling

4.1.1. Start Point

The initial start point for farm systems and catchment water quality was based on the Hinds/PC2 catchment feasibility undertaken by MRB for ECan in 2013. The farm models prepared for the 2013 project were intended to reflect the catchment as a whole rather than individual farms at the time. The same methodology has been applied to this project for ADC in the interest of being consistent.

From GMP based files, the mitigation levels were applied until one of the following was achieved:

1. 20kgN/ha/year loss was achieved
2. 36% reduction in N loss relative to GMP N loss was achieved
3. Farm business was unprofitable (no profit)

The resulting farms and management regimes that were used to represent the Start Point were:

- Arable 1: AM1
- Arable 2: AM3
- Arable 3: AM2
- Arable 4: GMP
- Dairy 1: AM2
- Dairy 2: AM2
- Dairy Support 1: AM1
- Dairy Support 2: AM2
- Red Meat 1: GMP
- Red Meat 2: AM2

Once the farm system was established, the nutrient budget models were updated to include:

- nitrification inhibitors where applicable
- pasture blocks containing 20% plantain
- centre pivot (high efficient) irrigation on all blocks
- deficit irrigation management to take advantage of spring and autumn rains

The cash budgets were then updated to reflect 2021 market conditions and pricing. The product and input pricing we have used is a professional opinion based on historical pricing balanced for forecast pricing given current long term market indicators.

4.1.2. Forecast

To reflect the likely change in farm systems required to achieve the national water quality target of 2.4ppm N in surface water, we developed four representative farms for Dairy, Dairy Support, Arable and Red Meat (sheep, beef and deer).

Due to the limited scope, a list of known tools to improve nitrogen efficiency was collated to implement in the systems and the suite of tools was implemented to make a best one-attempt at minimising N losses from farm systems. See Appendix 17.

The feasibility of the farm systems was ascertained by modelling the proposed farms in Farmax, followed by Overseer and finally a cash budget prepared.

The results of the N loss reductions were collated.

Where the improved Forecast farm systems did not enable the catchment to achieve the 2.4ppm N, MAR was added or increased in the catchment to a maximum of 0.055lps/ha (approximately 40% of annual recharge for the catchment)

Once MAR was fully utilised, forestry was added on the lightest soils until the target catchment concentration of 2.4ppm N were achieved. To make space for forestry the enterprises on the lightest soils were displaced at proportional rates.

We did not include a reversion of land use to dryland sheep, cattle and cropping as preliminary assessments indicated this would result in a higher concentration of N in drainage than irrigated land use.

4.1.3. Debt on Land

For this analysis we have not assumed any debt on any business. Currently, in Canterbury we are observing debt:asset ratios of approximately 60% in dairy, 30% in arable and 25% in red meat or dairy support.

Typically bank debt must be repaid in 25 years, with the low forecast profitability of the forecast farm systems, debt levels will need to reduce to almost zero in order for owners to get a return on capital that would make farming worth while.

4.2. Catchment Modelling

The “Start Point” was assumed to be the current groundwater quality targets as set under the LWRP.

While the Forks and Rakaia catchments do not currently have reduction targets as Hinds does in PC2, it was assumed that the Hinds target of 6.9ppm nitrogen would apply to the Forks and Rakaia catchments.

4.2.1. Land Use

Looking at only the land between the lower foothills (flat intensive) and the east coast of the Canterbury Plains between the Rakaia and Rangitata Rivers, the land use data for three catchments was attained from Asure Quality:

1. Hinds (Rangitata River to Ashburton South Branch)
2. Forks (between the Ashburton River North and South Branches)
3. Rakaia (Ashburton River North Branch to Rakaia River)

The land use data was then corrected to balance dairy and dairy support grazing numbers to represent 22.5% replacement grazing.

Corrected land use data was then overlaid with Irrigation information from ECan’s GIS portal, and soil texture information from the Landcare database and ECan GIS databases to calculate land use across the catchments.

4.2.2. Soil Type and Climate Scaling

- Climate: One representative location was defined as the central location for all climate modelling purposes, located at Latitude: -43.799291; Longitude: 171.641346.
- Soils: All farms were only modelled using one soil type in Overseer. The relativity coefficients from catchment modelling by Scott (2013) prepared in the PC2 modelling were then used to adjust N loss and drainage for soil type. This then gave a matrix of drainage and N losses for farm systems by soil type.

4.2.3. Catchment Water Quality

Nitrogen losses and drainage volumes from the overseer files were then applied to the relevant land use data (and MAR added if necessary) to calculate the catchment drainage concentration, to use as a proxy for N concentration in rivers.

5. Results

5.1. N Loss and Drainage by Farm System

Note below a summary of the N loss and drainage per hectare of the modelled representative farm systems used in the comparison report.

Farm	ha	N loss/ha	Drainage	N ppm
Arable 1	320	23	258	8.8
Arable 2	320	28	246	11.3
Arable 3	320	24	246	9.8
Arable 4	320	19	176	10.3
Dairy 2	220	36	248	14.6
Dairy 2	220	36	248	14.7
Dairy Support 1	270	44	293	15.0
Dairy Support 2	270	27	214	12.5
Red Meat 1	350	13	168	7.6
Red Meat 2	375	18	189	9.3
Viticulture	22	5	258	2.1
Forestry	270	2	175	0.0
Arable 5	320	16	248	6.5
Dairy 4	220	12	226	5.2
Dairy Support 4	270	27	249	9.9
Red Meat 3	360	18	197	8.3

Figure 1: comparison of farm system on environment impacts

5.2. Likely Water Quality under LWRP ("Start Point")

Feasibility work for PC2 MAR (Scott, 2013) modelled scenarios of using up to 5m³/sec alpine water to dilute the nutrient concentrations in the lowland drains and streams in the Hinds catchment.

The crude hydrology modelling suggests that for the existing balance of farm systems to remain in all three main catchments assessed in this report, MAR would be required to achieve shallow groundwater and surface water nitrogen concentrations of 6.9ppm.

To achieve the 6.9ppm, the following MAR flow rates would be required by catchment:

	Hinds	Forks	Rakaia
Catchment Total Area	137,446	29,349	145,213
MAR lps/catchment	7,500	1,450	7,100
MAR lps/hectare	0.055	0.049	0.049
Catchment N Load	3961	773	3968
Catchment ppm N without MAF	11.8	11.5	11.4
Catchment ppm with MAR	6.9	6.9	6.9

Figure 2: Possible water quality outcomes under "Start Point" scenario

At the quoted MAR rates above, approximately 40% of the ground and surface water recharge would come from MAR. A hydrologist should be engaged to assess whether this is possible, let alone any further increases beyond the nominated rates in this report.

For the purposes of this modelling, we have assumed that no further MAR is possible or available and any further improvements must come from farm system change and/or land use change.

5.3. Farm Model Profit Summary

5.3.1. Start Point Models

	"Start Point" Farm Models											
	Arable 1	Arable 2	Arable 3	Arable 4	Dairy 1	Dairy 2	D Support 1	D Support 2	Red Meat 1	Red Meat 2	Forestry	Viticulture
Nett Farm Income	6,642	5,255	3,824	2,213	11,591	10,372	3,860	4,073	1,780	2,317	2,126	16,716
Farm Working Expenses	5,070	3,518	2,399	1,676	8,253	7,217	2,565	2,349	1,232	1,757	1,751	12,738
Earnings Before Interest and Tax	1,572	1,738	1,425	537	3,338	3,155	1,296	1,724	548	560	376	3,978
Interest (on Overdraft)	106	74	50	35	173	152	54	49	26	37	37	267
Tax	238	266	241	103	691	641	189	340	114	94	93	409
Plant Replacement/Depreciation	613	677	490	113	715	708	557	461	115	180	0	2,136
Net Profit	615	721	645	286	1,759	1,655	496	874	292	249	246	1,165

Figure 3: Farm Profit Summary "Start Point"

5.3.2. Forecast Models

	"Forecast" Farm Models					
	Forestry	Viticulture	Arable 5	Dairy 4	D Support 4	Red Meat 3
Nett Farm Income	2,126	16,716	5,085	11,451	3,762	3,466
Farm Working Expenses	1,751	12,738	3,998	8,851	3,003	2,748
Earnings Before Interest and Tax	376	3,978	1,086	2,600	759	717
Interest (on Overdraft)	37	267	84	186	63	58
Tax	93	409	0	382	59	61
Plant Replacement/Depreciation	0	2,136	750	1,043	478	439
Net Profit	246	1,165	253	989	159	159

Figure 4: Farm Profit Summary "Forecast"

Note that both the viticulture (horticulture) and forestry models are common between the two scenarios. Viticulture in the "Forecast" balance of farms is used to represent only the viticulture area that is present in the "Start Point" balance of farms.

5.4. Water Quality Improvement Without Land Use Change

By modifying the farm systems to house cattle indoors and use every technology available on every farm in the catchment, the balance of farms would have to change, particularly dairy and dairy support.

In the Start Point modelling, for every 1 ha in dairy farms, the catchment requires 0.41 ha of dairy support land to graze replacements and winter dry cows.

If all cattle are housed inside, the relative area of dairy support land to dairy farm land is reduced to 0.27 ha dairy support per 1 ha dairy land.

We have assumed that the farm area reduction in dairy support between Start Point and the Forecast models would revert to the Red Meat 3 farm model (50% irrigated).

Even given the major change in farm system and maintaining the MAR contribution, the N in groundwater would reduce so far as 3.6-3.8 ppm. No catchment would meet the target without land use change, see the summary table below.

		Hinds	Forks	Rakaia
Catchment Total Area		137,446	29,349	145,213
MAR lps/catchment		7,500	1,450	7,100
MAR lps/hectare		0.055	0.049	0.049
Catchment N Load		1962	403	2139
Catchment ppm N without MAR		6.3	6.3	6.4
Catchment ppm with MAR		3.6	3.7	3.8

Figure 5: Possible water quality outcomes under "Forecast" farm systems without LUC

5.5. 2.4ppm N with "Forecast" farm system and LUC

5.5.1. Process

To achieve 2.4ppm N in ground and surface water, land use change will be required, even after significantly modifying farm systems.

When considering the land use change to reduce environmental impact we have followed the following steps in sequential order:

1. Increase MAR water to 0.055lps/ha

The MAR flow rate was initially set to attain an average catchment concentration of 6.9ppm under the "Start Point" catchment modelling.

In order to optimise chances of meeting 2.4ppm N in surface water under the NES 2020, initially the MAR flow rates were brought up to the arbitrary 0.055lps/ha cap rate. The 0.055lps/ha represents approximately 40% of catchment water recharge.

It is expected that with improvements in water use efficiency and further redundancy of irrigation plant due to the planting of forestry that there would be some additional surplus water available.

Increasing the MAR flow rates requires a total of 17.1 m³.sec supplied to:

- Hinds: 7.5 m³.sec
- Forks: 1.6 m³.sec
- Rakaia: 8.0 m³.sec

This part of the proposal is highly reliant on water being made available and not being surrendered back to the source.

2. Increase forestry area.

As forestry has the lowest emitting land use (2kgN/ha/year compared to circa 10kgN/ha/year for the weighted average for farm systems), it therefore was used as the solution to make significant reductions in contributions to N losses beyond farm programme change.

While considering forestry, I expect that it would be possible to cover up to 10% of the catchment with relative ease provided farmers plant some difficult-to-irrigate areas and some wider (3 row) shelter belts.

Increases beyond 10% area will likely require some targeted investment in large scale forests, planted for the purposes of logs.

We have not considered the value of Carbon or Carbon Credits in this assessment as the carbon can only be sold once and does not have a perpetuating cashflow.

While forestry might be planted on a range of soils I have assumed that it would firstly be planted on the lightest soils to preserve the productive areas for future food production.

The resulting forestry area totals is 105,079ha (35% of the total catchment) spread as:

- Hinds 32% (43,983ha)
- Forks 35% (10,272ha)
- Rakaia 35% (50,825ha)

This final step achieved ground and surface water concentrations of 2.4ppm across all three catchments.

5.5.2. Results

With the total Ashburton catchment investing in:

- 17.1m³.sec MAR
- 102,691 forestry

The community would be able to achieve a ground and surface water nitrogen concentration of 2.4ppm.

	Hinds	Forks	Rakaia
Catchment Total Area	137,446	29,349	145,213
MAR lps/catchment	7,500	1,600	8,000
MAR lps/hectare	0.055	0.055	0.055
Catchment N Load	1236	258	1341
Catchment ppm N without MAR	4.4	4.5	4.5
Catchment ppm with MAR	2.4	2.4	2.4

Figure 6: water quality outcomes for NES 2020

5.6. Economic Impacts of Achieving 2.4ppm

5.6.1. Cost of MAR

Based on the Hekeao Hinds Water Enhancement Trust business case (Kerr+Partners, 2020), projected capital expenditure and operating expenditure were estimated to be:

MAR Volume 5 m³/sec

Capital expenditure \$6,879,797

Operating expenditure \$400,000 p/a (excluding cost of water consent leases)

It is still undecided in the Hinds catchment how the MAR capital costs will be met and how the operating costs will be met. Given that both the farming and non-farming communities both benefit from MAR, it is likely that the cost will be divided between both the farming and non-farming communities.

Because of the uncertainty of obligation, I have not included the costs of MAR in the farm budgets, rather listed as a separate cost to the community.

Table 7 below provides a breakdown of the estimated cost for utilising 17,1m³ of water for a district wide MAR project.

MAR Cost		Hinds	Forks	Rakaia	Total
Capital Expenditure (\$)		10,319,696	2,201,535	11,007,675	23,528,906
Operational Expenditure (\$p/a)		600,000	128,000	640,000	1,368,000

Figure 7: Estimated costs of MAR

5.6.2. Land Use Summary (hectares)

The table below represents the expected land use between the Starting Point land use (where the water quality outcome achieved should be 6.9ppm N) and the Forecast land use (where the water quality outcome achieved should be 2.4ppm N).

	Starting Point	Forecast	Change
Arable	65,059	61,538	-3,522
Dairy	112,427	54,768	-57,659
Dairy Support	46,704	14,737	-31,967
Red Meat	53,029	43,152	-9,877
Viticulture	9	9	0
Forestry	2,388	105,079	102,691
Other	11,940	12,273	333

Figure 8: land use area (hectares) required to achieve 6.9 or 2.4ppm N

Under the Forecast land use, the total irrigated area is reduced by 61,169ha from approximately 213,000ha to 153,000ha.

Assuming an average application rate of 0.45lps per hectare, this would release 27.5m³/sec of flow rate from agricultural consents. Some of this water will come from bores and some will come from surface water schemes. Due to the unknown origin, it is difficult to assess whether this water might be made available for MAR. However, given that river based irrigation schemes account for approximately 50% of the irrigated area in Ashburton, it could be conservatively assumed that a portion of this water could be available for MAR.

5.6.3. Farm Budget Breakdowns

	Arable 1		Arable 2		Arable 3		Arable 4	
Land Area								
Area - Total	320		320		320		320	
Area - Effective	300		300		300		300	
Budget Summary	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha
Income								
Nett Sheep and Wool	170,140	532	74,117	232	147,386	461	274,177	857
Nett Cattle	0	0	0	0	276,791	865	0	0
Nett Deer and Velvet	0	0	0	0	0	0	0	0
Milk	0	0	0	0	0	0	0	0
Grain, Seed and Horticulture	1,882,400	5,883	1,496,499	4,677	773,700	2,418	408,600	1,277
Other Income	72,974	228	111,143	347	25,960	81	25,522	80
Total Nett Farm Income	2,125,514	6,642	1,681,758	5,255	1,223,836	3,824	708,299	2,213
	0		0		0		0	
Expenses								
Wages	242,484	758	154,440	483	106,421	333	119,218	373
Veterinary and Animal Health	10,965	34	4,210	13	19,522	61	11,370	36
Stockfeed - Grazing	0	0	0	0	0	0	0	0
Stockfeed - Domestic	0	0	0	0	0	0	0	0
Stockfeed - Imported	0	0	0	0	0	0	0	0
Stockfeed - Conservation	17,855	56	35,632	111	31,256	98	26,663	83
Other Stock Expenses	1,500	5	1,000	3	1,000	3	3,750	12
Contracting	239,243	748	35,188	110	10,454	33	15,297	48
Freight	132,224	413	41,250	129	16,391	51	20,309	63
Fertiliser - Product	208,989	653	96,681	302	107,545	336	50,929	159
Fertiliser - Cart and Spread	11,280	35	6,215	19	21,195	66	10,049	31
Seed	220,875	690	47,345	148	53,963	169	27,720	87
Certification and Dressing	36,785	115	117,228	366	26,275	82	34,726	109
Agrichemical - Product	147,965	462	205,729	643	81,443	255	54,942	172
Agrichemical - Application	0	0	780	2	0	0	13,860	43
Repairs and Maintenance	54,300	170	49,300	154	39,588	124	25,300	79
Vehicles - Fuel	69,500	217	56,500	177	43,300	135	40,500	127
Vehicles - Repairs and Maintenance	23,500	73	21,500	67	19,200	60	12,000	38
Electricity	63,400	198	63,400	198	63,400	198	4,000	13
Other Farm Working Expenses	28,635	89	73,405	229	25,696	80	5,055	16
Administration	28,500	89	27,500	86	27,500	86	27,500	86
Standing Charges - Rates	25,920	81	25,920	81	14,000	44	18,432	58
Standing Charges - Insurances	17,970	56	21,788	68	26,985	84	14,413	45
Standing Charges - Other	40,600	127	40,600	127	32,560	102	400	1
Total Farm Working Expenses	1,622,489	5,070	1,125,609	3,518	767,692	2,399	536,432	1,676
	0		0		0		0	
EBIT	503,025	1,572	556,149	1,738	456,144	1,425	171,867	537
	0		0		0		0	
Non-Operting Expenses								
Interest	34,072	106	23,638	74	16,122	50	11,265	35
Tax	76,000	238	85,000	266	77,000	241	33,000	103
Plant Replacement/Depreciation	196,124	613	216,700	677	156,760	490	36,000	113
Total Non-Operating Expenses	306,196	957	325,338	1,017	249,882	781	80,265	251
	0		0		0		0	
Net Profit	196,829	615	230,811	721	206,262	645	91,602	286
Capital								
Plant and Machinery	1,800,000	5,625	1,537,000	4,803	970,000	3,031	360,000	1,125
Land, Irrigation Hardware and Water	14,400,000	45,000	14,400,000	45,000	13,440,000	42,000	9,280,000	29,000
Capital Stock	\$0	0	0	0	0	0	0	0
Total Capital (excl Overdraft)	16,200,000	50,625	15,937,000	49,803	14,410,000	45,031	9,640,000	30,125
Tax-Paid Return on Capital	1.21%		1.45%		1.43%		0.95%	

	Dairy 1		Dairy 2		Dairy Support 1		Dairy Support 2	
Land Area								
Area - Total		220		220		270		270
Area - Effective		210		210		260		260
Budget Summary	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha
Income								
Nett Sheep and Wool	0	0	0	0	0	0	0	0
Nett Cattle	114,560	521	108,109	491	765,891	2,837	952,203	3,527
Nett Deer and Velvet	0	0		0	0	0	0	0
Milk	2,435,496	11,070	2,167,867	9,854	0	0	0	0
Grain, Seed and Horticulture	0	0	0	0	257,470	954	102,600	380
Other Income	0	0	5,800	26	18,955	70	44,900	166
Total Nett Farm Income	2,550,056	11,591	2,281,776	10,372	1,042,316	3,860	1,099,703	4,073
Expenses								
Wages	309,250	1,406	248,700	1,130	132,700	491	132,700	491
Veterinary and Animal Health	105,801	481	99,153	451	2,000	7	2,000	7
Stockfeed - Grazing	390,186	1,774	359,408	1,634	0	0	0	0
Stockfeed - Domestic	377,890	1,718	230,830	1,049	2,000	7	2,000	7
Stockfeed - Imported	0	0	9,324	42	0	0	0	0
Stockfeed - Conservation	0	0	0	0	2,000	7	40,828	151
Other Stock Expenses	18,840	86	17,640	80	68,150	252	0	0
Contracting	12,600	57	12,600	57	19,700	73	26,340	98
Freight	29,340	133	25,470	116	0	0	13,535	50
Fertiliser - Product	148,071	673	151,191	687	120,960	448	113,283	420
Fertiliser - Cart and Spread	25,891	118	25,941	118	12,301	46	9,955	37
Seed	10,784	49	10,784	49	41,378	153	35,220	130
Certification and Dressing	500	2	500	2	500	2	500	2
Agrichemical - Product	6,725	31	6,725	31	53,328	198	69,174	256
Agrichemical - Application	3,234	15	3,234	15	8,008	30	4,360	16
Repairs and Maintenance	106,345	483	103,258	469	22,000	81	22,891	85
Vehicles - Fuel	23,916	109	24,049	109	18,800	70	18,800	70
Vehicles - Repairs and Maintenance	22,400	102	22,400	102	31,000	115	31,000	115
Electricity	73,180	333	70,780	322	56,740	210	31,819	118
Other Farm Working Expenses	10,540	48	10,360	47	3,500	13	5,975	22
Administration	25,935	118	25,935	118	24,700	91	24,700	91
Standing Charges - Rates	21,780	99	17,160	78	20,412	76	16,281	60
Standing Charges - Insurances	42,564	193	50,660	230	15,424	57	13,424	50
Standing Charges - Other	49,889	227	61,554	280	36,840	136	19,420	72
Total Farm Working Expenses	1,815,660	8,253	1,587,655	7,217	692,441	2,565	634,204	2,349
EBIT	734,396	3,338	694,122	3,155	349,875	1,296	465,499	1,724
Non-Operating Expenses								
Interest	38,129	173	33,341	152	14,541	54	13,318	49
Tax	152,000	691	141,000	641	51,000	189	91,778	340
Plant Replacement/Depreciation	157,240	715	155,790	708	150,400	557	124,400	461
Total Non-Operating Expenses	347,369	1,579	330,131	1,501	215,941	800	229,496	850
Net Profit	387,027	1,759	363,991	1,655	133,934	496	236,002	874
Capital								
Plant and Machinery	721,000	3,277	701,000	3,186	725,000	2,685	725,000	2,685
Land, Irrigation Hardware and Water	12,100,000	55,000	12,100,000	55,000	11,340,000	42,000	9,045,000	33,500
Capital Stock	1,605,250	7,297	1,500,000	6,818	0	0	0	0
Total Capital (excl Overdraft)	14,426,250	65,574	14,301,000	65,005	12,065,000	44,685	9,770,000	36,185
Tax-Paid Return on Capital	2.68%		2.55%		1.11%		2.42%	

	Red Meat 1		Red Meat 2		Forestry		Viticulture	
Land Area								
Area - Total	350		350		270		22	
Area - Effective	340		340		260		20	
Budget Summary	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha
Income								
Nett Sheep and Wool	156,337	447	107,689	308	0	0	0	0
Nett Cattle	394,420	1,127	518,120	1,480	0	0	0	0
Nett Deer and Velvet	46,960	134	61,478	176	0	0	0	0
Milk	0	0	0	0	0	0	0	0
Grain, Seed and Horticulture	17,100	49	60,040	172	0	0	367,750	16,716
Other Income	8,026	23	63,676	182	574,089	2,126	0	0
Total Nett Farm Income	622,844	1,780	811,003	2,317	574,089	2,126	367,750	16,716
Expenses								
Wages	140,660	402	138,307	395	0	0	162,680	7,395
Veterinary and Animal Health	19,970	57	38,276	109	0	0	0	0
Stockfeed - Grazing	0	0	0	0	0	0	0	0
Stockfeed - Domestic	28,100	80	17,750	51	0	0	0	0
Stockfeed - Imported	0	0	0	0	0	0	0	0
Stockfeed - Conservation	46,800	134	36,816	105	0	0	0	0
Other Stock Expenses	3,951	11	3,000	9	1,500	6	0	0
Contracting	3,100	9	8,151	23	291,974	1,081	14,600	664
Freight	8,022	23	17,640	50	102,143	378	3,350	152
Fertiliser - Product	44,027	126	123,845	354	0	0	8,370	380
Fertiliser - Cart and Spread	9,702	28	13,587	39	0	0	0	0
Seed	5,370	15	22,097	63	2,835	11	0	0
Certification and Dressing	500	1	500	1	0	0	0	0
Agrichemical - Product	11,600	33	33,293	95	2,682	10	9,300	423
Agrichemical - Application	3,080	9	8,360	24	2,088	8	12,000	545
Repairs and Maintenance	20,000	57	25,000	71	0	0	18,000	818
Vehicles - Fuel	12,200	35	12,200	35	0	0	5,540	252
Vehicles - Repairs and Maintenance	12,000	34	12,000	34	0	0	2,140	97
Electricity	5,260	15	27,009	77	0	0	4,600	209
Other Farm Working Expenses	3,500	10	3,500	10	0	0	5,000	227
Administration	24,700	71	24,700	71	52,100	193	19,000	864
Standing Charges - Rates	15,750	45	18,963	54	4,860	18	3,240	147
Standing Charges - Insurances	10,924	31	15,424	44	12,000	44	9,230	420
Standing Charges - Other	2,000	6	14,570	42	500	2	3,180	145
Total Farm Working Expenses	431,215	1,232	614,987	1,757	472,681	1,751	280,230	12,738
EBIT	191,629	548	196,016	560	101,408	376	87,520	3,978
Non-Operating Expenses								
Interest	9,056	26	12,915	37	9,926	37	5,885	267
Tax	40,000	114	33,000	94	25,000	93	9,000	409
Plant Replacement/Depreciation	40,400	115	63,000	180	0	0	47,000	2,136
Total Non-Operating Expenses	89,456	256	108,915	311	34,926	129	61,885	2,813
Net Profit	102,174	292	87,101	249	66,482	246	25,635	1,165
Capital								
Plant and Machinery	355,000	1,014	355,000	1,014	0	0	165,000	7,500
Land, Irrigation Hardware and Water	8,750,000	25,000	10,535,000	30,100	6,750,000	25,000	1,940,000	88,182
Capital Stock	195,500	559	0	0	0	0	0	0
Total Capital (excl Overdraft)	9,300,500	26,573	10,890,000	31,114	6,750,000	25,000	2,105,000	95,682
Tax-Paid Return on Capital	1.10%		0.80%		0.98%		1.22%	

	Arable 5		Dairy 4		Dairy Support 4		Red Meat 3	
Land Area								
Area - Total		320		220		270		360
Area - Effective		300		210		260		350
Budget Summary	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha	\$ total	\$/ha
Income								
Nett Sheep and Wool	212,540	664	0	0	0	0	179,671	499
Nett Cattle	0	0	92,595	421	452,215	1,675	884,849	2,458
Nett Deer and Velvet	0	0	0	0	0	0	179,577	499
Milk	0	0	2,420,902	11,004	0	0	0	0
Grain, Seed and Horticulture	1,369,500	4,280	0	0	536,580	1,987	0	0
Other Income	45,000	141	5,800	26	26,880	100	3,500	10
Total Nett Farm Income	1,627,040	5,085	2,519,297	11,451	1,015,675	3,762	1,247,598	3,466
		0		0		0		0
Expenses		0		0		0		0
Wages	251,938	787	248,700	1,130	127,000	470	167,089	464
Veterinary and Animal Health	10,500	33	146,896	668	9,105	34	59,143	164
Stockfeed - Grazing	0	0	102,938	468	0	0	0	0
Stockfeed - Domestic	0	0	605,778	2,754	0	0	26,644	74
Stockfeed - Imported	0	0	0	0	0	0	0	0
Stockfeed - Conservation	15,000	47	190,000	864	102,760	381	151,020	420
Other Stock Expenses	1,500	5	14,400	65	0	0	4,959	14
Contracting	51,078	160	4,760	22	43,700	162	52,125	145
Freight	46,652	146	3,308	15	19,620	73	38,128	106
Fertiliser - Product	120,899	378	141,275	642	80,845	299	128,191	356
Fertiliser - Cart and Spread	42,057	131	23,524	107	18,176	67	21,128	59
Seed	117,975	369	8,568	39	83,764	310	48,100	134
Certification and Dressing	50,699	158	500	2	500	2	500	1
Agrichemical - Product	220,474	689	6,862	31	56,354	209	28,625	80
Agrichemical - Application	0	0	2,992	14	30,822	114	14,300	40
Repairs and Maintenance	54,300	170	126,200	574	44,500	165	46,750	130
Vehicles - Fuel	81,500	255	42,000	191	33,973	126	40,487	112
Vehicles - Repairs and Maintenance	26,000	81	46,400	211	20,500	76	28,000	78
Electricity	63,400	198	67,260	306	58,480	217	41,650	116
Other Farm Working Expenses	25,410	79	10,360	47	3,500	13	3,500	10
Administration	32,740	102	25,935	118	24,900	92	27,500	76
Standing Charges - Rates	6,912	22	17,160	78	7,020	26	9,450	26
Standing Charges - Insurances	19,730	62	62,680	285	21,346	79	28,068	78
Standing Charges - Other	40,600	127	48,756	222	23,950	89	23,950	67
Total Farm Working Expenses	1,279,363	3,998	1,947,251	8,851	810,815	3,003	989,306	2,748
		0		0		0		0
EBIT	347,677	1,086	572,046	2,600	204,860	759	258,292	717
		0		0		0		0
Non-Operting Expenses		0		0		0		0
Interest	26,867	84	40,892	186	17,027	63	20,775	58
Tax	0	0	84,000	382	16,000	59	22,000	61
Plant Replacement/Depreciation	240,000	750	229,500	1,043	129,000	478	158,137	439
Total Non-Operating Expenses	266,867	834	354,392	1,611	162,027	600	200,913	558
		0		0		0		0
Net Profit	80,810	253	217,653	989	42,833	159	57,379	159
Capital								
Plant and Machinery	1,830,000	5,719	3,057,000	13,895	2,122,000	7,859	3,270,000	9,083
Land, Irrigation Hardware and Water	4,577,323	14,304	4,074,674	18,521	1,151,169	4,264	2,774,957	7,708
Capital Stock	0	0	1,194,750	5,431	0	0	0	0
Total Capital (excl Overdraft)	6,407,323	20,023	8,326,424	37,847	3,273,169	12,123	6,044,957	16,792
Tax-Paid Return on Capital	1.26%		2.61%		1.31%		0.95%	

5.6.4. Assessing Return on Capital and Land Value

The “Starting Point” return on capital has been ascertained using arbitrary land values, considered by MRB to represent medium-term value with no irrigation scheme debt (MRB are not registered valuers and value noted should be considered an opinion, not a valuation).

The Starting Point land values were set as land and buildings (including dairy sheds, excluding barns).

Dairy 1	\$55,000
Dairy 2	\$55,000
Dairy Support 1	\$42,000
Dairy Support 2	\$33,500
Arable 1	\$45,000
Arable 2	\$45,000
Arable 3	\$42,000
Arable 4	\$29,000
Red Meat 1	\$25,000
Red Meat 2	\$30,100
Viticulture (land + establishment)	\$97,000
Forestry	\$25,000
Other	\$43,196

Figure 9: Starting Point nominal land values

To calculate the underlying land values in the Forecast models, the return on capital that was enjoyed by the farm system in the Starting Point models was applied to the tax paid EBIT to ascertain total asset value. The improvements (for example barns) that were added to run the Forecast farm system were deducted from the total capital, as were stock and plant, to define the residual land asset value.

Formula:

$$(\text{Tax Paid Profit} / \text{Starting Point ROC}) - \text{new improvements, stock and plant} = \text{land asset value}$$

5.6.5. Consolidated Catchment Budget Comparison

CATCHMENT BUDGET	Starting Point (\$M)	Forecast (\$M)	Variance (\$M)
Income			
Nett Sheep and Wool	44.3	62.4	18.1
Nett Cattle	302.1	153.8	-148.3
Nett Deer and Velvet	8.2	21.5	13.3
Milk	1,129.8	602.7	-527.2
Grain, Seed and Horticulture	263.8	292.8	29.0
Other Income	31.2	235.4	204.2
Total Nett Farm Income	1,779.4	1,368.6	-410.8
Expenses			
Wages	203.0	137.4	-65.6
Veterinary and Animal Health	58.6	46.2	-12.4
Stockfeed - Grazing	186.2	25.6	-160.6
Stockfeed - Domestic	133.8	154.0	20.2
Stockfeed - Imported	4.0	0.0	-4.0
Stockfeed - Conservation	16.3	73.9	57.6
Other Stock Expenses	16.4	5.1	-11.3
Contracting	19.8	133.3	113.5
Freight	23.6	55.2	31.6
Fertiliser - Product	131.8	78.2	-53.6
Fertiliser - Cart and Spread	19.9	17.5	-2.4
Seed	25.9	36.3	10.3
Certification and Dressing	13.5	10.0	-3.6
Agrichemical - Product	44.8	51.7	6.9
Agrichemical - Application	3.8	5.0	1.2
Repairs and Maintenance	69.2	49.9	-19.3
Vehicles - Fuel	27.5	32.8	5.4
Vehicles - Repairs and Maintenance	22.7	21.0	-1.7
Electricity	59.4	37.1	-22.3
Other Farm Working Expenses	15.8	8.1	-7.7
Administration	27.3	37.7	10.4
Standing Charges - Rates	19.0	9.0	-10.0
Standing Charges - Insurances	34.8	28.6	-6.2
Standing Charges - Other	44.0	24.3	-19.7
Total Farm Working Expenses	1,221.1	1,077.7	-143.4
EBIT	558.3	290.9	-267.4
Non-Operating Expenses			
Interest	25.6	22.6	-3.0
Tax	106.9	34.2	-72.7
Plant Replacement/Depreciation	148.4	129.3	-19.1
Total Non-Operating Expenses	280.9	186.1	-94.8
Net Profit	277.4	104.8	-172.6
Capital			
Plant and Machinery	788.1	1,620.8	832.7
Land, Irrigation Hardware and Water	12,297.1	4,917.8	-7,379.2
Capital Stock	789.6	297.4	-492.1
Total Capital (excl Overdraft)	13,874.8	6,836.1	-7,038.7

5.6.6. Consolidated Catchment Budget Comparison by Enterprise

Catchment Based Enterprise Budget Variance Summary									
Budget Summary	Arable (\$M)			Dairy (\$M)			Dairy Support (\$M)		
	Start Point	Forecast	Variance	Start Point	Forecast	Variance	Start Point	Forecast	Variance
Income									
Nett Sheep and Wool	24.4	40.9	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Nett Cattle	29.9	0.0	-29.9	55.8	23.1	-32.7	147.0	24.7	-122.3
Nett Deer and Velvet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Milk	0.0	0.0	0.0	1,129.8	602.7	-527.2	0.0	0.0	0.0
Grain, Seed and Horticulture	225.2	263.4	38.2	0.0	0.0	0.0	32.5	29.3	-3.2
Other Income	12.8	8.7	-4.1	2.5	1.4	-1.0	5.3	1.5	-3.8
Total Nett Farm Income	292.3	312.9	20.6	1,188.1	627.2	-560.9	184.8	55.4	-129.3
Expenses									
Wages	26.8	48.4	21.7	132.1	61.9	-70.2	23.0	6.9	-16.0
Veterinary and Animal Health	2.6	2.0	-0.6	51.2	36.6	-14.6	0.3	0.5	0.2
Stockfeed - Grazing	0.0	0.0	0.0	186.2	25.6	-160.6	0.0	0.0	0.0
Stockfeed - Domestic	0.0	0.0	0.0	130.0	150.8	20.8	0.3	0.0	-0.3
Stockfeed - Imported	0.0	0.0	0.0	4.0	0.0	-4.0	0.0	0.0	0.0
Stockfeed - Conservation	6.6	2.9	-3.7	0.0	47.3	47.3	3.4	5.6	2.2
Other Stock Expenses	0.2	0.3	0.1	9.1	3.6	-5.5	6.5	0.0	-6.5
Contracting	6.0	9.8	3.8	6.4	1.2	-5.3	3.9	2.4	-1.5
Freight	6.3	9.0	2.6	13.3	0.8	-12.5	1.1	1.1	0.0
Fertiliser - Product	21.5	23.2	1.7	77.0	35.2	-41.8	20.3	4.4	-15.9
Fertiliser - Cart and Spread	2.9	8.1	5.2	13.3	5.9	-7.4	1.9	1.0	-1.0
Seed	11.6	22.7	11.1	5.5	2.1	-3.4	6.7	4.6	-2.1
Certification and Dressing	13.1	9.7	-3.3	0.3	0.1	-0.1	0.1	0.0	-0.1
Agrichemical - Product	27.4	42.4	15.0	3.4	1.7	-1.7	10.5	3.1	-7.4
Agrichemical - Application	0.1	0.0	-0.1	1.7	0.7	-0.9	1.1	1.7	0.6
Repairs and Maintenance	8.9	10.4	1.5	53.0	31.4	-21.6	3.9	2.4	-1.4
Vehicles - Fuel	10.1	15.7	5.6	12.3	10.5	-1.8	3.3	1.9	-1.4
Vehicles - Repairs and Maintenance	4.1	5.0	0.9	11.4	11.6	0.1	5.4	1.1	-4.2
Electricity	12.7	12.2	-0.5	36.4	16.7	-19.6	7.9	3.2	-4.7
Other Farm Working Expenses	9.2	4.9	-4.3	5.3	2.6	-2.7	0.8	0.2	-0.6
Administration	5.6	6.3	0.7	13.3	6.5	-6.8	4.3	1.4	-2.9
Standing Charges - Rates	4.0	1.3	-2.6	9.1	4.3	-4.9	3.2	0.4	-2.8
Standing Charges - Insurances	4.9	3.8	-1.1	25.2	15.6	-9.6	2.5	1.2	-1.3
Standing Charges - Other	7.2	7.8	0.6	30.5	12.1	-18.4	5.0	1.3	-3.7
Total Farm Working Expenses	191.9	246.0	54.2	830.1	484.8	-345.3	115.2	44.3	-71.0
EBIT	100.5	66.9	-33.6	358.0	142.4	-215.6	69.5	11.2	-58.3
Non-Operating Expenses									
Interest	4.0	5.2	1.1	17.4	10.2	-7.3	2.4	0.9	-1.5
Tax	16.2	0.0	-16.2	73.0	20.9	-52.0	12.0	0.9	-11.1
Plant Replacement/Depreciation	36.8	46.2	9.4	79.7	57.1	-22.6	24.0	7.0	-17.0
Total Non-Operating Expenses	57.0	51.3	-5.6	170.1	88.2	-81.9	38.4	8.8	-29.6
Net Profit	43.5	15.5	-28.0	187.9	54.2	-133.7	31.1	2.3	-28.8
Capital									
Plant and Machinery	249.0	351.9	103.0	359.9	761.0	401.2	125.4	115.8	-9.6
Land, Irrigation Hardware and Water	2,805.2	880.2	-1,925.0	6,183.5	1,014.4	-5,169.1	1,782.9	62.8	-1,720.1
Capital Stock	0.0	0.0	0.0	775.2	297.4	-477.8	0.0	0.0	0.0
Total Capital (excl Overdraft)	3,054.2	1,232.2	-1,822.0	7,318.6	2,072.8	-5,245.7	1,908.3	178.7	-1,729.7

Catchment Based Enterprise Budget Variance Summary									
Budget Summary	Red Meat (\$M)			Viticulture (\$M)			Forestry (\$M)		
	Start Point	Forecast	Variance	Start Point	Forecast	Variance	Start Point	Forecast	Variance
Income									
Nett Sheep and Wool	19.9	21.5	1.6	0.0	0.0	0.0	0.0	0.0	0.0
Nett Cattle	69.4	106.1	36.7	0.0	0.0	0.0	0.0	0.0	0.0
Nett Deer and Velvet	8.2	21.5	13.3	0.0	0.0	0.0	0.0	0.0	0.0
Milk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grain, Seed and Horticulture	5.9	0.0	-5.9	0.2	0.2	0.0	0.0	0.0	0.0
Other Income	5.6	0.4	-5.1	0.0	0.0	0.0	5.1	223.4	218.3
Total Nett Farm Income	109.0	149.5	40.5	0.2	0.2	0.0	5.1	223.4	218.3
Expenses									
Wages	21.1	20.0	-1.1	0.1	0.1	0.0	0.0	0.0	0.0
Veterinary and Animal Health	4.5	7.1	2.6	0.0	0.0	0.0	0.0	0.0	0.0
Stockfeed - Grazing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stockfeed - Domestic	3.5	3.2	-0.3	0.0	0.0	0.0	0.0	0.0	0.0
Stockfeed - Imported	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stockfeed - Conservation	6.3	18.1	11.8	0.0	0.0	0.0	0.0	0.0	0.0
Other Stock Expenses	0.5	0.6	0.1	0.0	0.0	0.0	0.0	0.6	0.6
Contracting	0.9	6.2	5.4	0.0	0.0	0.0	2.6	113.6	111.0
Freight	2.0	4.6	2.6	0.0	0.0	0.0	0.9	39.8	38.8
Fertiliser - Product	12.9	15.4	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Fertiliser - Cart and Spread	1.8	2.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Seed	2.1	5.8	3.6	0.0	0.0	0.0	0.0	1.1	1.1
Certification and Dressing	0.1	0.1	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agrichemical - Product	3.4	3.4	-0.0	0.0	0.0	0.0	0.0	1.0	1.0
Agrichemical - Application	0.9	1.7	0.8	0.0	0.0	0.0	0.0	0.8	0.8
Repairs and Maintenance	3.4	5.6	2.2	0.0	0.0	0.0	0.0	0.0	0.0
Vehicles - Fuel	1.8	4.9	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Vehicles - Repairs and Maintenance	1.8	3.4	1.5	0.0	0.0	0.0	0.0	0.0	0.0
Electricity	2.5	5.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
Other Farm Working Expenses	0.5	0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Administration	3.7	3.3	-0.4	0.0	0.0	0.0	0.5	20.3	19.8
Standing Charges - Rates	2.6	1.1	-1.5	0.0	0.0	0.0	0.0	1.9	1.8
Standing Charges - Insurances	2.0	3.4	1.4	0.0	0.0	0.0	0.1	4.7	4.6
Standing Charges - Other	1.3	2.9	1.6	0.0	0.0	0.0	0.0	0.2	0.2
Total Farm Working Expenses	79.7	118.6	38.9	0.1	0.1	0.0	4.2	184.0	179.8
EBIT	29.4	31.0	1.6	0.0	0.0	0.0	0.9	39.5	38.6
Non-Operating Expenses									
Interest	1.7	2.5	0.8	0.0	0.0	0.0	0.1	3.9	3.8
Tax	5.5	2.6	-2.9	0.0	0.0	0.0	0.2	9.7	9.5
Plant Replacement/Depreciation	7.9	19.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0
Total Non-Operating Expenses	15.1	24.1	9.0	0.0	0.0	0.0	0.3	13.6	13.3
Net Profit	14.3	6.9	-7.4	0.0	0.0	0.0	0.6	25.9	25.3
Capital									
Plant and Machinery	53.8	392.0	338.2	0.1	0.1	0.0	0.0	0.0	0.0
Land, Irrigation Hardware and Water	1,465.0	332.6	-1,132.3	0.8	0.8	0.0	59.7	2,627.0	2,567.3
Capital Stock	14.4	0.0	-14.4	0.0	0.0	0.0	0.0	0.0	0.0
Total Capital (excl Overdraft)	1,533.1	724.6	-808.5	0.9	0.9	0.0	59.7	2,627.0	2,567.3

6. Discussion

1. At a catchment level, the nett farm income may reduce as a result of trying to achieve 2.4ppm N in surface water

A mitigation to additional fixed costs in a farming business is to try and increase the level of output from the fixed resources. In this particular analysis the livestock operations (dairy, beef, deer sheep) performance was increased markedly, which in turn increases nett sales for more product is sold. Despite the projected increase in nett farm revenue from agriculture, the significant land use change to forestry which has a much lower nett revenue results in a catchment reduction in nett farm income.

2. Reduced Farm Working Expenses

\$143,000,000 reduction in expenditure.

In partnership with the drive to increase income when under pressure, this comes with additional costs. In all agriculture budgets there is a material change in infrastructure to putting cattle in barns over winter which not only comes at a capital cost, but all the feed must be harvested, stored, and fed out again which adds further cost.

The increase in farm working expenses for is offset by the increase in forestry area with much lower farm working expenses, resulting in a nett reduction in regional spend.

3. Reduced rates

To reflect reduced asset values, the rates have been reduced proportionally to suit. This will impact Councils ability to spend in the community, including maintaining roads.

An alternative approach might be that total rates are maintained, resulting in an increase in rates to some, to compensate for the reduced rating revenue from rural land.

4. Lower Profit

As a result of both a reduction in farm expenses and a much greater reduction in farm income a nett reduction in regional EBIT (\$267 million p/a less) is projected. Consequently we could expect to see at least a \$72.7m less tax paid to the government.

Residual profit after tax reduced by \$592 per effective hectare, total \$173m less profit in the community.

5. Land Capital

Profit and asset value are intrinsically linked. In the modelled farm and forestry scenarios considered, cash profit is reduced and significant capital investment has been required. Collectively these two actions result in a devaluation of the underlying asset value (land in this case) when investors seek to maintain a return on total capital.

The modelling forecasts a loss of land equity of \$7.4bn for the Mid Canterbury Plains. This equates to an average reduction in land value of \$25,309/ha.

6. Forestry and the potential impact on infrastructure

The forestry is not new to Canterbury, although it has become less popular and therefore less common mid-plains in the recent decades.

With the advent of 105,079 ha forestry, approximately 3800 ha will be harvested in the Ashburton district annually. This will put significant pressure on roading networks and regional infrastructure.

The Ashburton District would need to consider what further investment in the infrastructure will be required in the future to provide for this land use change.

7. Displacing established businesses.

Local specialist businesses (meat processors, grain and seed merchants or vegetable producers) will have their businesses models threatened if Ashburton is to achieve 2.4ppm N in surface water in the way modelled.

Changes in land use detailed in the scenario considered in this report indicate the local business impact could be:

- 85,000,000kgMS less production
- 3,522 ha less available to the seed multiplication and process vegetable market.
- Approximately 185,000 less head of cattle (dairy and beef) to process for meat.

8. Culture, personnel, and market access

Moving to a housed livestock system is at odds with the free-range system on which much of NZ's market access and trade reputation is based. Widespread change in the way we farm, away from a more "free range" system to indoor farming may undermine our reputation and challenge NZ's premium position in the market place.

Housed livestock systems can be very mechanical in terms of day to day management. Being inside for 5 months of the year would be a large psychological challenge for many New Zealand farmers as they (mostly) prefer to work outdoors. We would expect to see a large change in management personnel, similar to that with the introduction of irrigation schemes to an area (90% turnover in 10 years).

9. Managed Aquifer Recharge.

This scenario is highly dependant on finding 17.1m³.sec from alpine rivers to seep into the aquifers or directly into rivers/drains/streams. The political and social resistance to this is increasing constantly and there are no guarantees that unused water on existing consents will not be mandated to return to the river of origin.

7. Conclusions

1. While it is technically plausible to achieve the national environmental standards of nitrogen in water of 2.4ppm, there will be material economic, social and physical changes to the (traditionally) agricultural land in the Ashburton District. The focal consequences in terms of productivity and land use are:
 - a. 3,522ha less arable land.
 - b. 85,000,000kg less milk solids produced.
 - c. 185,000 head less cattle to process.
 - d. 102,691 ha increase in forestry, lost from food production unless carbon credits are repaid.
2. To achieve the 2.4ppm Nitrate Nitrogen in rivers, Ashburton District will also rely on obtaining 17.1 m³/sec alpine water for Managed Aquifer Recharge. The availability of this water would need to be ascertained and hydrological assessments would need to be made to ensure this is feasible. If 17.1 m³/sec MAR is hydrologically, socially or culturally impractical, the further land use change to forestry would need to be considered.
3. While we are able to model financial viability of farm systems with a much reduced environmental footprint, the significantly reduced profit and significantly increased cash loss exposure due to commodity price swings may have more adverse impacts than the modelling indicates. The modelling indicates the Ashburton District would see:
 - a. Average \$592/ha less profit across the catchment.
 - b. Increased cost structures will result in reduced business resilience and greater profit/loss volatility.
 - c. \$7.4 bn loss in land asset values.
4. Significant investment in market development and alternative business opportunities will be required by the district (and country) to ensure it survives, because the changes to farming methods proposed in this assessment would undermine a large portion of NZ's current market positioning.
5. Attempting to meet a water quality target of 2.4ppm N would be extremely financially, physically and psychologically challenging for most Ashburton farmers and could have material sociological impacts on the wider community.

8. Appendices

8.1. Appendix 1: Arable 1 - Start Point

Farm System Summary

Area:

Total	320ha
Effective	300ha

Irrigated balance:

100% Pivot Irrigated

Stock policy:

3800 trading Lambs.

Labour Policy:

Waged:

Two permanent staff responsible particularly for machinery operations.

Two casual labour units through summer months e.g. agricultural students helping with irrigation and harvest.

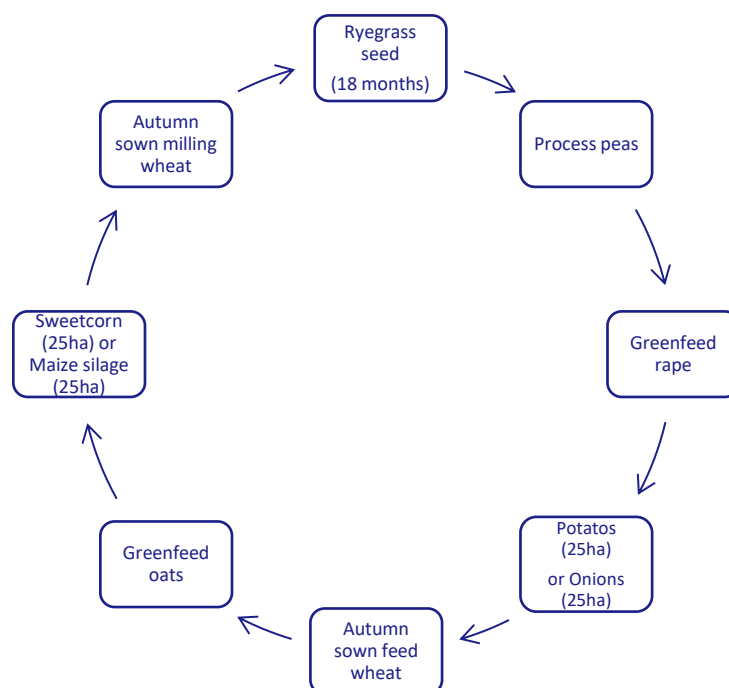
Own labour used for cultivation, drilling, boom-spraying, fertiliser spreading, grain & seed harvest, grain/seed cartage to sale.

Contractors:

Specialist contractors employed for:

all fertiliser spreading, boom-spraying, direct-drilling of kale, windrowing & heading & drying of ryegrass seed crop, straw baling, shearing and crutching, grain/seed/livestock cartage to sale.

Crop Rotation:

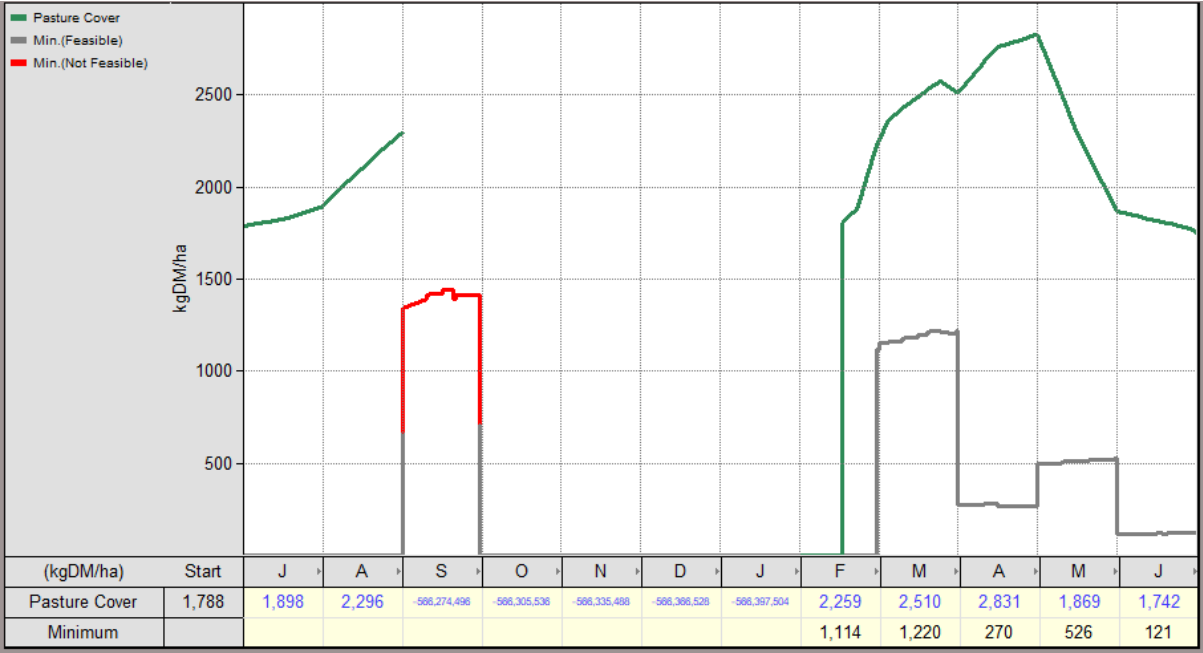


Budget Summary

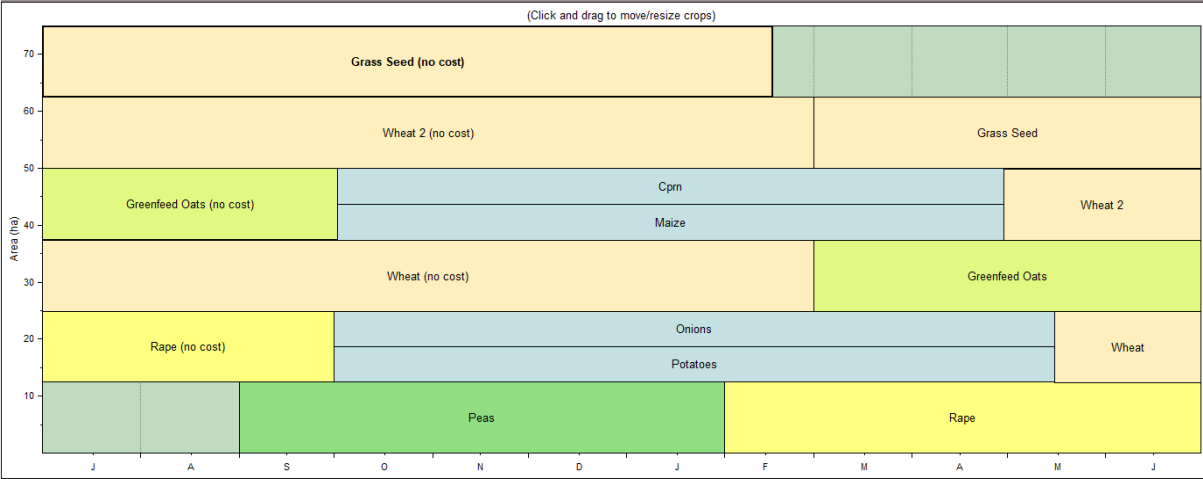
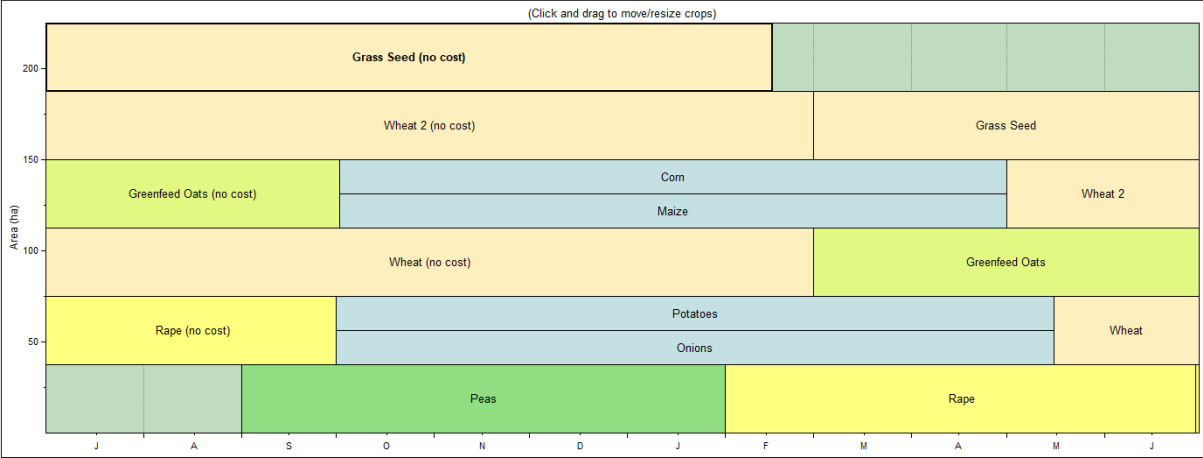
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		320 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	242,484	758	SHEEP	435,781	
VETERINARY AND ANIMAL HEALTH	10,965	34	WOOL	24,671	
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES	1,500	5	VELVET		
STOCKFEED - Conservation	17,855	56	GRAIN AND PULSE PRODUCE		
CONTRACTING	239,243	748	Previous Yr Sales		
FREIGHT	132,224	413	Current Yr Sales	1,658,150	
FERTILISER - Product	208,989	653	Unsold At Year End		
FERTILISER - Cart and Spread	11,280		SMALL SEED PRODUCE		
SEED	220,875	690	Previous Yr Sales		
CERTIFICATION AND DRESSING	36,785	115	Current Yr Sales	224,250	
AGRICHEMICAL - Product	147,965	462	Unsold At Year End		
AGRICHEMICAL - Application			MISCELLANEOUS INCOME	72,974	
REPAIRS & MAINTENANCE	54,300	170			
VEHICLES - Fuels	69,500	217	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	23,500		Sheep	-290,312	
ELECTRICITY	63,400	198	Cattle		
OTHER WORKING EXPS	28,635	89	Deer		
ADMINISTRATION	28,500	89	Other		
STANDING CHARGES - Rates	25,920	81			
STANDING CHARGES - Insurance & ACC	17,970				
STANDING CHARGES - Other	40,600				
CASH FARM WORKING EXPENSES	1,622,489	5,070	CASH FARM INCOME	2,125,514	6,642
EBIT (Earnings Before Interest and Tax)	503,025	1,572			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	34,072	106			
Rent					
Other					
CASH OPERATING EXPENSES	1,656,561	5,177	CASH OPERATING INCOME	2,125,514	6,642
CASH OPERATING SURPLUS/DEFICIT	468,953	1,465			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	76,000	238			
PLANT REPLACEMENT	196,124	613	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	1,928,685	6,027	TOTAL CASH INCOME	2,125,514	6,642
TOTAL CASH SURPLUS/DEFICIT	196,829	615			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	196,829	615			

Farmax Summary

Pasture Covers



Crops by Block`



Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Lambs								500	1,490	2,615	3,010	2,499
Mixed Hoggets	2,489	1,899										
Total	2,489	1,899						500	1,490	2,615	3,010	2,499

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr-Arable 1 - AM1_2035.21

Analysis type Predictive
Is publication No
Application version 3.4.1.3
Printed date 27 May 2021, 11:30AM
Model version 6.3.5

Farm details

Total area	320 ha
Productive block area	300.00 ha
Nitrogen conversion efficiency (NCE)	97%
N Surplus	5 kg/ha
Region	Canterbury
Sheep stock rate (RSU)	945

N: **7,207** N/ha: **23** P: **143** P/ha: **0.4** GHG/ha: **3,655** | NCE: **97%**

8.2. Appendix 2: Arable 2 - Start Point

Farm System Summary

Area:

Total	320ha
Effective	300ha

Irrigated balance:

100% Pivot Irrigated

Stock policy:

1400 summer trading Lambs
700 winter trading lambs

Labour Policy:

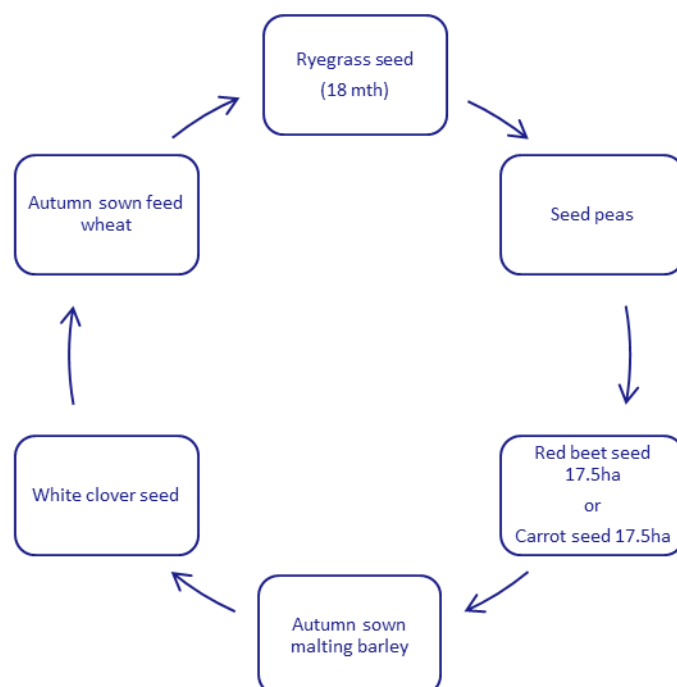
Waged:

Two permanent staff, plus one casual labour unit helping with irrigation and harvest.
Own labour used for cultivation, drilling, boom-spraying, harvest, grain/seed cartage to sale.
Crutching carried out by own farm labour.

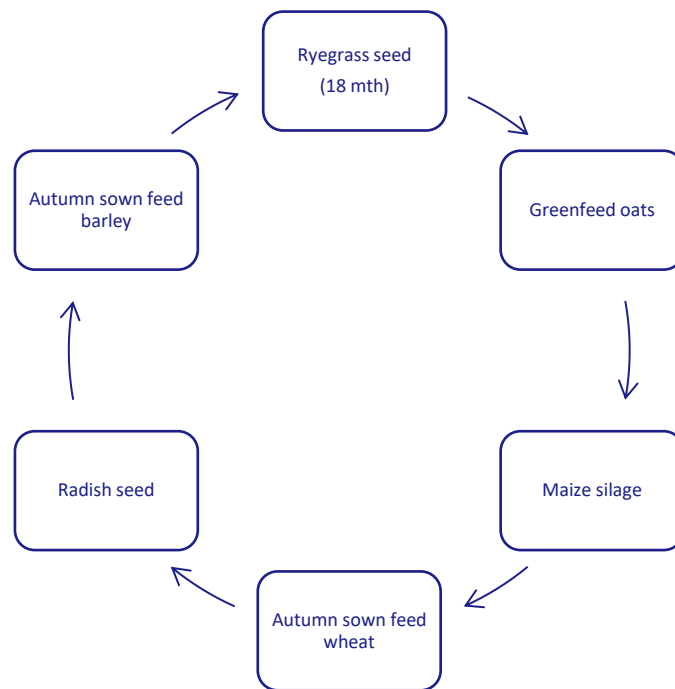
Contractors:

Specialist contractors employed for all fertiliser spreading, all hybrid seed crop related operations, maize planting, windrowing & heading & drying of ryegrass seed crop, windrowing & drying of carrot seed crop, straw baling, shearing. Contract cartage for delivery-to-sale of various grain & seed produce.

Crop Rotation 1 (70% Area):



Crop Rotation 2 (30% Area):

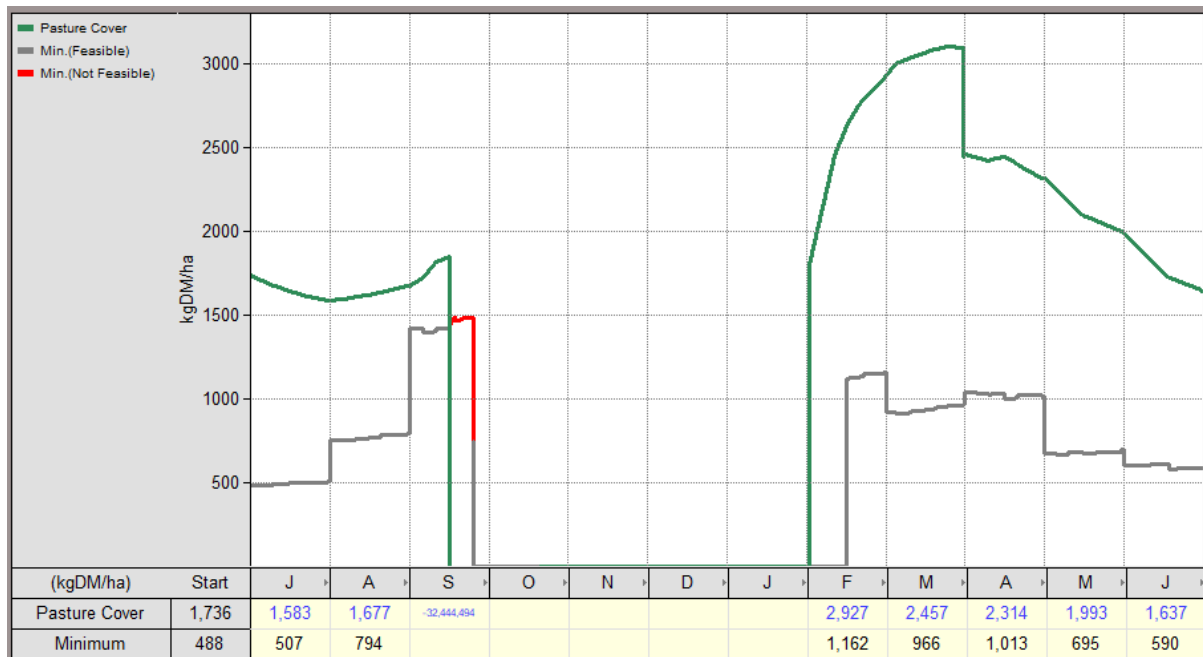


Budget Summary

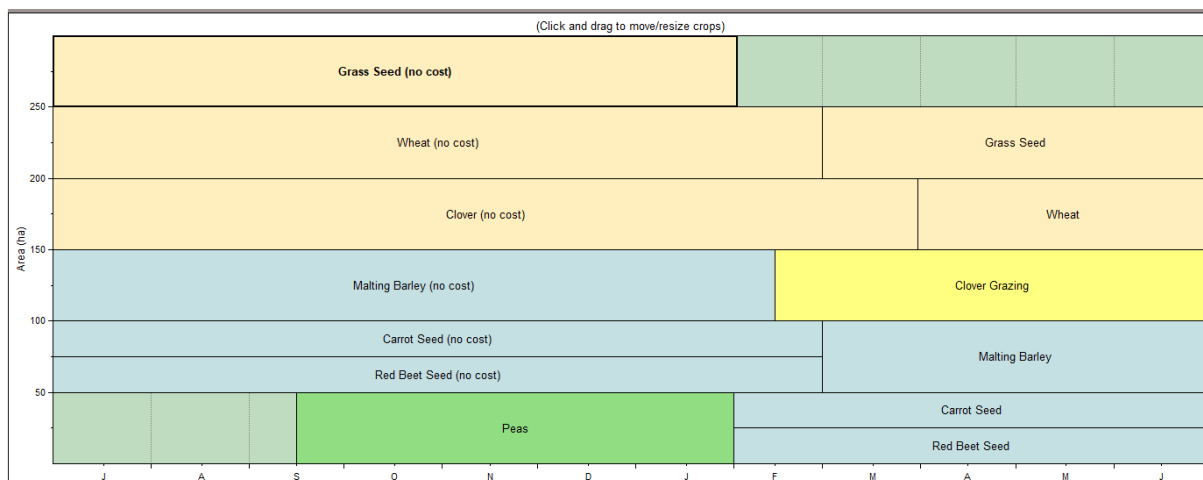
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		300 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	154,440	515	SHEEP	221,256	
VETERINARY AND ANIMAL HEALTH	4,210	14	WOOL	11,999	
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES	1,000	3	VELVET		
STOCKFEED - Conservation	35,632	119	GRAIN AND PULSE PRODUCE		
CONTRACTING	35,188	117	Previous Yr Sales		
FREIGHT	41,250	137	Current Yr Sales	660,824	
FERTILISER - Product	96,681	322	Unsold At Year End		
FERTILISER - Cart and Spread	6,215	21	SMALL SEED PRODUCE		
SEED	47,345	158	Previous Yr Sales		
CERTIFICATION AND DRESSING	117,228	391	Current Yr Sales	835,675	
AGRICHEMICAL - Product	205,729	686	Unsold At Year End		
AGRICHEMICAL - Application	780	3	MISCELLANEOUS INCOME	111,143	
REPAIRS & MAINTENANCE	49,300	164			
VEHICLES - Fuels	56,500	188	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	21,500	72	Sheep	-159,138	
ELECTRICITY	63,400	211	Cattle		
OTHER WORKING EXPS	73,405	245	Deer		
ADMINISTRATION	27,500	92	Other		
STANDING CHARGES - Rates	25,920	86			
STANDING CHARGES - Insurance & ACC	21,788	73			
STANDING CHARGES - Other	40,600	135			
CASH FARM WORKING EXPENSES	1,125,609	3,752	CASH FARM INCOME	1,681,758	5,606
EBIT (Earnings Before Interest and Tax)	556,149	1,854			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	23,638	79			
Rent					
Other					
CASH OPERATING EXPENSES	1,149,247	3,831	CASH OPERATING INCOME	1,681,758	5,606
CASH OPERATING SURPLUS/DEFICIT	532,511	1,775			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	85,000	283			
PLANT REPLACEMENT	216,700	722	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	1,450,947	4,836	TOTAL CASH INCOME	1,681,758	5,606
TOTAL CASH SURPLUS/DEFICIT	230,811	769			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	230,811	769			

Farmax Summary

Pasture Covers



Crops by Block



Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Lambs								595	1,237	1,200	1,232	698
Mixed Hoggets	688	586										
Total	688	586						595	1,237	1,200	1,232	698

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr-Arable2 - AM3_2035.21

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 11:17AM
Model version	6.3.5

Farm details

Total area	360 ha
Productive block area	300.00 ha
Nitrogen conversion efficiency (NCE)	43%
N Surplus	85 kg/ha
Region	Canterbury
Sheep stock rate (RSU)	369

N: 9,047 N/ha: 25 P: 36 P/ha: 0.1 GHG/ha: 2,448 NCE: 43%

8.3. Appendix 3: Arable 3 - Start Point

Farm System Summary

Area:

Total	320ha
Effective	300ha

Irrigated balance:

80% Pivot Irrigated
20% Dry land

Stock policy:

3000 summer trading Lambs
1000 winter trading lambs
300 beef cross calves bought as 100kg weaners and sold prime.

Labour Policy:

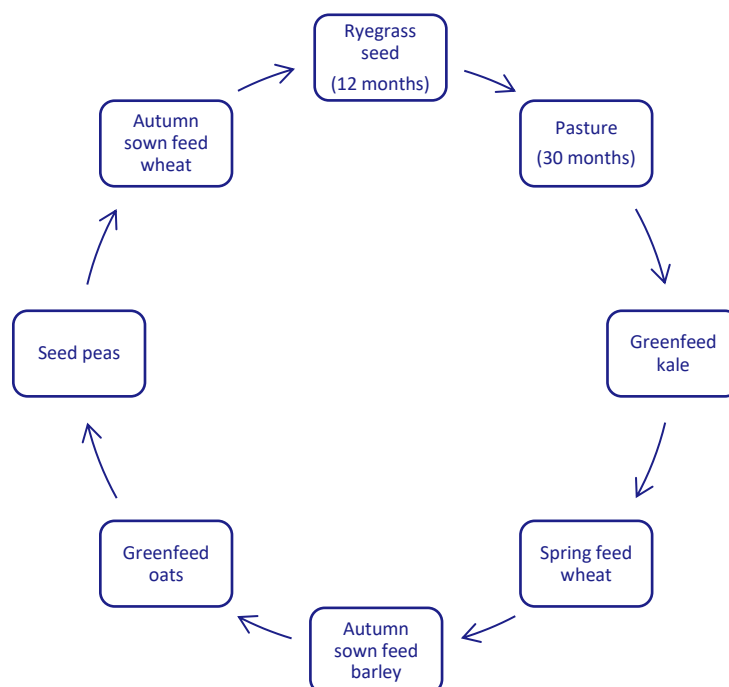
Waged:

One full time labour unit plus one casual labour unit helping with irrigation and harvest.
Own labour used for cultivation, drilling, boom-spraying, harvest, grain/seed cartage to sale.

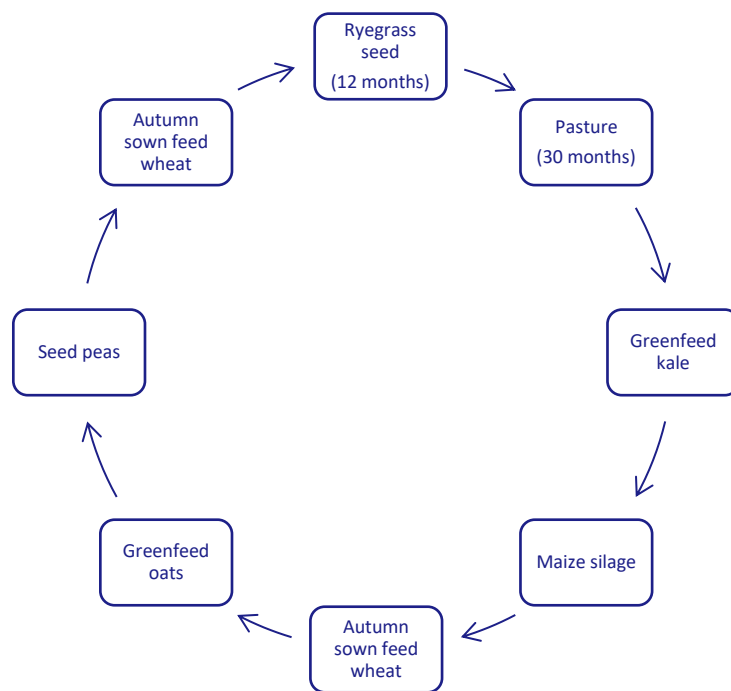
Contractors:

Specialist contractors employed for: all fertiliser spreading, direct-drilling of kale, maize planting, windrowing & heading & drying of ryegrass seed crop, straw baling, maize harvest and silage stack preparation, shearing and some crutching.

Crop Rotation 1 (Dryland):



Crop Rotation 2 (Irrigated):

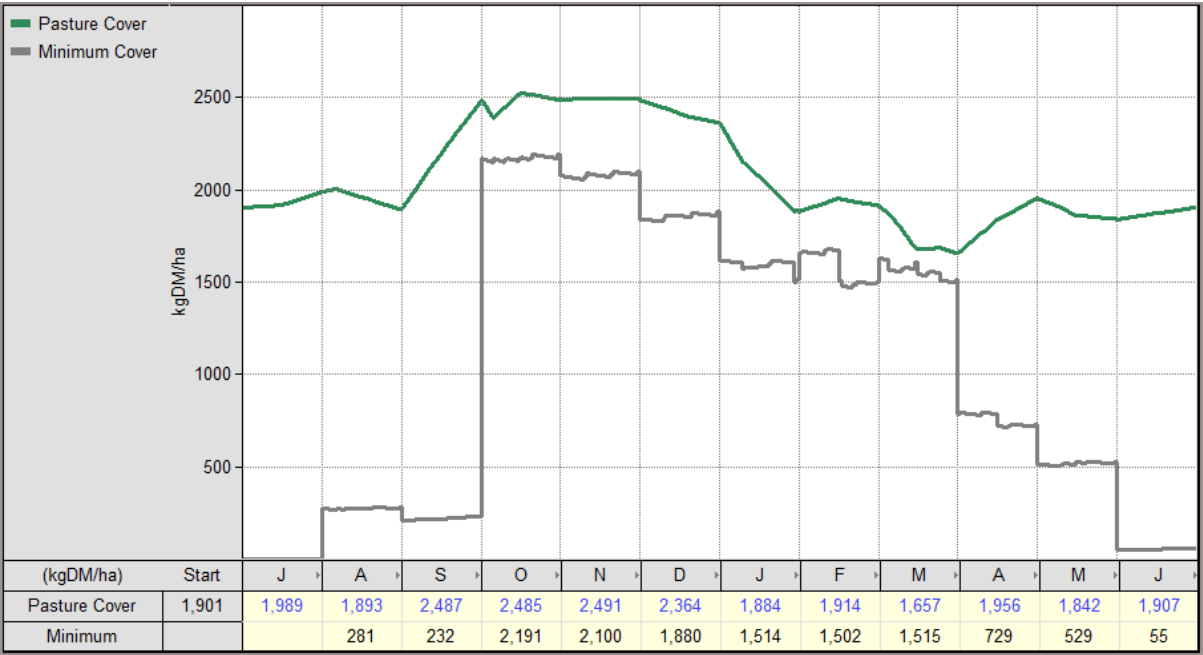


Budget Summary

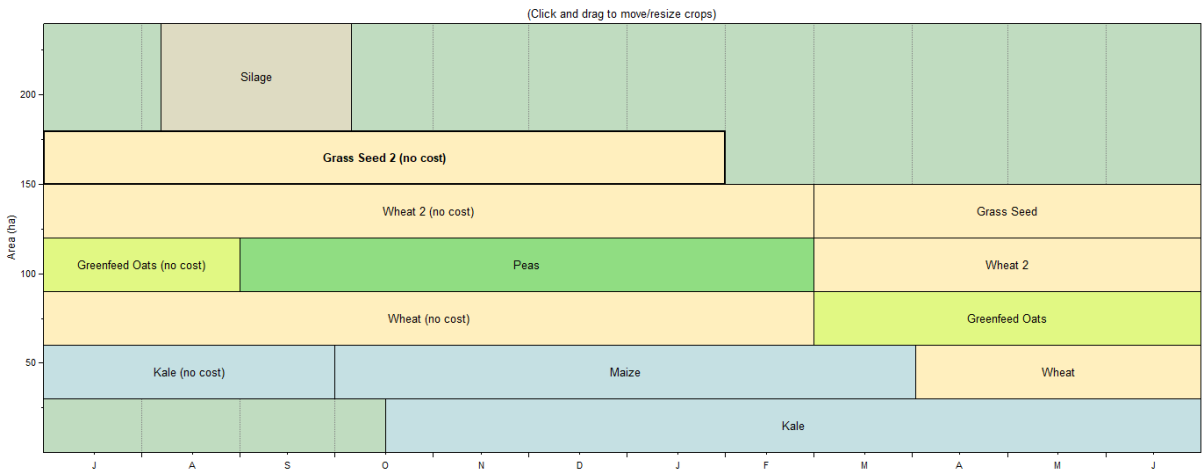
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		320 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	106,421	333	SHEEP	431,687	
VETERINARY AND ANIMAL HEALTH	19,522	61	WOOL	27,317	
STOCKFEED - Grazing			CATTLE	411,791	
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES	1,000	3	VELVET		
STOCKFEED - Conservation	31,256	98	GRAIN AND PULSE PRODUCE		
CONTRACTING	10,454	33	Previous Yr Sales		
FREIGHT	16,391	51	Current Yr Sales	616,200	
FERTILISER - Product	107,545	336	Unsold At Year End		
FERTILISER - Cart and Spread	21,195	66	SMALL SEED PRODUCE		
SEED	53,963	169	Previous Yr Sales		
CERTIFICATION AND DRESSING	26,275	82	Current Yr Sales	157,500	
AGRICHEMICAL - Product	81,443	255	Unsold At Year End		
AGRICHEMICAL - Application			MISCELLANEOUS INCOME	25,960	
REPAIRS & MAINTENANCE	39,588	124			
VEHICLES - Fuels	43,300	135	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	19,200	60	Sheep	-311,619	
ELECTRICITY	63,400	198	Cattle	-135,000	
OTHER WORKING EXPS	25,696	80	Deer		
ADMINISTRATION	27,500	86	Other		
STANDING CHARGES - Rates	14,000	44			
STANDING CHARGES - Insurance & ACC	26,985	84			
STANDING CHARGES - Other	32,560	102			
CASH FARM WORKING EXPENSES	767,692	2,399	CASH FARM INCOME	1,223,836	3,824
EBIT (Earnings Before Interest and Tax)	456,144	1,425			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	16,122	50			
Rent					
Other					
CASH OPERATING EXPENSES	783,814	2,449	CASH OPERATING INCOME	1,223,836	3,824
CASH OPERATING SURPLUS/DEFICIT	440,022	1,375			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	77,000	241			
PLANT REPLACEMENT	156,760	490	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	1,017,574	3,180	TOTAL CASH INCOME	1,223,836	3,824
TOTAL CASH SURPLUS/DEFICIT	206,262	645			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	206,262	644.6			

Farmax Summary

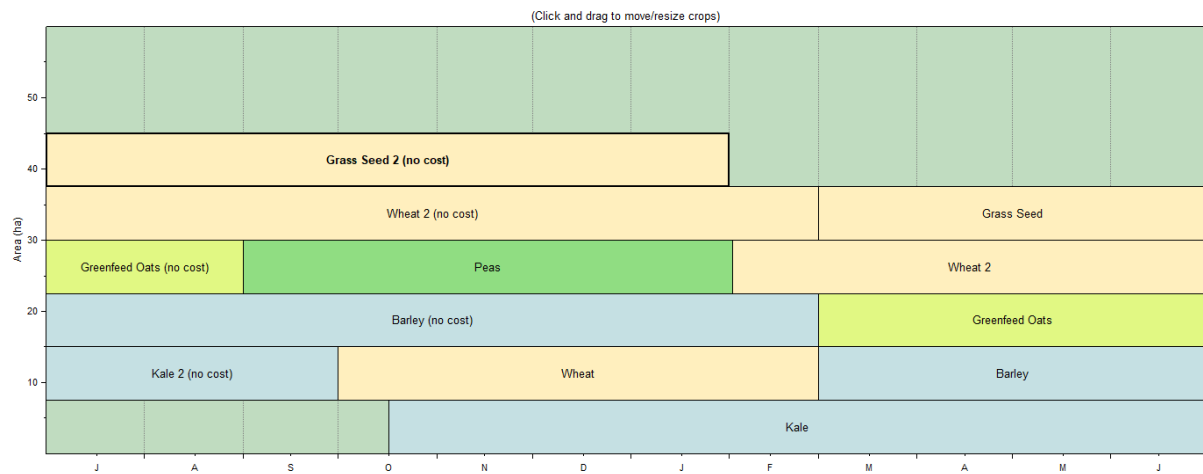
Pasture Cover



Crops by Block (Irrigated)



Crops by Block (Dryland)



Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Lambs							895	1,837	2,118	2,507	1,929	1,161
Mixed Hoggets	1,151	955										
Total	1,151	955					895	1,837	2,118	2,507	1,929	1,161

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Bull Calves						300	300	300	300	300	300	300
1-Year Bulls	298	297	296	295	295	278	123	93	28	2		
Total	298	297	296	295	295	578	423	393	328	302	300	300

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr-Arable 3_AM2_2035.12

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 11:57AM
Model version	6.3.5

Farm details

N: 7,662 N/ha: 24 P: 129 P/ha: 0.4 GHG/ha: 5,176 NCE: 57%

Total area	320 ha
Productive block area	300.00 ha
Nitrogen conversion efficiency (NCE)	57%
N Surplus	63 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	1612	Percent male beef animals	100
Total liveweight reared (kg/ha grazed)	1981	Beef / dairy grazing stock rate (RSU)	1839
Total liveweight sold (kg/ha grazed)	4893	Sheep stock rate (RSU)	960

8.4. Appendix 4: Arable 4 - Start Point

Farm System Summary

Area:

Total	320ha
Effective	300ha

Irrigated balance:

100% dryland

Stock policy:

- 1500 lambing ewes (one year culls)
- 1200 trading lambs finished to meet winter schedule

Labour Policy:

Waged:

One full time and one casual labour unit through summer months helping with irrigation and harvest.

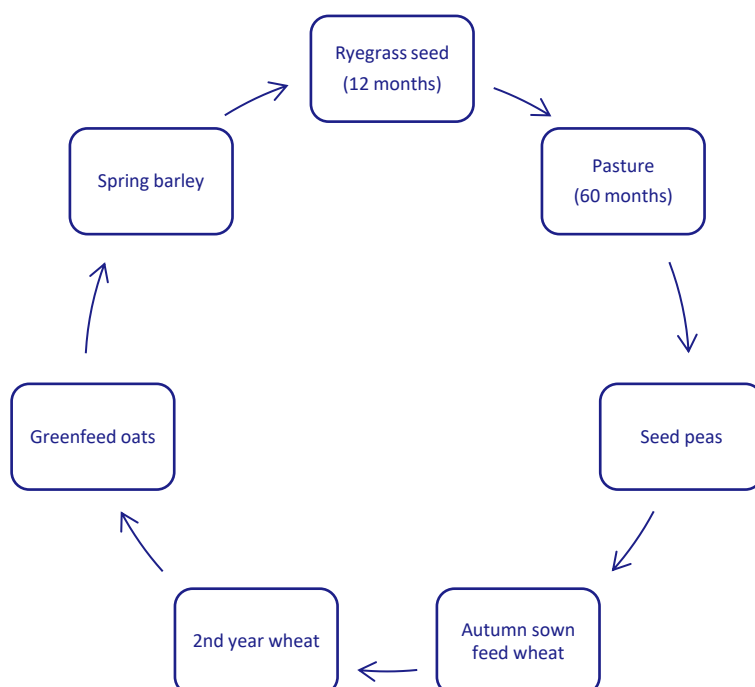
Own labour used for cultivation, drilling, harvest of grain crops.

Contractors:

Specialist contractors employed for:

all fertiliser spreading, boom-spraying, direct-drilling of kale, windrowing & heading & drying of ryegrass seed crop, straw baling, shearing and crutching, grain/seed/livestock cartage to sale.

Crop Rotation:

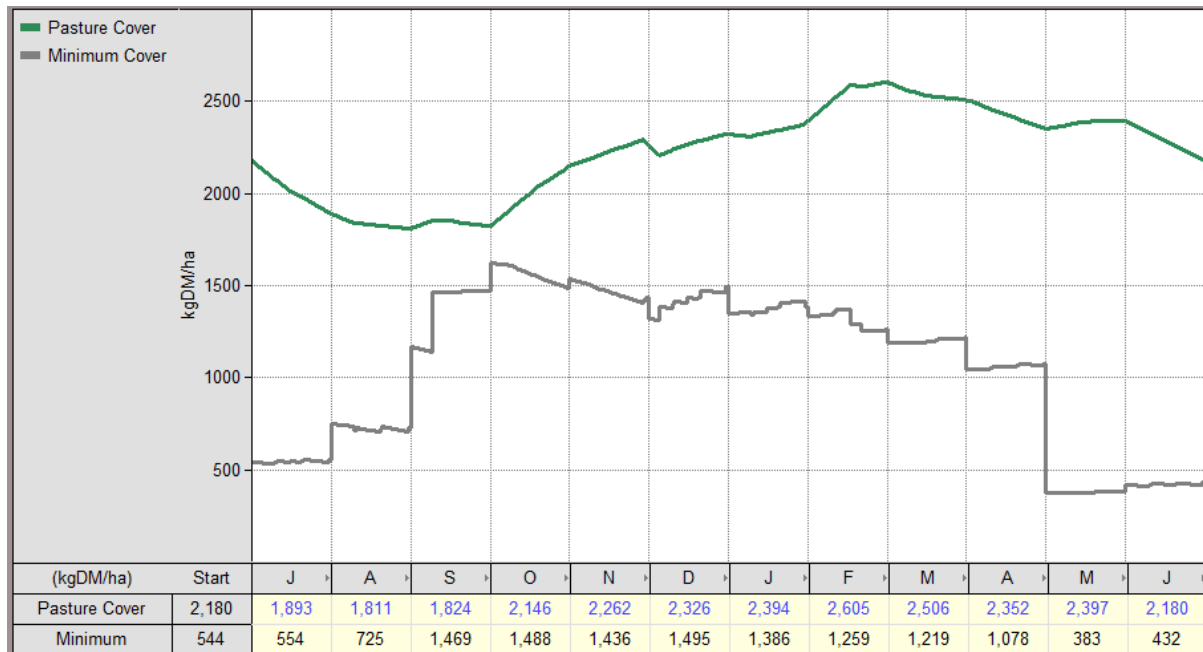


Budget Summary

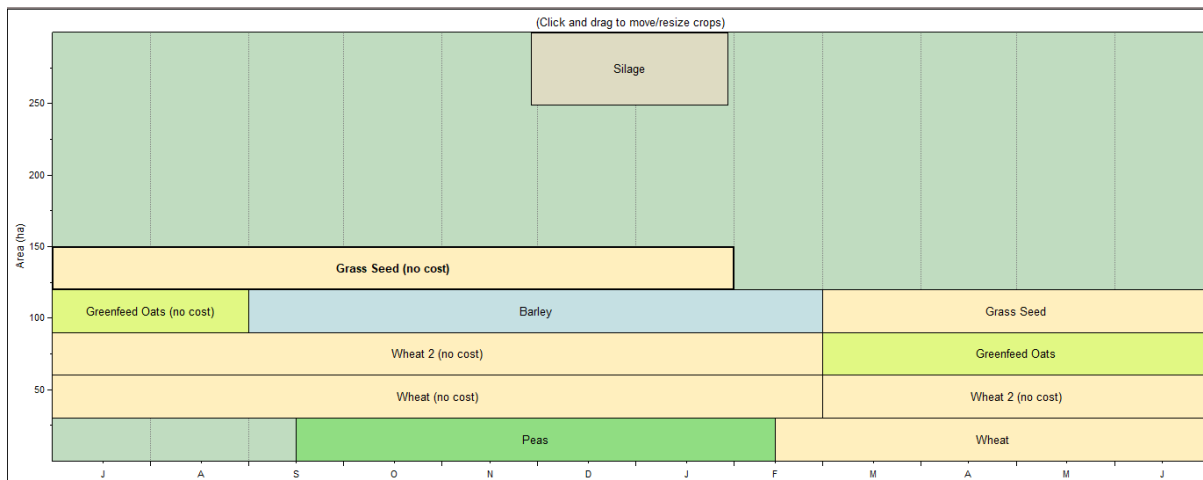
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		320 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	119,218	373	SHEEP	508,912	
VETERINARY AND ANIMAL HEALTH	11,370	36	WOOL	43,845	
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES	3,750	12	VELVET		
STOCKFEED - Conservation	26,663	83	GRAIN AND PULSE PRODUCE		
CONTRACTING	15,297	48	Previous Yr Sales		
FREIGHT	20,309	63	Current Yr Sales	330,600	
FERTILISER - Product	50,929	159	Unsold At Year End		
FERTILISER - Cart and Spread	10,049	31	SMALL SEED PRODUCE		
SEED	27,720	87	Previous Yr Sales		
CERTIFICATION AND DRESSING	34,726	109	Current Yr Sales	78,000	
AGRICHEMICAL - Product	54,942	172	Unsold At Year End		
AGRICHEMICAL - Application	13,860	43	MISCELLANEOUS INCOME	25,522	
REPAIRS & MAINTENANCE	25,300	79			
VEHICLES - Fuels	40,500	127	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	12,000	38	Sheep	-278,580	
ELECTRICITY	4,000	13	Cattle		
OTHER WORKING EXPS	5,055	16	Deer		
ADMINISTRATION	27,500	86	Other		
STANDING CHARGES - Rates	18,432	58			
STANDING CHARGES - Insurance & ACC	14,413	45			
STANDING CHARGES - Other	400	1			
CASH FARM WORKING EXPENSES	536,432	1,676	CASH FARM INCOME	708,299	2,213
EBIT (Earnings Before Interest and Tax)	171,867	537			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	11,265	35			
Rent					
Other					
CASH OPERATING EXPENSES	547,697	1,712	CASH OPERATING INCOME	708,299	2,213
CASH OPERATING SURPLUS/DEFICIT	160,602	502			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	33,000	103			
PLANT REPLACEMENT	36,000	113	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	616,697	1,927	TOTAL CASH INCOME	708,299	2,213
TOTAL CASH SURPLUS/DEFICIT	91,602	286			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	91,602	286.3			

Farmax Summary

Pasture Cover



Crops by Block



Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Ewes	1,500	1,500	1,500	1,475	1,450			1,500	1,500	1,500	1,500	1,500
Mixed Lambs					1,800	1,695	764	276	1,276	1,266	1,256	
Mixed Hoggets	1,242	206										
Rams	10	10	10	10	10	10	10	10	15	15	15	15
Total	2,752	1,716	1,510	1,485	3,260	1,705	774	1,786	2,791	2,781	2,771	1,515

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr-Arable 4 - GMP

Analysis type Predictive
Is publication No
Application version 3.4.1.3
Printed date 27 May 2021, 12:30PM
Model version 6.3.5

Farm details

N: 6,187 N/ha: 19 P: 30 P/ha: 0.1 GHG/ha: 3,563 NCE: 41%

Total area	320 ha
Productive block area	300.00 ha
Nitrogen conversion efficiency (NCE)	41%
N Surplus	57 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed) 644	Total liveweight sold (kg/ha grazed) 1039
Total liveweight reared (kg/ha grazed) 98	Sheep stock rate (RSU) 2153

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N SURPLUS/HA	P LOSS	P LOSS/HA
Dryland Pasture	Pasture	150	1,173	8	92	10	0.1
DL (Pasture > Peas)	Crop	30	2,273	76	-61	1	0
DL (S Peas > Wheat)	Crop	30	1,057	35	8	1	0
DL (Sp Barley > RGS)	Crop	30	803	27	239	1	0
DL (Wheat > GF Oats > SP Barley)	Crop	30	156	5	-15	2	0.1
DL (Wheat > Wheat)	Crop	30	714	24	22	1	0
Other sources	Other	-	11	-	-	13	-

8.5. Appendix 5: Dairy 1 - Start Point

Farm System Summary

Area:

Total	220ha
Effective	210ha

Irrigated balance:

100% Irrigated with centre pivots

Stock policy:

785 peak cows

3.74 cows/ha

500kgMS/cow

Covered feed pad not used for wintering

Labour Policy:

Waged:

Five full time plus casual labour over calf rearing.

Contractors:

Specialist contractors employed for all cultivation, drilling and forage making or freight.

Crop Rotation:

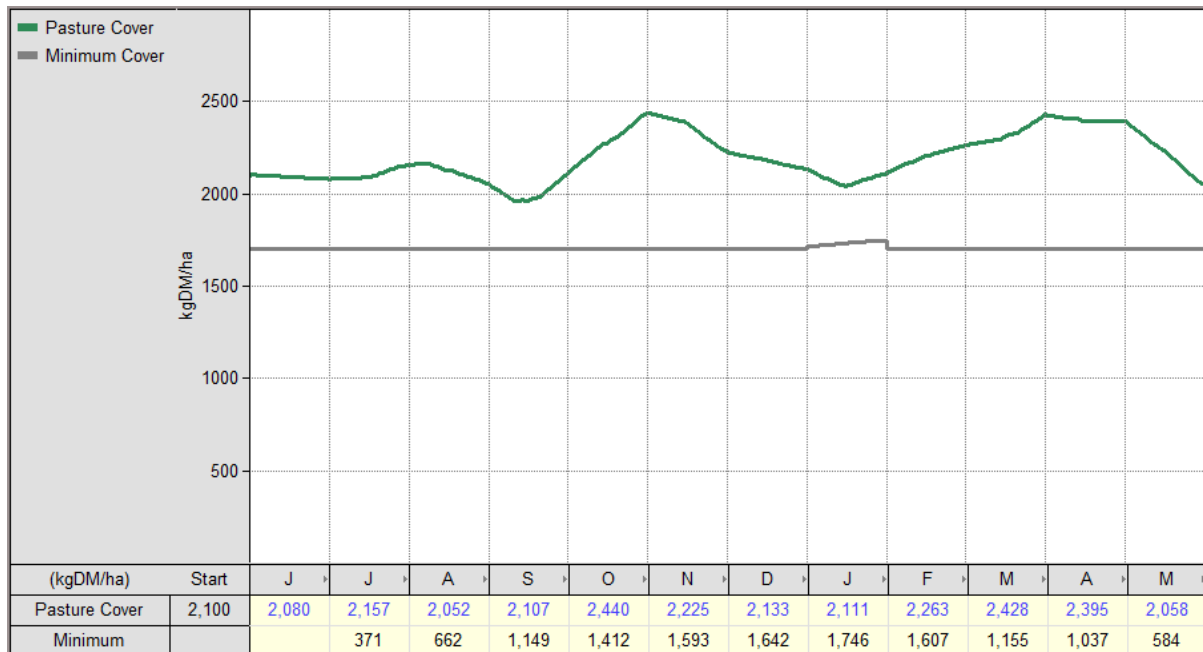
Regrassing only (no forage or feed crops grown)

Budget Summary

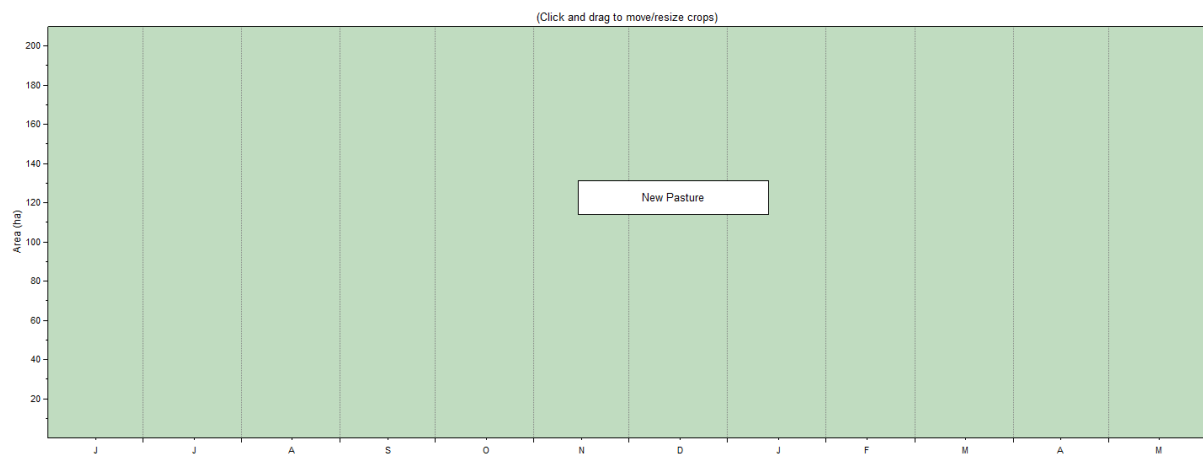
MACFARLANE RURAL BUSINESS LTD					
BUDGET SUMMARY					
220 Su or Ha					
	TOTAL \$	Income		TOTAL \$	Income
WAGES	309,250	1,406	SHEEP		
VETERINARY AND ANIMAL HEALTH	105,801	481	WOOL		
STOCKFEED - Grazing	390,186	1,774	CATTLE	139,760	
STOCKFEED - Domestic	377,890	1,718	GRAZING		
STOCKFEED - Imported			MILK	2,435,496	
OTHER STOCK EXPENSES	18,840	86	DEER		
STOCKFEED - Conservation			VELVET		
CONTRACTING	12,600	57	GRAIN AND PULSE PRODUCE		
FREIGHT	29,340	133	Previous Yr Sales		
FERTILISER - Product	148,071	673	Current Yr Sales		
FERTILISER - Cart and Spread	25,891	118	Unsold At Year End		
SEED	10,784	49	SMALL SEED PRODUCE		
CERTIFICATION AND DRESSING	500	2	Previous Yr Sales		
AGRICHEMICAL - Product	6,725	31	Current Yr Sales		
AGRICHEMICAL - Application	3,234	15	Unsold At Year End		
REPAIRS & MAINTENANCE	106,345	483	MISCELLANEOUS INCOME	5,800	
VEHICLES - Fuels	23,916	109			
VEHICLES - Repairs and Maintenance	22,400	102	STOCK PURCHASES		
ELECTRICITY	73,180	333	Sheep		
OTHER WORKING EXPS	10,540	48	Cattle	-25,200	
ADMINISTRATION	25,935	118	Deer		
STANDING CHARGES - Rates	21,780	99	Other		
STANDING CHARGES - Insurance & ACC	42,564	193			
STANDING CHARGES - Other	49,889	227			
CASH FARM WORKING EXPENSES	1,815,660	8,253.0	CASH FARM INCOME	2,555,856	11,617.5
CASH FARM WORKING PROFIT	740,196	3,364.5			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	38,129	173.3			
Rent					
Other					
CASH OPERATING EXPENSES	1,853,789	8,426.3	CASH OPERATING INCOME	2,555,856	11,617.5
CASH OPERATING SURPLUS/DEFICIT	702,067	3,191.2			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	152,000	690.9			
CAPITAL PURCHASES & PAYMENTS	157,240	714.7	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	2,163,029	9,831.9	TOTAL CASH INCOME	2,555,856	11,617.5
TOTAL CASH SURPLUS/DEFICIT	392,827	1,785.6			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	392,827	1,785.6			

Farmax Summary

Pasture Cover



Crops by Block



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
F4 Hay/Straw bought		21.7			21.7	
F1 Meal and Grains bought		624			624	
F2 Pasture Silage						
New Pasture						
F2 Pasture Silage bought		227			227	
Total	0.00	872	0.00	0.00	872	0.00

Stock Numbers by Month

Mob	30 Jun	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May
Cows at home		178	795	790	785	785	785	780	780	780	740	555
Cows Grazing	800	622										
2011 Born Heifers Grazing	180	180	180	180	180	180	180	180	180	180	180	180
2012 Born Heifers Grazing							180	180	180	180	180	180
2012 Born Heifers at Home		43	180	180	180	180						
Bobby Calves		24	72	32								
Total	980	1,047	1,227	1,182	1,145	1,145	1,145	1,140	1,140	1,140	1,100	915

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr - Dairy1_AM2_2035.21

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 1:28PM
Model version	6.3.5

Farm details

N: 7,886 N/ha: 36 P: 176 P/ha: 0.8 GHG/ha: 17,035 NCE: 30%

Total area	220 ha
Productive block area	210.00 ha
Nitrogen conversion efficiency (NCE)	30%
N Surplus	276 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	493	Milk solids (kg/ha grazed)	1867
Total liveweight reared (kg/ha grazed)	100	Milking herd size (peak cows/ha grazed)	3.7
Total liveweight sold (kg/ha grazed)	559	Dairy stock rate (RSU)	8685
Default calving date	06 August	Dairy replacements stock rate (RSU)	0
Milk production per cow (kg milk solids / cow)	499.5		

8.6. Appendix 6: Dairy 2 - Start Point

Farm System Summary

Area:

Total	220ha
Effective	210ha

Irrigated balance:

100% Irrigated with centre pivots

Stock policy:

735 peak cows

3.5 cows/ha

476kgMS/cow

Covered feed pad not used for wintering

Labour Policy:

Waged:

Four full time plus casual labour over calf rearing.

Contractors:

Specialist contractors employed for all cultivation, drilling and forage making or freight.

Crop Rotation:

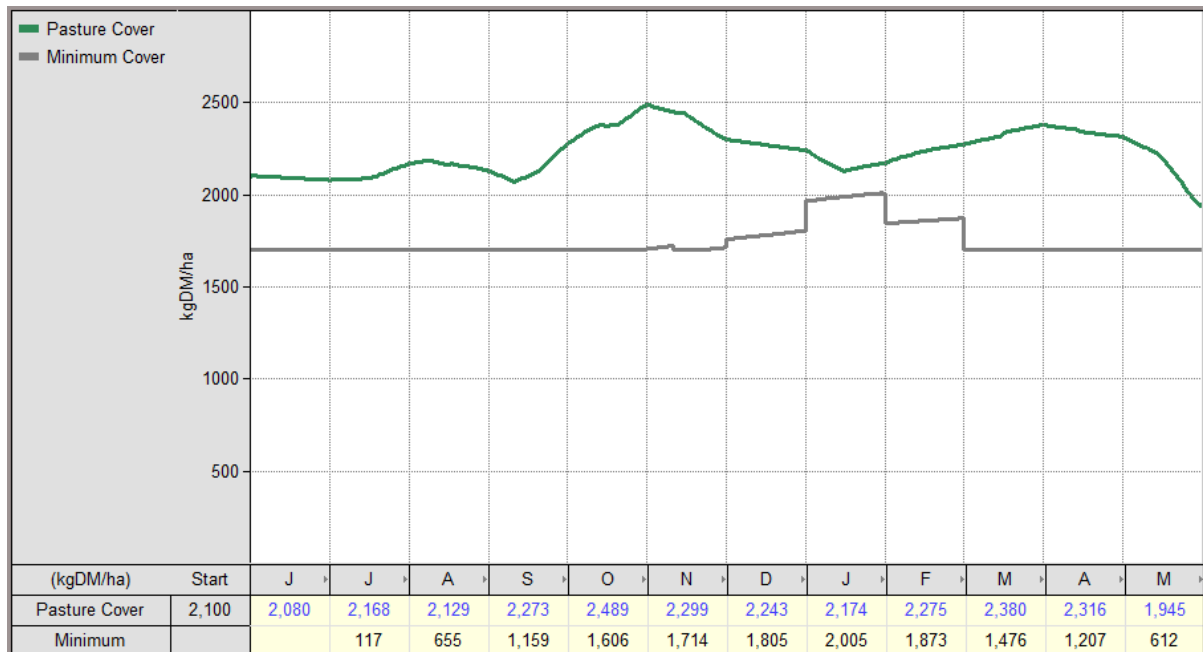
Regrassing only (no forage or feed crops grown)

Budget Summary

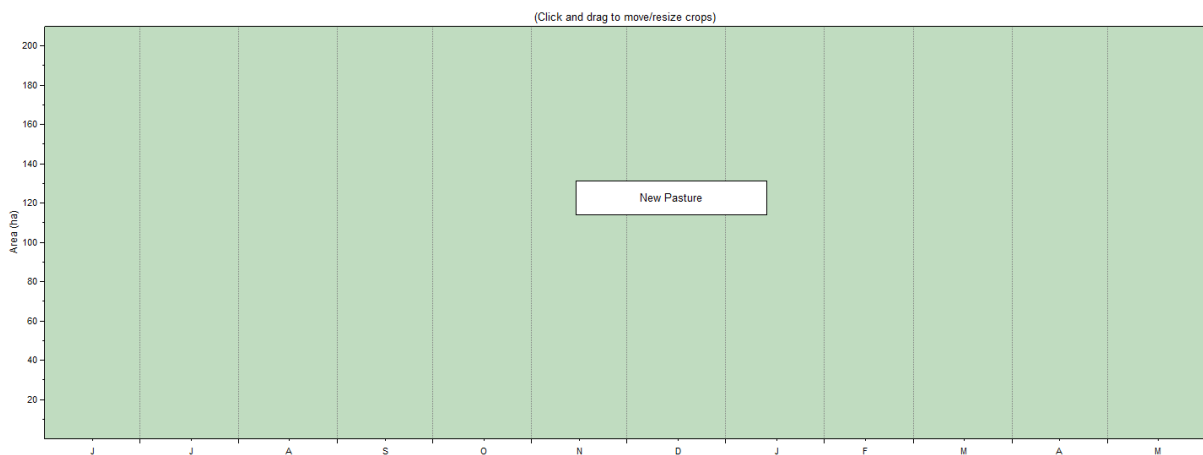
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		220 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	248,700	1,130	SHEEP		
VETERINARY AND ANIMAL HEALTH	99,153	451	WOOL		
STOCKFEED - Grazing	359,408	1,634	CATTLE	126,109	
STOCKFEED - Domestic	230,830	1,049	GRAZING		
STOCKFEED - Imported	9,324	42	MILK	2,167,867	
OTHER STOCK EXPENSES	17,640	80	DEER		
STOCKFEED - Conservation			VELVET		
CONTRACTING	12,600	57	GRAIN AND PULSE PRODUCE		
FREIGHT	25,470	116	Previous Yr Sales		
FERTILISER - Product	151,191	687	Current Yr Sales		
FERTILISER - Cart and Spread	25,941	118	Unsold At Year End		
SEED	10,784	49	SMALL SEED PRODUCE		
CERTIFICATION AND DRESSING	500	2	Previous Yr Sales		
AGRICHEMICAL - Product	6,725	31	Current Yr Sales		
AGRICHEMICAL - Application	3,234	15	Unsold At Year End		
REPAIRS & MAINTENANCE	103,258	469	MISCELLANEOUS INCOME	5,800	
VEHICLES - Fuels	24,049	109			
VEHICLES - Repairs and Maintenance	22,400	102	STOCK PURCHASES		
ELECTRICITY	70,780	322	Sheep		
OTHER WORKING EXPS	10,360	47	Cattle	-18,000	
ADMINISTRATION	25,935	118	Deer		
STANDING CHARGES - Rates	17,160	78	Other		
STANDING CHARGES - Insurance & ACC	50,660	230			
STANDING CHARGES - Other	61,554	280			
CASH FARM WORKING EXPENSES	1,587,655	7,216.6	CASH FARM INCOME	2,281,776	10,371.7
EBIT (Earnings Before Interest and Tax)	694,122	3,155.1			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	33,341	151.5			
Rent					
Other					
CASH OPERATING EXPENSES	1,620,995	7,368.2	CASH OPERATING INCOME	2,281,776	10,371.7
CASH OPERATING SURPLUS/DEFICIT	660,781	3,003.5			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	141,000	640.9			
PLANT REPLACEMENT	155,790	708.1	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	1,917,785	8,717.2	TOTAL CASH INCOME	2,281,776	10,371.7
TOTAL CASH SURPLUS/DEFICIT	363,991	1,654.5			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	363,991	1,654.5			

Farmax Summary

Pasture Cover



Crops by Block



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
F4 Hay/Straw bought		26.9			26.9	
F1 Meal and Grains bought		288			288	
F2 Pasture Silage						
New Pasture						
F2 Pasture Silage bought		172			172	
Total	0.00	487	0.00	0.00	487	0.00

Stock Numbers by Month

Mob	30 Jun	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May
Cows at home		178	745	740	735	735	735	730	730	730	690	582
Cows Grazing	747	569										
2011 Born Heifers Grazing	165	165	165	165	165	165	165	165	165	165	165	165
2012 Born Heifers Grazing							135	135	135	135	135	135
2012 Born Heifers at Home		11	135	135	135	135						
Bobby Calves		7	64	8								
Total	912	930	1,109	1,048	1,035	1,035	1,035	1,030	1,030	1,030	990	882

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr - Dairy2_AM2_2035.21

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 1:39PM
Model version	6.3.5

Farm details

N: 7,922 N/ha: 36 P: 168 P/ha: 0.8 GHG/ha: 15,721 NCE: 29%

Total area	220 ha
Productive block area	210.00 ha
Nitrogen conversion efficiency (NCE)	29%
N Surplus	265 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	507	Milk solids (kg/ha grazed)	1665
Total liveweight reared (kg/ha grazed)	103	Milking herd size (peak cows/ha grazed)	3.5
Total liveweight sold (kg/ha grazed)	576	Dairy stock rate (RSU)	7981
Default calving date	06 August	Dairy replacements stock rate (RSU)	0
Milk production per cow (kg milk solids / cow)	469.3		

8.7. Appendix 7: Dairy Support 1 - Start Point

Farm System Summary

Area:

Total	270ha
Effective	260ha

Irrigated balance:

100% Irrigated with centre pivots

Stock policy:

520 R1 Heifers
520 R2 Heifers
520 R2 IC Heifers wintered
550 Mixed Age cows wintered

Labour Policy:

Waged:

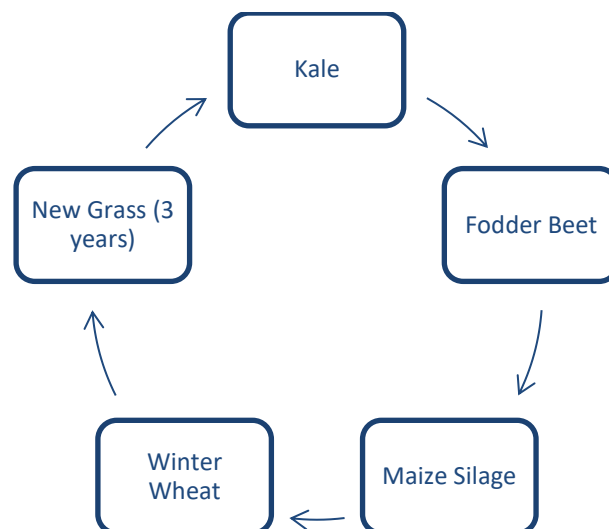
Two full time plus casual labour.

Contractors:

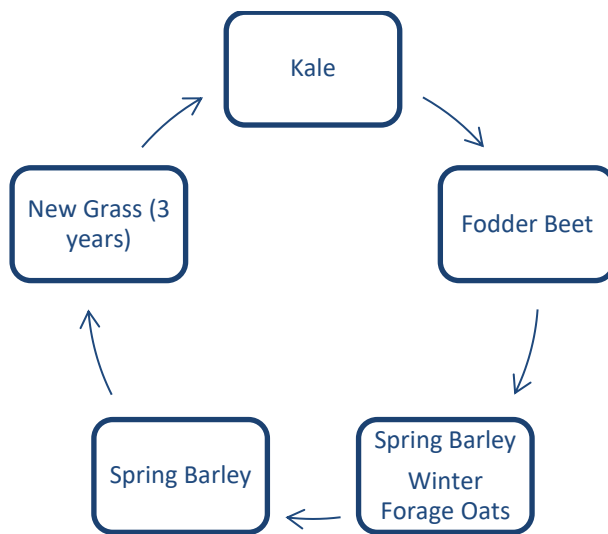
Specialist contractors employed for some cultivation, drilling and forage making or freight.

Harvest completed by farm staff with own machinery.

Crop Rotation 1 (Blocks 1 & 2):



Crop Rotation 2 (Block 3):

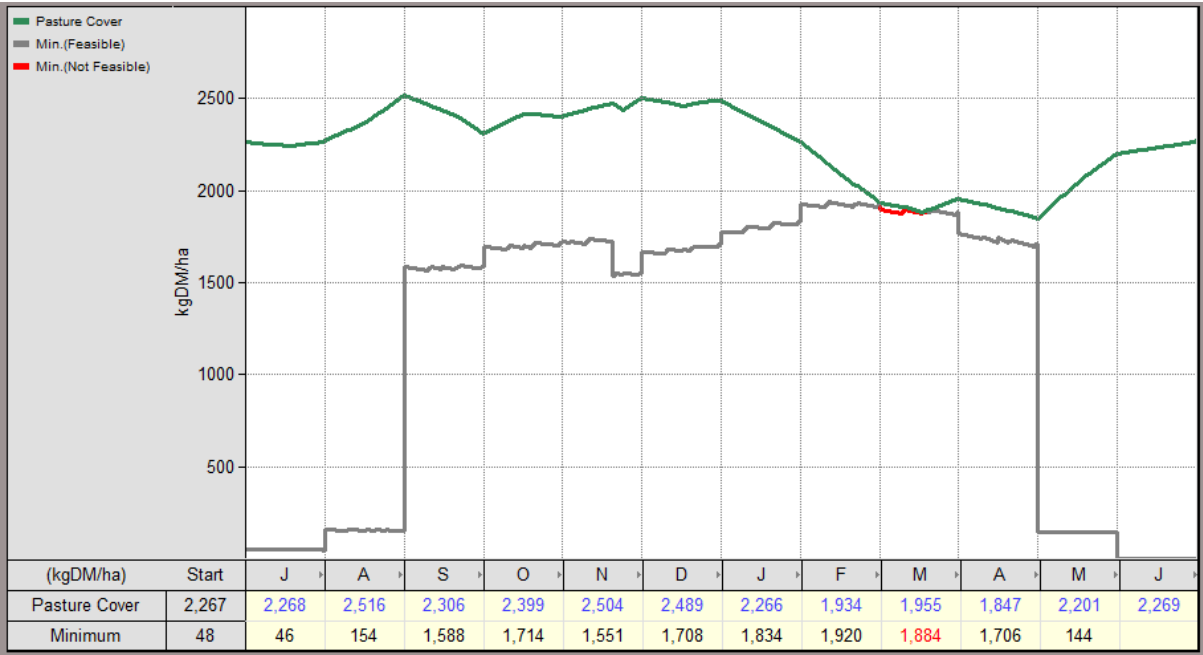


Budget Summary

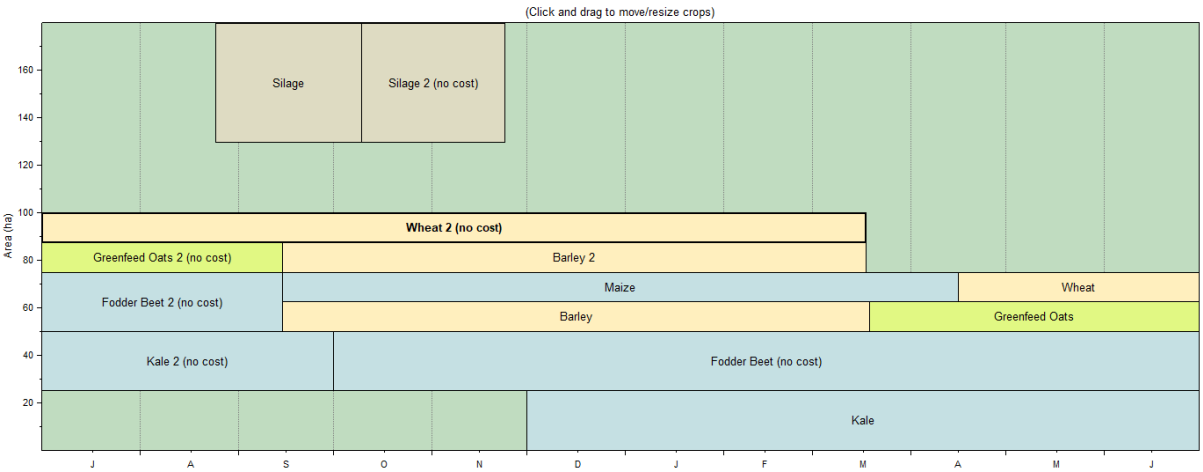
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		270 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	132,700	491	SHEEP		
VETERINARY AND ANIMAL HEALTH	2,000	7	WOOL		
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic	2,000	7	GRAZING	765,891	
STOCKFEED - Imported			MILK		
OTHER STOCK EXPENSES	2,000	7	DEER		
STOCKFEED - Conservation	68,150	252	VELVET		
CONTRACTING	19,700	73	GRAIN AND PULSE PRODUCE		
FREIGHT			Previous Yr Sales	95,615	
FERTILISER - Product	120,960	448	Current Yr Sales	161,855	
FERTILISER - Cart and Spread	12,301	46	Unsold At Year End	95,615	
SEED	41,378	153	SMALL SEED PRODUCE		
CERTIFICATION AND DRESSING	500	2	Previous Yr Sales		
AGRICHEMICAL - Product	53,328	198	Current Yr Sales		
AGRICHEMICAL - Application	8,008	30	Unsold At Year End		
REPAIRS & MAINTENANCE	22,000	81	MISCELLANEOUS INCOME	18,955	
VEHICLES - Fuels	18,800	70			
VEHICLES - Repairs and Maintenance	31,000	115	STOCK PURCHASES		
ELECTRICITY	56,740	210	Sheep		
OTHER WORKING EXPS	3,500	13	Cattle		
ADMINISTRATION	24,700	91	Deer		
STANDING CHARGES - Rates	20,412	76	Other		
STANDING CHARGES - Insurance & ACC	15,424	57			
STANDING CHARGES - Other	36,840	136			
CASH FARM WORKING EXPENSES	692,441	2,564.6	CASH FARM INCOME	1,042,316	3,860.4
EBIT (Earnings Before Interest and Tax)	349,875	1,295.8			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	14,541	53.9			
Rent					
Other					
CASH OPERATING EXPENSES	706,982	2,618.5	CASH OPERATING INCOME	1,042,316	3,860.4
CASH OPERATING SURPLUS/DEFICIT	335,334	1,242.0			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	51,000	188.9			
PLANT REPLACEMENT	150,400	557.0	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	908,382	3,364.4	TOTAL CASH INCOME	1,042,316	3,860.4
TOTAL CASH SURPLUS/DEFICIT	133,934	496.1			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	133,934	496.1			

Farmax Summary

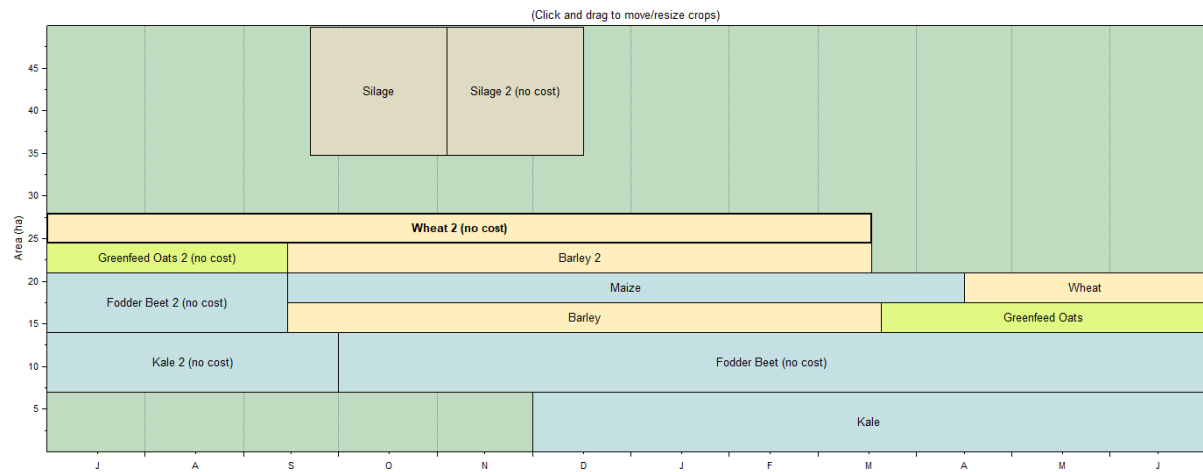
Pasture Cover



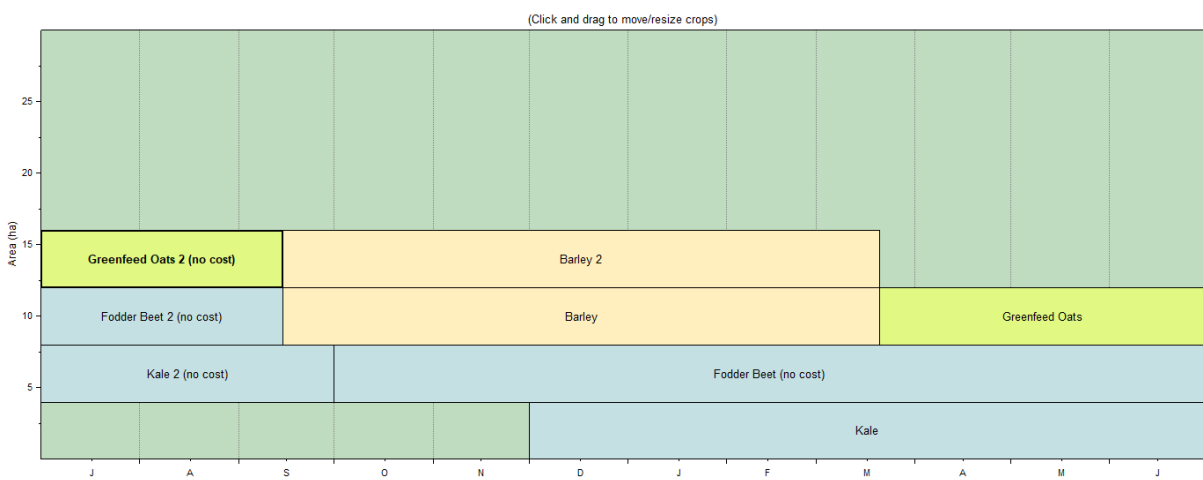
Crops by Block (Main Block)



Crops by Block (Second Block)



Crops by Block (Third Block)



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Kale			1,190		1,190	
Straw	69.6				69.5	0.12
Wheat			479	479		
Greenfeed Oats			60.0		54.0	5.98
Maize			272			272
Silage	38.3		94.4	6.60	87.8	38.3
Total	108	0.00	2,096	486	1,401	316

Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Heifer Calves					520	520	520	520	520	520	520	520
1-Year Heifers	520	520	520	520	520	520	520	520	520	520	520	520
2-Year Heifers	520											
Cows												550
Total	1,040	520	520	520	1,040	1,040	1,040	1,040	1,040	1,040	1,040	1,590

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr - Dairy Support 1_AM1_2035.21

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 1:00PM
Model version	6.3.5

Farm details

N: 11,996 N/ha: 44 P: 46 P/ha: 0.2 GHG/ha: 7,027 NCE: 30%

Total area	270 ha
Productive block area	260.00 ha
Nitrogen conversion efficiency (NCE)	30%
N Surplus	108 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed) 7037

Total liveweight sold (kg/ha grazed) 7676

Total liveweight reared (kg/ha grazed) 1582

Beef / dairy grazing stock rate (RSU) 4153

8.8. Appendix 8: Dairy Support 2 - Start Point

Farm System Summary

Area:

Total	270ha
Effective	260ha

Irrigated balance:

- 50% Irrigated with centre pivots
- 50% dryland

Stock policy:

- 260 R1 Heifers
- 260 R2 Heifers
- 260 R2 IC Heifers wintered
- 2400 Mixed Age cows wintered

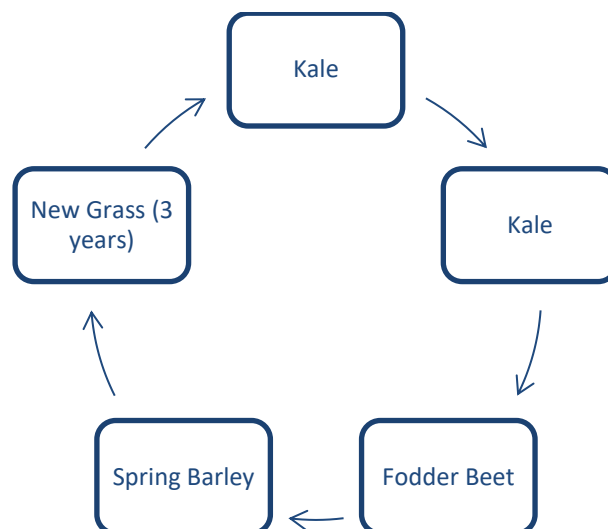
Labour Policy:

- Waged:
- Two full time plus casual labour.

Contractors:

- Specialist contractors employed for some cultivation, drilling and forage making or freight.
- Harvest completed by farm staff with own machinery.

Crop Rotation (Blocks 1 & 2):

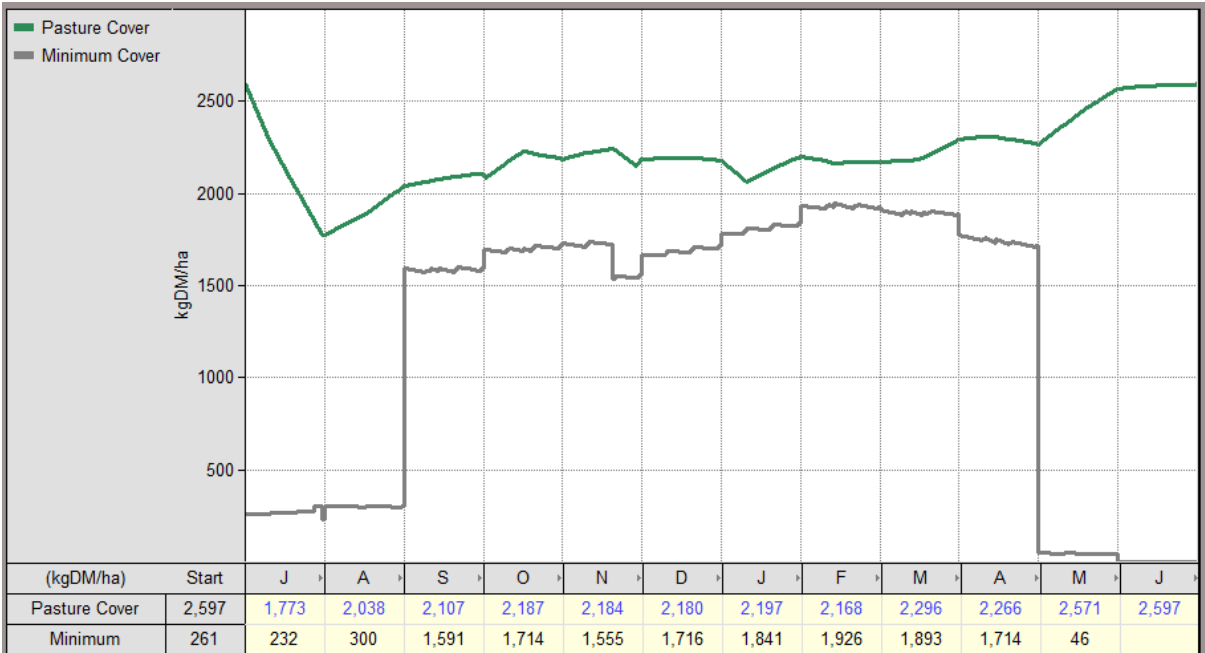


Budget Summary

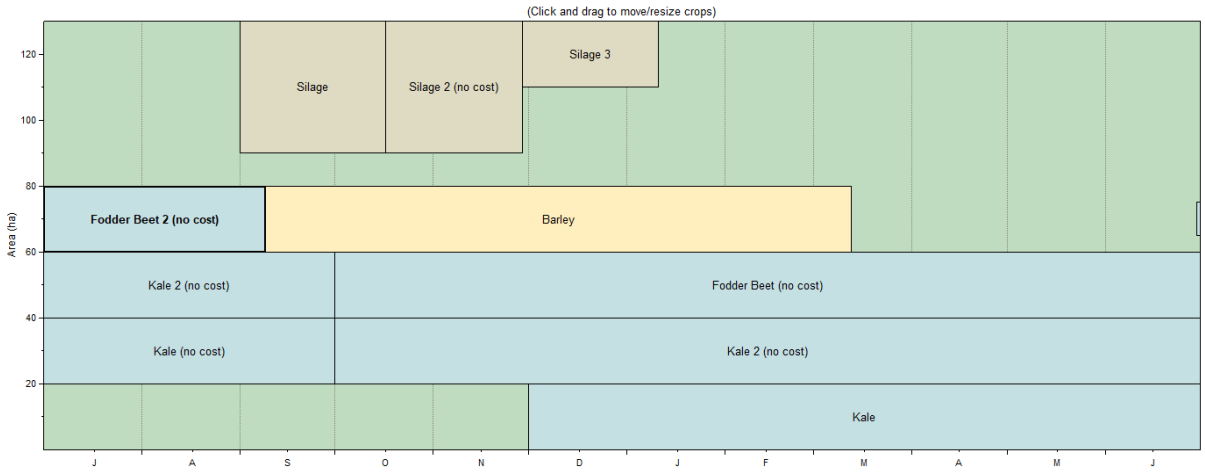
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		270 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	132,700	491	SHEEP		
VETERINARY AND ANIMAL HEALTH	2,000	7	WOOL		
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic	2,000	7	GRAZING	952,203	
STOCKFEED - Imported			MILK		
OTHER STOCK EXPENSES			DEER		
STOCKFEED - Conservation	40,828	151	VELVET		
CONTRACTING	26,340	98	GRAIN AND PULSE PRODUCE		
FREIGHT	13,535	50	Previous Yr Sales	51,300	
FERTILISER - Product	113,283	420	Current Yr Sales	51,300	
FERTILISER - Cart and Spread	9,955	37	Unsold At Year End	51,300	
SEED	35,220	130	SMALL SEED PRODUCE		
CERTIFICATION AND DRESSING	500	2	Previous Yr Sales		
AGRICHEMICAL - Product	69,174	256	Current Yr Sales		
AGRICHEMICAL - Application	4,360	16	Unsold At Year End		
REPAIRS & MAINTENANCE	22,891	85	MISCELLANEOUS INCOME	44,900	
VEHICLES - Fuels	18,800	70			
VEHICLES - Repairs and Maintenance	31,000	115	STOCK PURCHASES		
ELECTRICITY	31,819	118	Sheep		
OTHER WORKING EXPS	5,975	22	Cattle		
ADMINISTRATION	24,700	91	Deer		
STANDING CHARGES - Rates	16,281	60	Other		
STANDING CHARGES - Insurance & ACC	13,424	50			
STANDING CHARGES - Other	19,420	72			
CASH FARM WORKING EXPENSES	634,204	2,348.9	CASH FARM INCOME	1,099,703	4,073.0
EBIT (Earnings Before Interest and Tax)	465,499	1,724.1			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	13,318	49.3			
Rent					
Other					
CASH OPERATING EXPENSES	647,523	2,398.2	CASH OPERATING INCOME	1,099,703	4,073.0
CASH OPERATING SURPLUS/DEFICIT	452,180	1,674.7			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	91,778	339.9			
PLANT REPLACEMENT	124,400	460.7	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	863,701	3,198.9	TOTAL CASH INCOME	1,099,703	4,073.0
TOTAL CASH SURPLUS/DEFICIT	236,002	874.1			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	236,002	874.1			

Farmax Summary

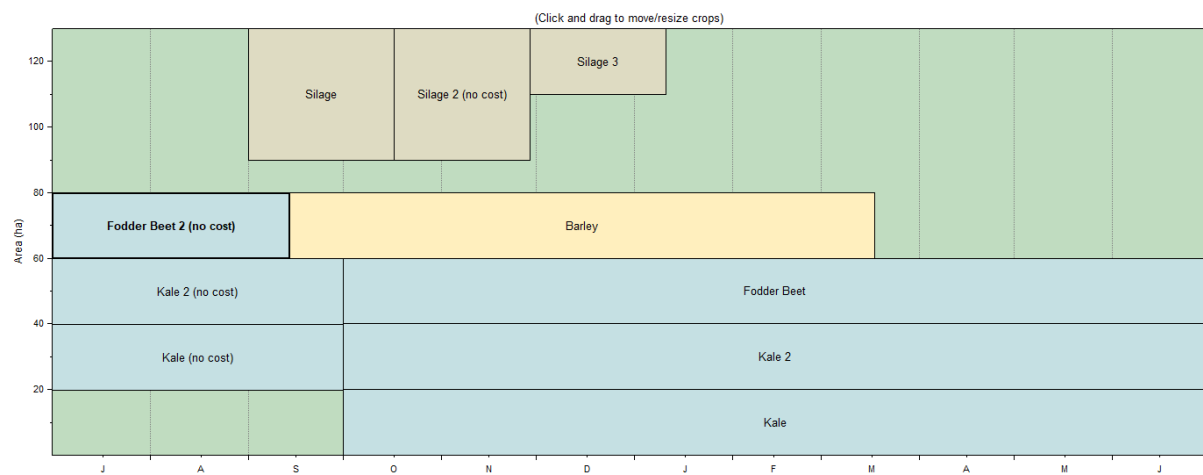
Pasture Cover



Crops by Block (Irrigated Block)



Crops by Block (Dryland Block)



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Kale	228		2,040		2,040	228
Straw	83.9	171			171	83.9
Wheat			260	185		75.0
Silage	42.2		145	68.3	76.9	42.2
Total	354	171	2,445	253	2,288	429

Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Heifer Calves					260	260	260	260	260	260	260	260
1-Year Heifers	260	260	260	260	260	260	260	260	260	260	260	260
2-Year Heifers	260											
Cows												2,400
Total	520	260	260	260	520	520	520	520	520	520	520	2,920

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr - Dairy Support 2_AM2_2035.21

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 1:04PM
Model version	6.3.5

Farm details

N: **7,262** N/ha: **27** P: **42** P/ha: **0.2** GHG/ha: **5,815** NCE: **16%**

Total area	270 ha
Productive block area	260.00 ha
Nitrogen conversion efficiency (NCE)	16%
N Surplus	78 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	29581
Total liveweight reared (kg/ha grazed)	918

Total liveweight sold (kg/ha grazed)	29952
Beef / dairy grazing stock rate (RSU)	3883

8.9. Appendix 9: Red Meat 1 - Start Point

Farm System Summary

Area:

Total	350ha
Effective	340ha

Irrigated balance:

100% dryland

Stock policy:

959 breeding ewes lambing 136%, lambing hoggets

574 weaner beef cattle in February/March to finish at 260kg CW before second winter

192 weaner trading deer

Labour Policy:

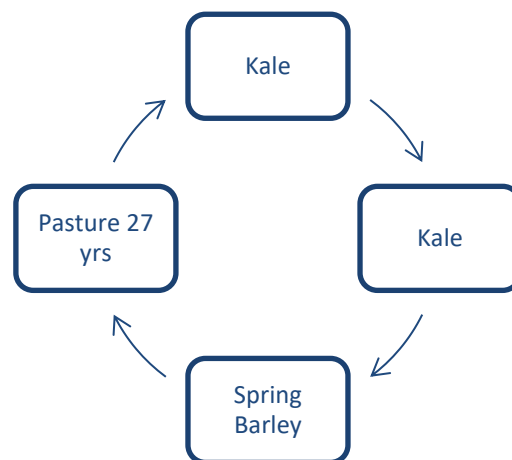
Waged:

Two full time plus seasonal casual.

Contractors:

Specialist contractors employed for all agricultural tasks including ground work and drilling.

Crop Rotation:

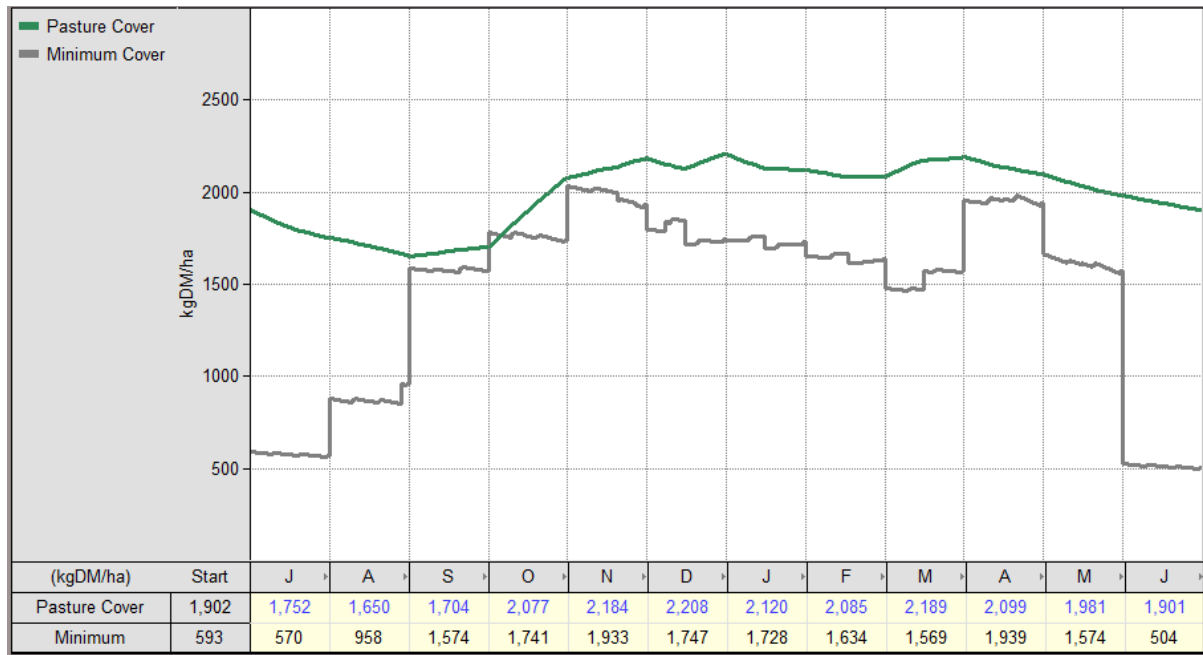


Budget Summary

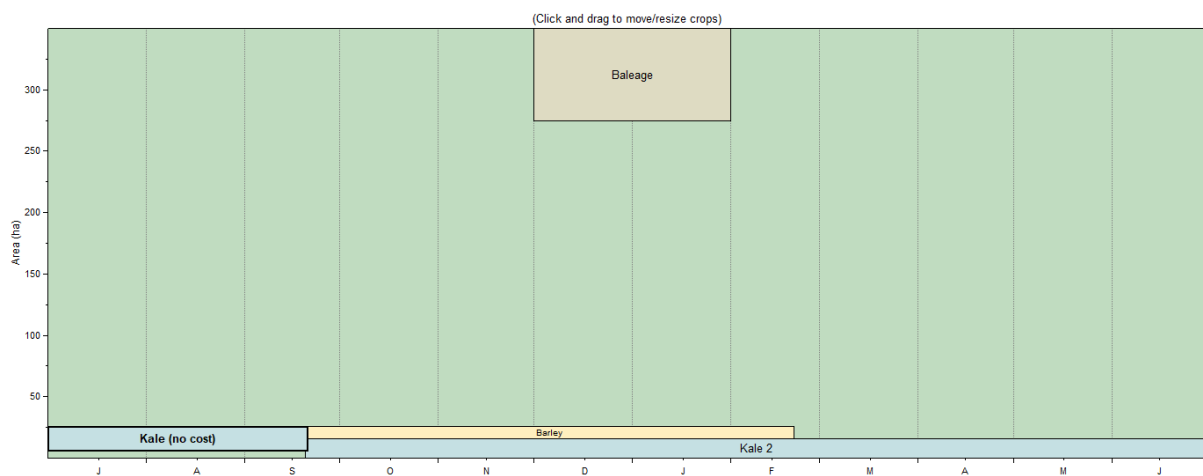
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		350 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	140,660	401.9	SHEEP	145,494	
VETERINARY AND ANIMAL HEALTH	19,970	57.1	WOOL	14,443	
STOCKFEED - Grazing			CATTLE	764,478	
STOCKFEED - Domestic	28,100	80.3	MILK		
STOCKFEED - Imported			DEER	88,825	
OTHER STOCK EXPENSES	3,951	11.3	VELVET	3,563	
STOCKFEED - Conservation	46,800	133.7	GRAIN AND PULSE PRODUCE		
CONTRACTING	3,100	8.9	Previous Yr Sales	17,100	
FREIGHT	8,022	22.9	Current Yr Sales		
FERTILISER - Product	44,027	125.8	Unsold At Year End	17,100	
FERTILISER - Cart and Spread	9,702	27.7	SMALL SEED PRODUCE		
SEED	5,370	15.3	Previous Yr Sales		
CERTIFICATION AND DRESSING	500	1.4	Current Yr Sales		
AGRICHEMICAL - Product	11,600	33.1	Unsold At Year End		
AGRICHEMICAL - Application	3,080	8.8	MISCELLANEOUS INCOME	8,026	
REPAIRS & MAINTENANCE	20,000	57.1			
VEHICLES - Fuels	12,200	34.9	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	12,000	34.3	Sheep	-3,600	
ELECTRICITY	5,260	15.0	Cattle	-370,058	
OTHER WORKING EXPS	3,500	10.0	Deer	-45,427	
ADMINISTRATION	24,700	70.6	Other		
STANDING CHARGES - Rates	15,750	45.0			
STANDING CHARGES - Insurance & ACC	10,924	31.2			
STANDING CHARGES - Other	2,000	5.7			
CASH FARM WORKING EXPENSES	431,215	1,232.0	CASH FARM INCOME	622,844	1,779.6
EBIT (Earnings Before Interest and Tax)	191,629	547.5			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	9,056	25.9			
Rent					
Other					
CASH OPERATING EXPENSES	440,271	1,257.9	CASH OPERATING INCOME	622,844	1,779.6
CASH OPERATING SURPLUS/DEFICIT	182,574	521.6			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	40,000	114.3			
PLANT REPLACEMENT	40,400	115.4	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	520,671	1,487.6	TOTAL CASH INCOME	622,844	1,779.6
TOTAL CASH SURPLUS/DEFICIT	102,174	291.9			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	102,174	291.9			

Farmax Summary

Pasture Covers



Crops by Block



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Kale	90.0		216		120	186
Straw	17.9	86.3			104	
Baleage	135		225		225	135
Barley	8.50				8.50	
Wheat	55.0		55.0	45.0		65.0
Total	306	86.3	496	45.0	457	386

Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Beef Weaners									574	574	574	574
R1 Beef	574	574	574	574	488	341	256	171	56	15		
Total	574	574	574	574	488	341	256	171	630	589	574	574

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Ewes	959	959	949	939	929	827	827	827	827	827	754	958
Ewe Hoggets	230	226	216	216	212	212	212	212	208	208	208	
Ewe Lambs					652	230	230	230	230	230	230	230
Mixed Lambs					847	885	718	320				
Rams	10	10	10	10	10	10	10	10	13	13	10	10
Total	1,199	1,195	1,175	1,165	2,650	2,164	1,997	1,599	1,278	1,278	1,202	1,198

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Fawns								192	191	191	190	190
R1 Mixed Deer	190	190	63									
Total	190	190	63					192	191	191	190	190

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr - Sheep & Beef 1_GMP_2035.21

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	27 May 2021, 1:38PM
Model version	6.3.5

Farm details

N: **4,704** N/ha: **13** P: **46** P/ha: **0.1** GHG/ha: **4,931** NCE: **16%**

Total area	350 ha
Productive block area	340.00 ha
Nitrogen conversion efficiency (NCE)	16%
N Surplus	89 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	678	Beef / dairy grazing stock rate (RSU)	2496
Total liveweight reared (kg/ha grazed)	529	Deer stock rate (RSU)	207
Total liveweight sold (kg/ha grazed)	1171	Sheep stock rate (RSU)	1571
Percent male beef animals	50		

8.10. Appendix 10: Red Meat 2 - Start Point

Farm System Summary

Area:

Total	350ha
Effective	340ha

Irrigated balance:

30% Irrigated with centre pivots
70% dryland

Stock policy:

1200 winter trade lambs
3150 summer trade lambs
620 dairy beef cross calves bought at 100kg and finished
250 weaner deer finished

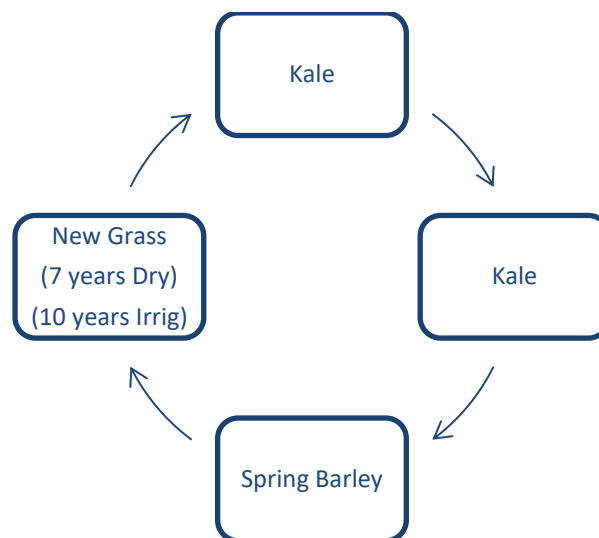
Labour Policy:

Waged:
Two full time plus casual labour.

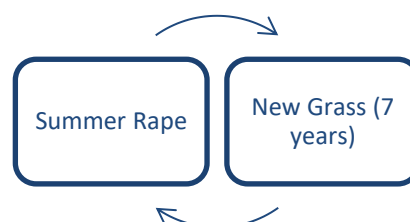
Contractors:

Specialist contractors employed for all crop establishment and harvest tasks.

Crop Rotation (Irrigated and Dryland):



Crop Rotation (Dryland):

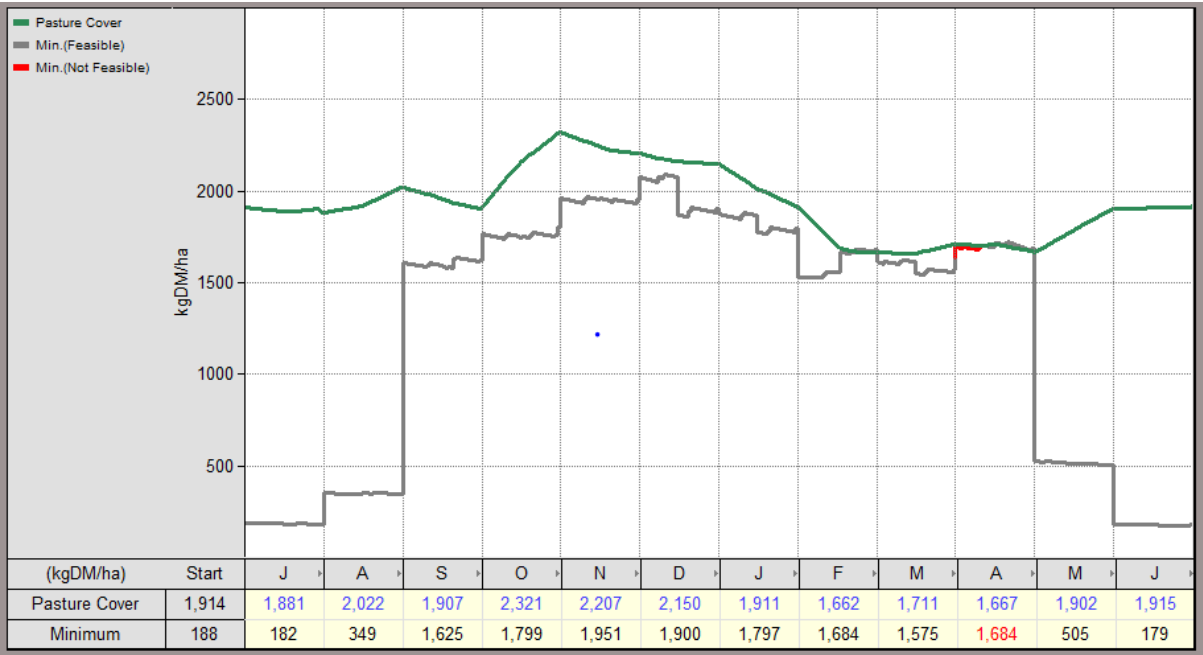


Budget Summary

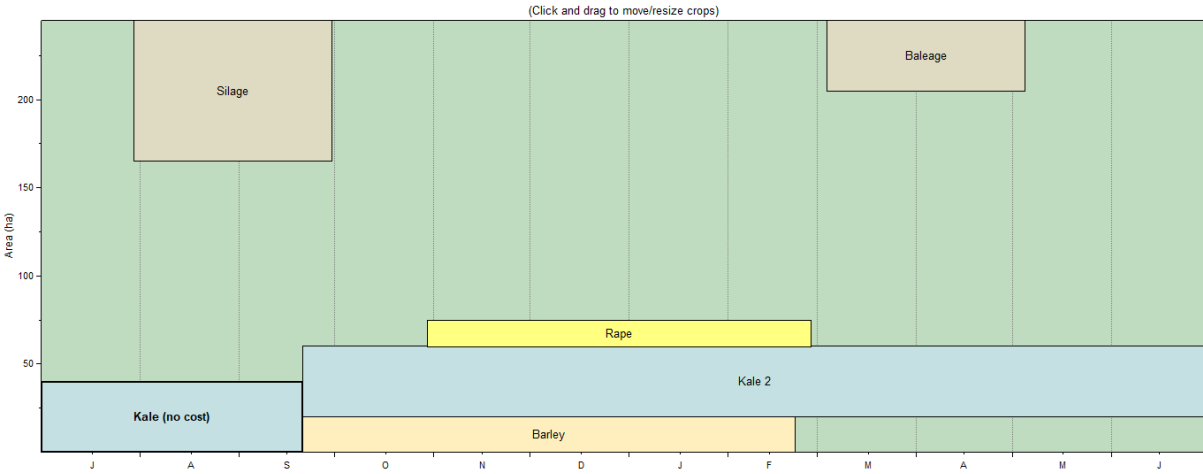
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		350 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	138,307	395.2	SHEEP	465,370	
VETERINARY AND ANIMAL HEALTH	38,276	109.4	WOOL	6,469	
STOCKFEED - Grazing			CATTLE	774,180	
STOCKFEED - Domestic	17,750	50.7	MILK		
STOCKFEED - Imported			DEER	115,940	
OTHER STOCK EXPENSES	3,000	8.6	VELVET	4,688	
STOCKFEED - Conservation	36,816	105.2	GRAIN AND PULSE PRODUCE		
CONTRACTING	8,151	23.3	Previous Yr Sales	30,020	
FREIGHT	17,640	50.4	Current Yr Sales	30,020	
FERTILISER - Product	123,845	353.8	Unsold At Year End	30,020	
FERTILISER - Cart and Spread	13,587	38.8	SMALL SEED PRODUCE		
SEED	22,097	63.1	Previous Yr Sales		
CERTIFICATION AND DRESSING	500	1.4	Current Yr Sales		
AGRICHEMICAL - Product	33,293	95.1	Unsold At Year End		
AGRICHEMICAL - Application	8,360	23.9	MISCELLANEOUS INCOME	63,676	
REPAIRS & MAINTENANCE	25,000	71.4			
VEHICLES - Fuels	12,200	34.9	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	12,000	34.3	Sheep	-364,150	
ELECTRICITY	27,009	77.2	Cattle	-256,060	
OTHER WORKING EXPS	3,500	10.0	Deer	-59,150	
ADMINISTRATION	24,700	70.6	Other		
STANDING CHARGES - Rates	18,963	54.2			
STANDING CHARGES - Insurance & ACC	15,424	44.1			
STANDING CHARGES - Other	14,570	41.6			
CASH FARM WORKING EXPENSES	614,987	1,757.1	CASH FARM INCOME	811,003	2,317.2
EBIT (Earnings Before Interest and Tax)	196,016	560.0			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	12,915	36.9			
Rent					
Other					
CASH OPERATING EXPENSES	627,902	1,794.0	CASH OPERATING INCOME	811,003	2,317.2
CASH OPERATING SURPLUS/DEFICIT	183,101	523.1			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	33,000	94.3			
PLANT REPLACEMENT	63,000	180.0	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	723,902	2,068.3	TOTAL CASH INCOME	811,003	2,317.2
TOTAL CASH SURPLUS/DEFICIT	87,101	248.9			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	87,101	248.9			

Farmax Summary

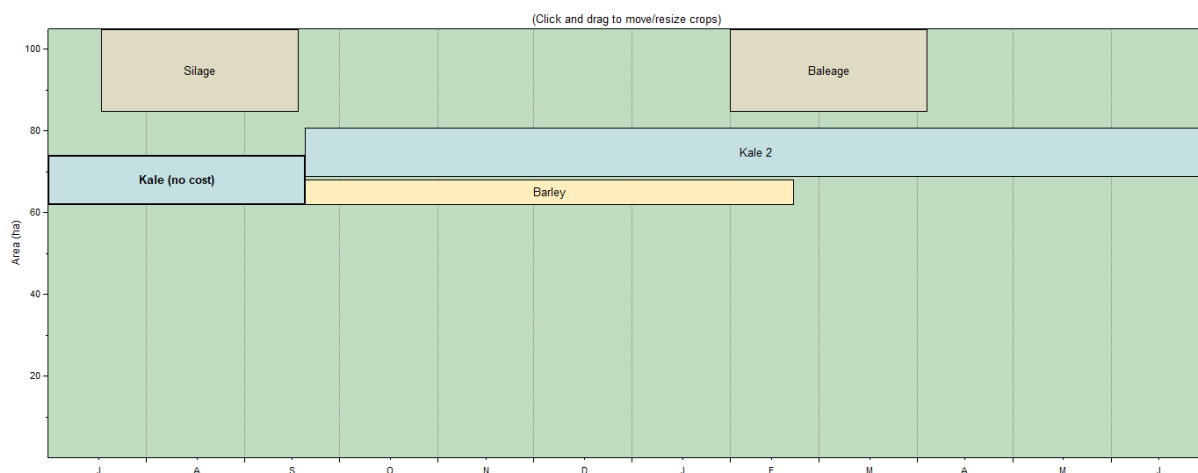
Pasture Covers



Crops by Block (Dryland)



Crops by Block (Irrigated)



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Kale			568		560	8.00
Straw	29.8	52.1			52.1	29.8
Baleage	135		180		180	135
Wheat			158	126		32.0
Rape			67.5		67.6	-0.050
Silage			72.6			72.6
Total	165	52.1	1,046	126	859	277

Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Beef Weaners					620	618	618	616	616	614	614	614
R1 Beef	614	614	614	614	522	365	274	183	42	15		
Total	614	614	614	614	1,142	983	892	799	658	629	614	614

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Lambs					945	1,643	2,017	1,033	1,575	1,570	1,565	1,213
Mixed Hoggets	1,208	55										
Total	1,208	55			945	1,643	2,017	1,033	1,575	1,570	1,565	1,213

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Fawns								250	249	249	248	248
R1 Mixed Deer	248	248	83									
Total	248	248	83					250	249	249	248	248

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

Ovr - Sheep & Beef 2_AM2_2035.21

Analysis type Predictive
Is publication No
Application version 3.4.1.3
Printed date 27 May 2021, 2:00PM
Model version 6.3.5

Farm details

N: 6,931 N/ha: 19 P: 28 P/ha: 0.1 GHG/ha: 5,001 NCE: 35%

Total area	360 ha
Productive block area	350.00 ha
Nitrogen conversion efficiency (NCE)	35%
N Surplus	82 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	633	Beef / dairy grazing stock rate (RSU)	3352
Total liveweight reared (kg/ha grazed)	818	Deer stock rate (RSU)	235
Total liveweight sold (kg/ha grazed)	1626	Sheep stock rate (RSU)	755
Percent male beef animals	50		

8.11. Appendix 11: Viticulture

Farm System Summary

Area:

Total	22ha
Effective	200ha

Irrigated balance:

100% irrigated with drip

Labour Policy:

Contractors for all tasks and part managed under contract.

Crop:

15 ha white varieties

5ha red varieties

Budget Summary

Note this budget is contingent on a local processor establishing in the region to enable savings on freight. If product has to be shipped to Marlborough then freight would become \$350/t.

MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		22 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	162,680	7,395	SHEEP		
VETERINARY AND ANIMAL HEALTH			WOOL		
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES			VELVET		
STOCKFEED - Conservation			GRAIN AND PULSE PRODUCE		
CONTRACTING	14,600	664	Previous Yr Sales		
FREIGHT	3,350	152	Current Yr Sales	367,750	
FERTILISER - Product	8,370	380	Unsold At Year End		
FERTILISER - Cart and Spread			SMALL SEED PRODUCE		
SEED			Previous Yr Sales		
CERTIFICATION AND DRESSING			Current Yr Sales		
AGRICHEMICAL - Product	9,300	423	Unsold At Year End		
AGRICHEMICAL - Application	12,000	545	MISCELLANEOUS INCOME		
REPAIRS & MAINTENANCE	18,000	818			
VEHICLES - Fuels	5,540	252	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	2,140	97	Sheep		
ELECTRICITY	4,600	209	Cattle		
OTHER WORKING EXPS	5,000	227	Deer		
ADMINISTRATION	19,000	864	Other		
STANDING CHARGES - Rates	3,240	147			
STANDING CHARGES - Insurance & ACC	9,230	420			
STANDING CHARGES - Other	3,180	145			
CASH FARM WORKING EXPENSES	280,230	12,738	CASH FARM INCOME	367,750	16,716
EBIT (Earnings Before Interest and Tax)	87,520	3,978			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	5,885	267			
Rent					
Other					
CASH OPERATING EXPENSES	286,115	13,005	CASH OPERATING INCOME	367,750	16,716
CASH OPERATING SURPLUS/DEFICIT	81,635	3,711			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	9,000	409			
PLANT REPLACEMENT	47,000	2,136	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	342,115	15,551	TOTAL CASH INCOME	367,750	16,716
TOTAL CASH SURPLUS/DEFICIT	25,635	1,165			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	25,635	1,165			

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

ADC - Viticulture, 2021

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	21 Jun 2021, 4:24AM
Model version	6.3.5

Farm details

Total area	22 ha
Productive block area	20.00 ha
Nitrogen conversion efficiency (NCE)	14%
N Surplus	46 kg/ha
Region	Canterbury

N: 117 N/ha: 5 P: 1 P/ha: 0.1 GHG/ha: 1,592 NCE: 14%

8.12. Appendix 12: Forestry

Farm System Summary

Area:

Total	270ha
Effective	260ha

Irrigated balance:

100% dryland

Labour Policy:

Contractors for all tasks.

Crop Rotation:

Forestry radiata 28 years repeating.

Budget Summary

Note there is no provision for income from carbon as it can only be sold once. This forestry is assumed to operate in perpetuity for logging purposes.

MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		260 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES			SHEEP		
VETERINARY AND ANIMAL HEALTH			WOOL		
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES	1,500	6	VELVET		
STOCKFEED - Conservation			GRAIN AND PULSE PRODUCE		
CONTRACTING	291,974	1,123	Previous Yr Sales		
FREIGHT	102,143	393	Current Yr Sales		
FERTILISER - Product			Unsold At Year End		
FERTILISER - Cart and Spread			SMALL SEED PRODUCE		
SEED	2,835	11	Previous Yr Sales		
CERTIFICATION AND DRESSING			Current Yr Sales		
AGRICHEMICAL - Product	2,682	10	Unsold At Year End		
AGRICHEMICAL - Application	2,088	8	MISCELLANEOUS INCOME	574,089	
REPAIRS & MAINTENANCE					
VEHICLES - Fuels			STOCK PURCHASES		
VEHICLES - Repairs and Maintenance			Sheep		
ELECTRICITY			Cattle		
OTHER WORKING EXPS			Deer		
ADMINISTRATION	52,100	200	Other		
STANDING CHARGES - Rates	4,860	19			
STANDING CHARGES - Insurance & ACC	12,000	46			
STANDING CHARGES - Other	500	2			
CASH FARM WORKING EXPENSES	472,681	1,818	CASH FARM INCOME	574,089	2,208
EBIT (Earnings Before Interest and Tax)	101,408	390			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	9,926	38			
Rent					
Other					
CASH OPERATING EXPENSES	482,608	1,856	CASH OPERATING INCOME	574,089	2,208
CASH OPERATING SURPLUS/DEFICIT	91,482	352			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	25,000	96			
PLANT REPLACEMENT			INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	507,608	1,952	TOTAL CASH INCOME	574,089	2,208
TOTAL CASH SURPLUS/DEFICIT	66,482	256			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	66,482	256			

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

ADC - Forestry

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	21 Jun 2021, 2:20AM
Model version	6.3.5

Farm details

Total area	310 ha
Productive block area	0 ha
Nitrogen conversion efficiency (NCE)	-
N Surplus	2 kg/ha
Region	Canterbury

N: 751 N/ha: 2 P: 42 P/ha: 0.1 GHG/ha: X NCE: -

8.13. Appendix 13: Arable 5 - Forecast

Farm System Summary

Area:

Total	320ha
Effective	300ha

Irrigated balance:

100% Irrigated with centre pivots

Stock policy:

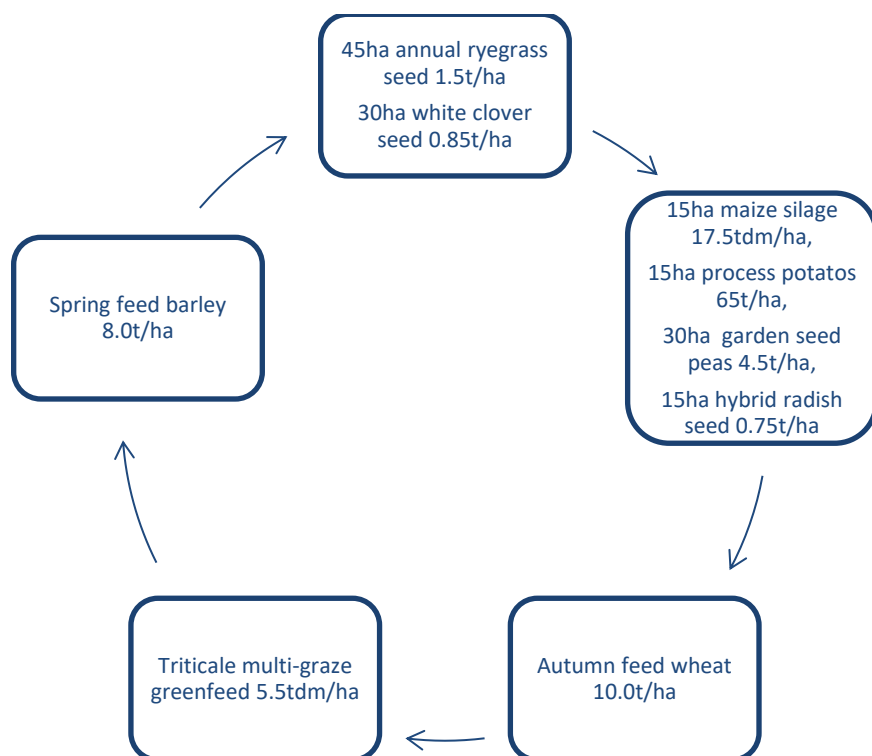
350 winter trade lambs

Labour Policy:

Waged:

Three full time plus casual labour, most of required machinery is owned to undertake farm activities.

Crop Rotation:

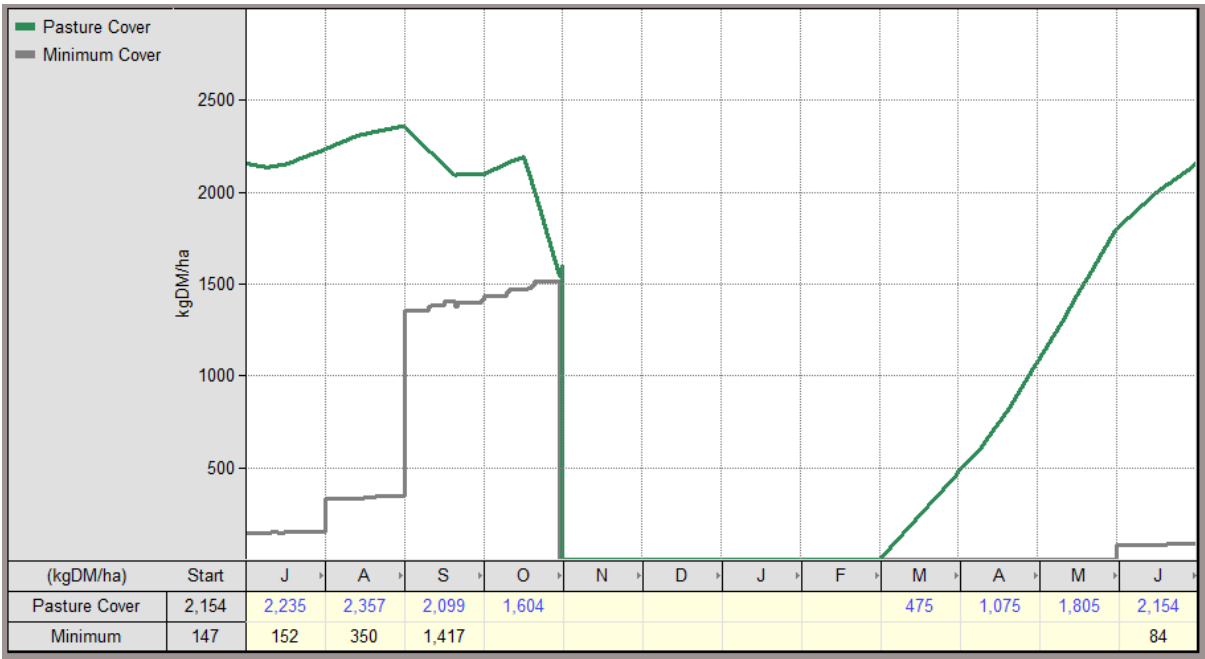


Budget Summary

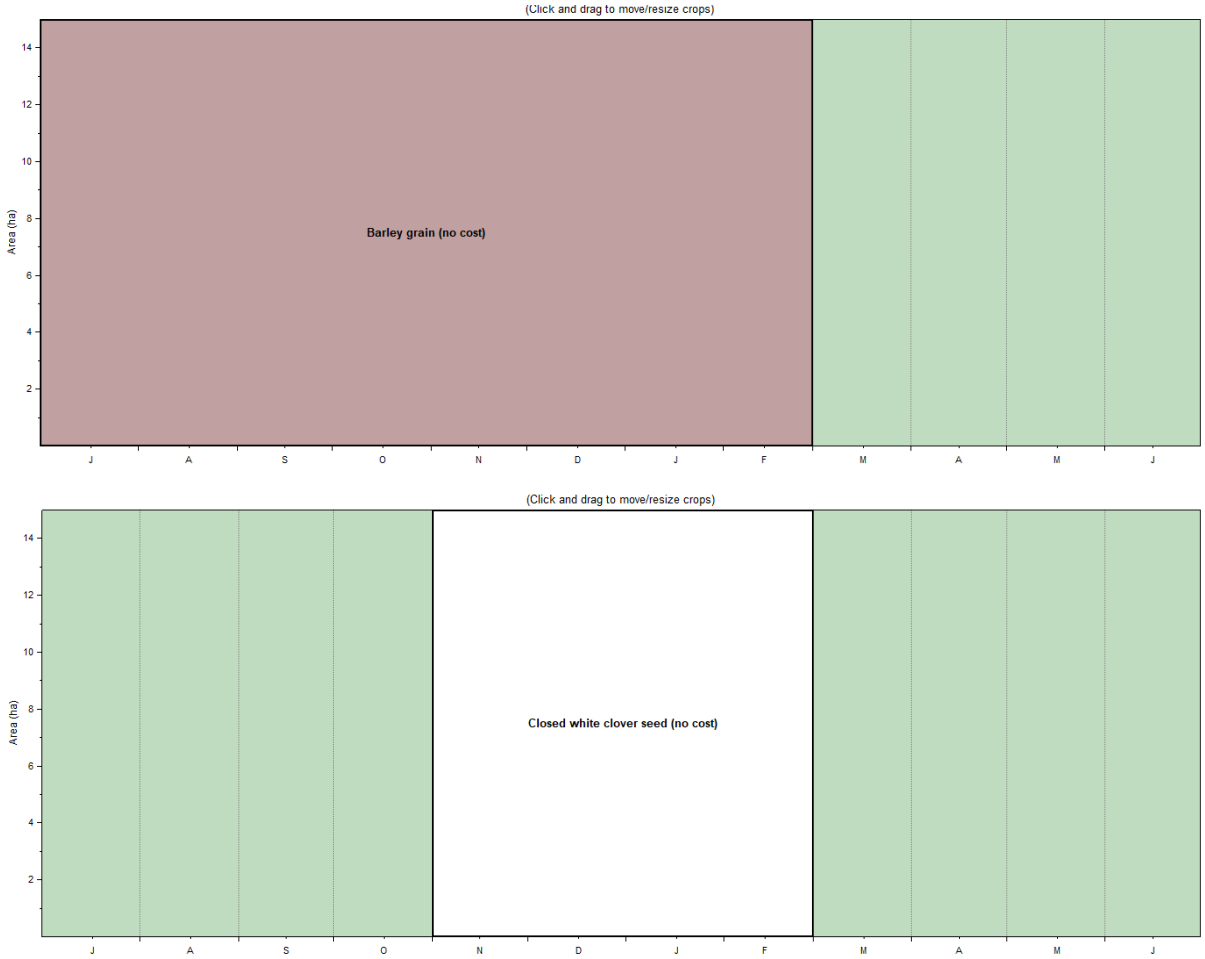
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		320 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	251,938	787	SHEEP	508,640	
VETERINARY AND ANIMAL HEALTH	10,500	33	WOOL	23,625	
STOCKFEED - Grazing			CATTLE		
STOCKFEED - Domestic			MILK		
STOCKFEED - Imported			DEER		
OTHER STOCK EXPENSES	1,500	5	VELVET		
STOCKFEED - Conservation	15,000	47	GRAIN AND PULSE PRODUCE		
CONTRACTING	51,078	160	Previous Yr Sales		
FREIGHT	46,652	146	Current Yr Sales	957,375	
FERTILISER - Product	120,899	378	Unsold At Year End		
FERTILISER - Cart and Spread	42,057	131	SMALL SEED PRODUCE		
SEED	117,975	369	Previous Yr Sales		
CERTIFICATION AND DRESSING	50,699	158	Current Yr Sales	412,125	
AGRICHEMICAL - Product	220,474	689	Unsold At Year End		
AGRICHEMICAL - Application			MISCELLANEOUS INCOME	45,000	
REPAIRS & MAINTENANCE	54,300	170			
VEHICLES - Fuels	81,500	255	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	26,000	81			
ELECTRICITY	63,400	198	Sheep	-319,725	
OTHER WORKING EXPS	25,410	79	Cattle		
ADMINISTRATION	32,740	102	Deer		
STANDING CHARGES - Rates	6,912	22	Other		
STANDING CHARGES - Insurance & ACC	19,730	62			
STANDING CHARGES - Other	40,600	127			
CASH FARM WORKING EXPENSES	1,279,363	3,998	CASH FARM INCOME	1,627,040	5,085
EBIT (Earnings Before Interest and Tax)	347,677	1,086			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	26,867	84			
Rent					
Other					
CASH OPERATING EXPENSES	1,306,230	4,082	CASH OPERATING INCOME	1,627,040	5,085
CASH OPERATING SURPLUS/DEFICIT	320,810	1,003			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION					
PLANT REPLACEMENT	240,000	750	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	1,546,230	4,832	TOTAL CASH INCOME	1,627,040	5,085
TOTAL CASH SURPLUS/DEFICIT	80,810	253			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	80,810	253			

Farmax Summary

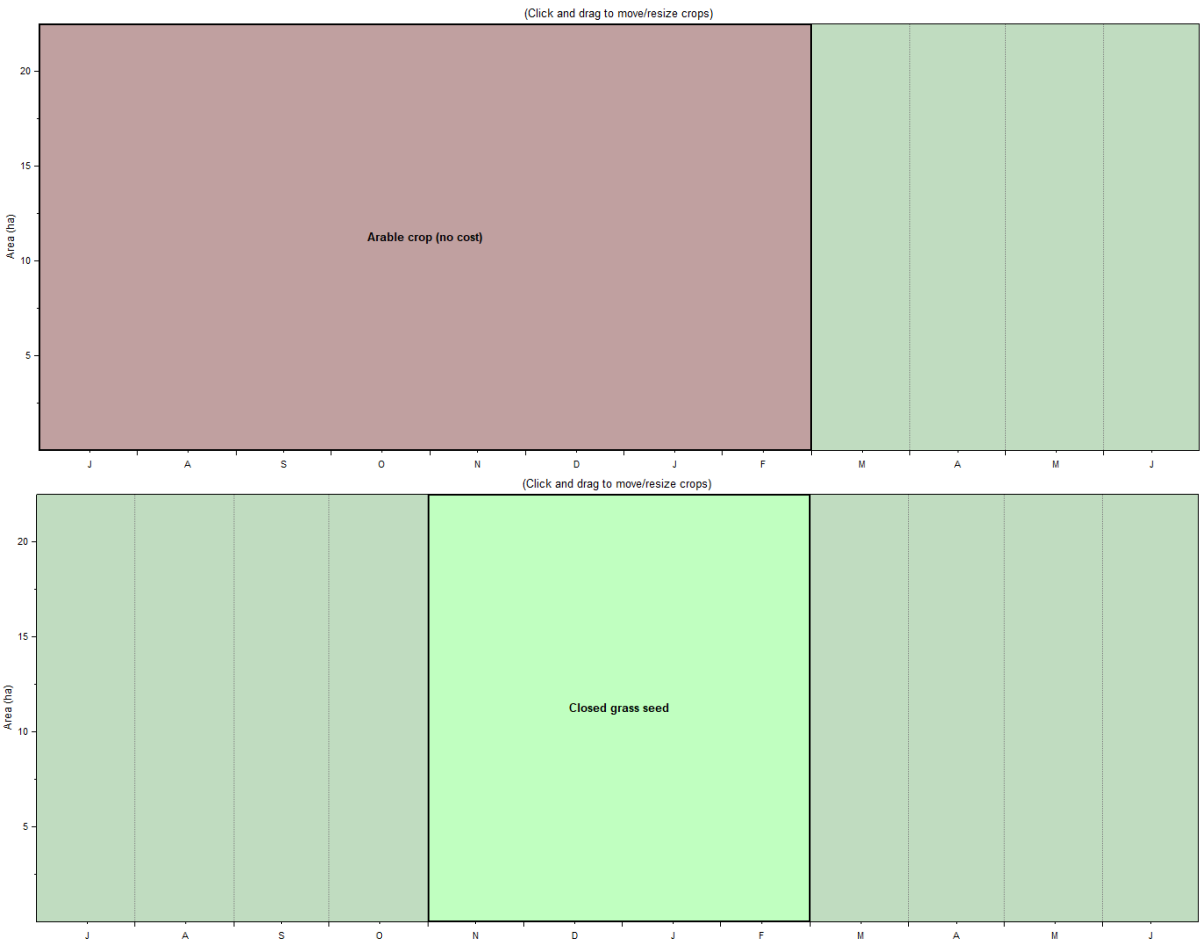
Pasture Covers



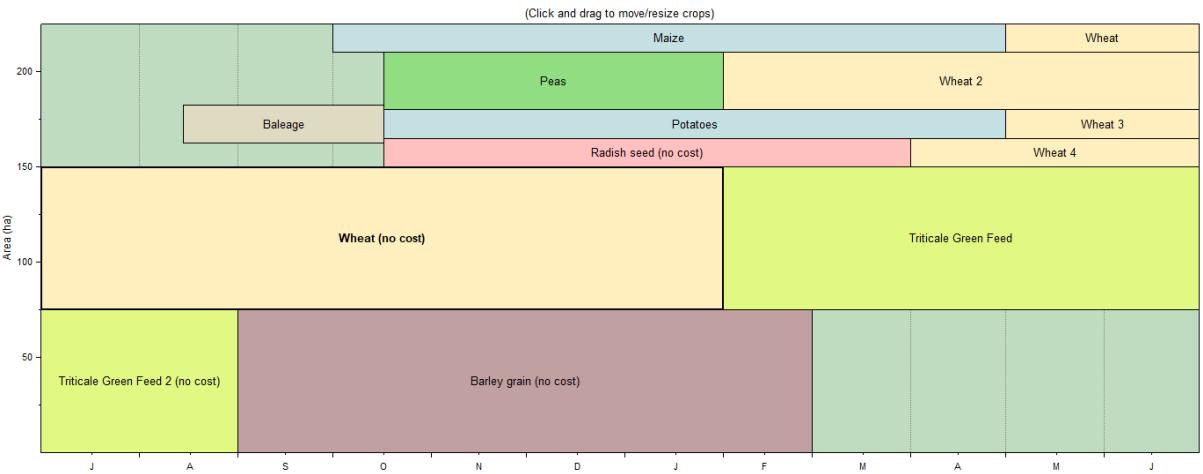
Crops by Block (Clover Seed)



Crops by Block (Post Grass Seed Block)



Crops by Block (Main Crop Block)



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Wheat grain			900			900
Rape	156					156
Peas - Seed						
Maize						
Greenfeed Oats	150					150
Grass Seed			22.5			22.5
Triticale Green Feed			413		413	-0.50
White clover seed			13.5			13.5
Radish seed						
Barley grain						
Baleage			59.8			59.8
Total	306	0.00	1,408	0.00	413	1,301

Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Lambs											3,480	3,460
Mixed Hoggets	3,440	3,420	2,321									
Total	3,440	3,420	2,321								3,480	3,460

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

ADC-Arable 5-NPS

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	21 Jun 2021, 4:36AM
Model version	6.3.5

Farm details

Total area	320 ha
Productive block area	300.00 ha
Nitrogen conversion efficiency (NCE)	65%
N Surplus	53 kg/ha
Region	Canterbury
Sheep stock rate (RSU)	1084

N: 5,032 N/ha: 16 P: 148 P/ha: 0.5 GHG/ha: 3,435 NCE: 65%

8.14. Appendix 14: Dairy 4 - Forecast

Farm System Summary

Area:

Total	220ha
Effective	210ha

Irrigated balance:

100% Irrigated with centre pivots

Stock policy:

581 peak cows

2.8 cows/ha

600kgMS/cow

Winter barn in use with cows fed indoors from 1 April to 1 September. Cull cows sold in March and April to provide room for the replacement heifers to arrive on 1 April.

Labour Policy:

Waged:

Four full time plus casual labour over calf rearing.

Contractors:

Specialist contractors employed for all cultivation, drilling and forage making or freight.

Crop Rotation:

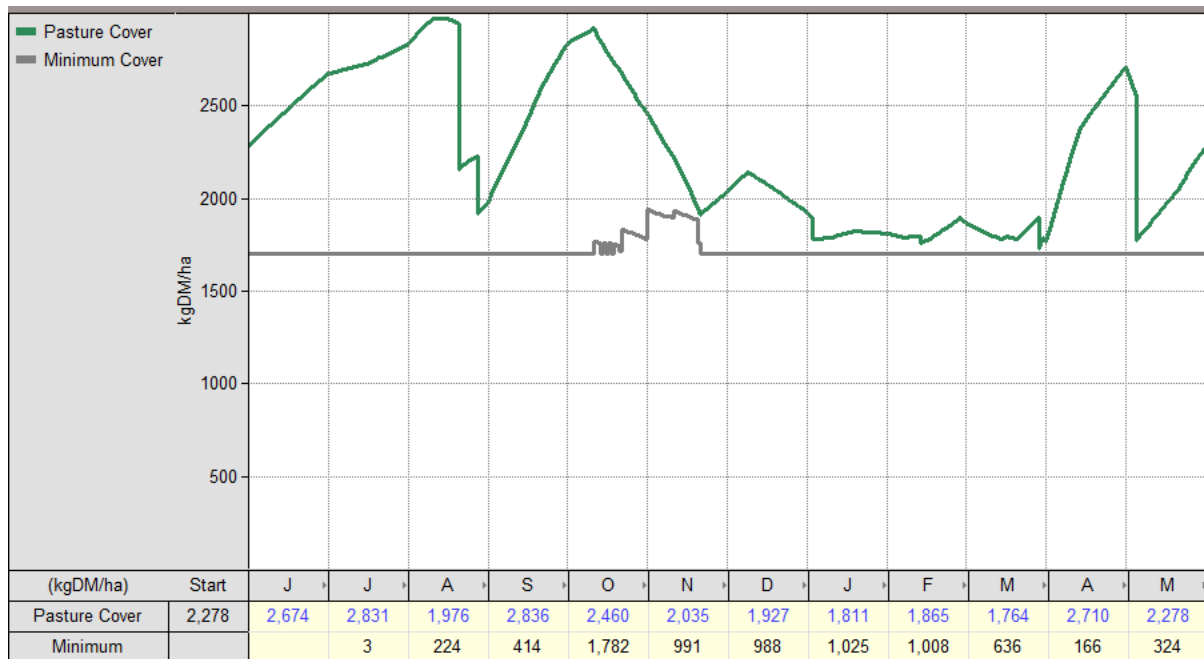
Regrassing only (no forage or feed crops grown). All grasses are Italian and plantain pasture so there is high winter growth to try and manage leaching risk further.

Budget Summary

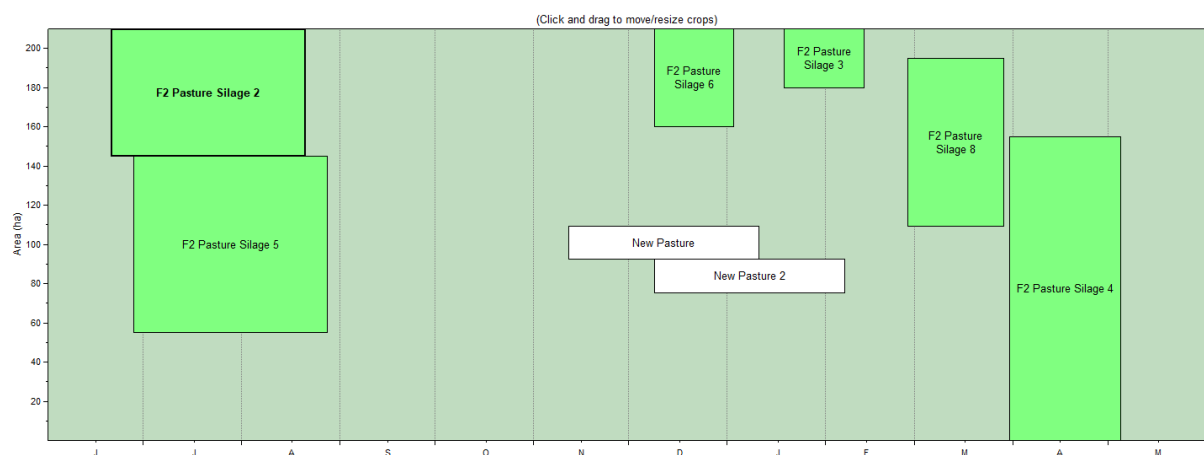
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		220 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	248,700	1,130.5	SHEEP		
VETERINARY AND ANIMAL HEALTH	146,896	667.7	WOOL		
STOCKFEED - Grazing	102,938	467.9	CATTLE	114,195	
STOCKFEED - Domestic	605,778	2,753.5	GRAZING		
STOCKFEED - Imported			MILK	2,420,902	
OTHER STOCK EXPENSES	14,400	65.5	DEER		
STOCKFEED - Conservation	190,000	863.6	VELVET		
CONTRACTING	4,760	21.6	GRAIN AND PULSE PRODUCE		
FREIGHT	3,308	15.0	Previous Yr Sales		
FERTILISER - Product	141,275	642.2	Current Yr Sales		
FERTILISER - Cart and Spread	23,524	106.9	Unsold At Year End		
SEED	8,568	38.9	SMALL SEED PRODUCE		
CERTIFICATION AND DRESSING	500	2.3	Previous Yr Sales		
AGRICHEMICAL - Product	6,862	31.2	Current Yr Sales		
AGRICHEMICAL - Application	2,992	13.6	Unsold At Year End		
REPAIRS & MAINTENANCE	126,200	573.6	MISCELLANEOUS INCOME	5,800	
VEHICLES - Fuels	42,000	190.9			
VEHICLES - Repairs and Maintenance	46,400	210.9	STOCK PURCHASES		
ELECTRICITY	67,260	305.7	Sheep		
OTHER WORKING EXPS	10,360	47.1	Cattle	-21,600	
ADMINISTRATION	25,935	117.9	Deer		
STANDING CHARGES - Rates	17,160	78.0	Other		
STANDING CHARGES - Insurance & ACC	62,680	284.9			
STANDING CHARGES - Other	48,756	221.6			
CASH FARM WORKING EXPENSES	1,947,251	8,851.1	CASH FARM INCOME	2,519,297	11,451.3
EBIT (Earnings Before Interest and Tax)	572,046	2,600.2			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	40,892	185.9			
Rent					
Other					
CASH OPERATING EXPENSES	1,988,143	9,037.0	CASH OPERATING INCOME	2,519,297	11,451.3
CASH OPERATING SURPLUS/DEFICIT	531,153	2,414.3			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	84,000	381.8			
PLANT REPLACEMENT	229,500	1,043.2	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	2,301,643	10,462.0	TOTAL CASH INCOME	2,519,297	11,451.3
TOTAL CASH SURPLUS/DEFICIT	217,653	989.3			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	217,653	989.3			

Farmax Summary

Pasture Covers



Crops by Block



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
F1 Meal and Grains bought		1,009			1,009	
F2 Pasture Silage	600		951		953	599
New Pasture						
F3 Maize/barley Silage bought		641			641	
Total	600	1,650	951	0.00	2,603	599

Stock Numbers by Month

Mob	30 Jun	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May
Cows at home	600	598	586	581	581	581	581	579	579	579	458	458
Cows Grazing												
2011 Born Heifers at Home											135	135
2011 Born Heifers Grazing	135	135	135	135	135	135	135	135	135	135		
2012 Born Heifers Grazing							135	135	135	135	135	135
2012 Born Heifers at Home		11	135	135	135	135						
Bobby Calves		7	64	8								
Total	735	751	920	859	851	851	851	849	849	849	728	728

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

ADC-Dairy4-NPS

Analysis type Predictive
Is publication No
Application version 3.4.1.3
Printed date 21 Jun 2021, 2:20PM
Model version 6.3.5

Farm details

N: 2,534 N/ha: 12 P: 102 P/ha: 0.5 GHG/ha: 22,783 NCE: 39%

Total area	215 ha
Productive block area	210.00 ha
Nitrogen conversion efficiency (NCE)	39%
N Surplus	213 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	407	Milk solids (kg/ha grazed)	2221
Total liveweight reared (kg/ha grazed)	118	Milking herd size (peak cows/ha grazed)	3.4
Total liveweight sold (kg/ha grazed)	489	Dairy stock rate (RSU)	8113
Default calving date	06 August	Dairy replacements stock rate (RSU)	193
Milk production per cow (kg milk solids / cow)	651.4		

8.15. Appendix 15: Dairy Support 4 - Forecast

Farm System Summary

Area:

Total	270ha
Effective	260ha

Irrigated balance:

100% Irrigated with centre pivots

Stock policy:

600 R1 dairy grazing heifers

600 R2 IC dairy grazing heifer (depart 1 April to winter in the barn as an R2 at the dairy farm)

Feeding maize silage over summer to balance surplus protein from pasture.

All cattle wintered in a straw based barn from 1 April to 1 September.

Labour Policy:

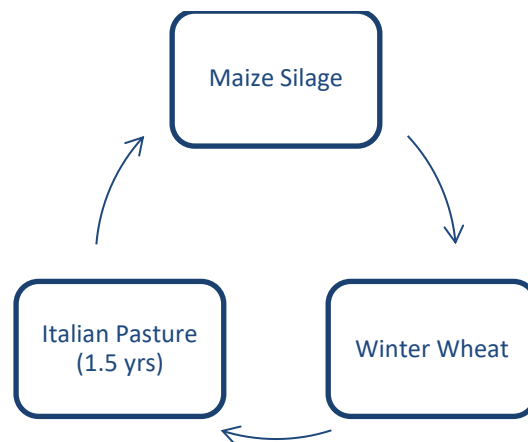
Waged:

Two full time plus casual labour, completing cultivation and drilling of wheat and grass but not maize.

Contractors:

Specialist contractors employed for all silage making and manure spreading.

Crop Rotation:

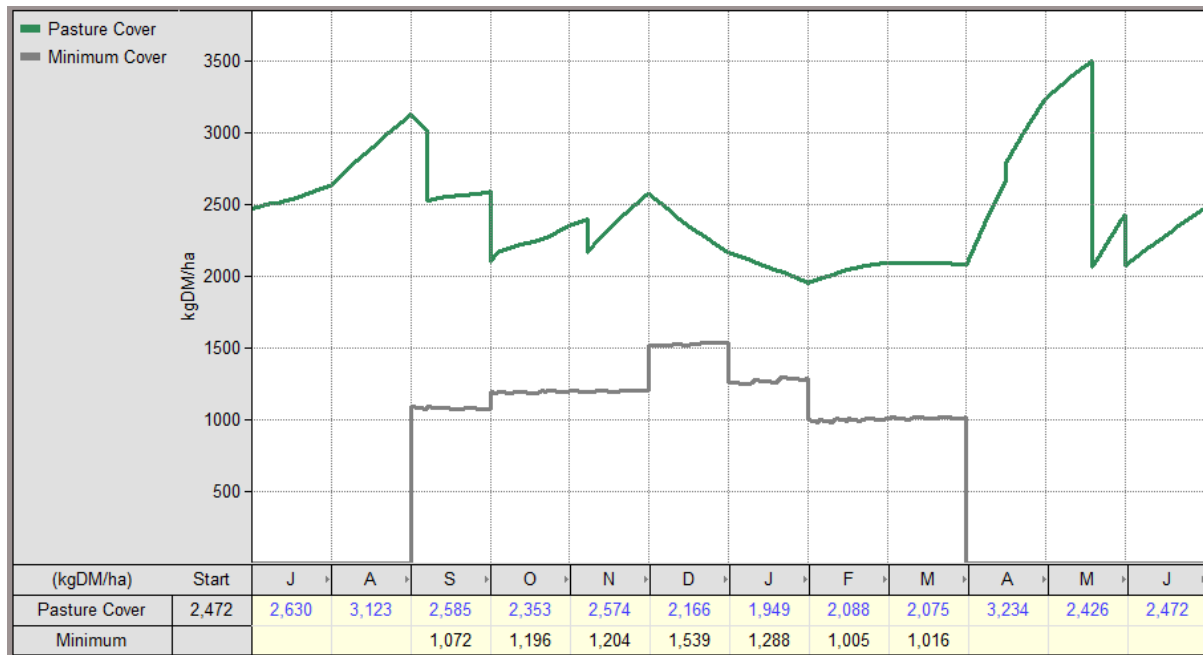


Budget Summary

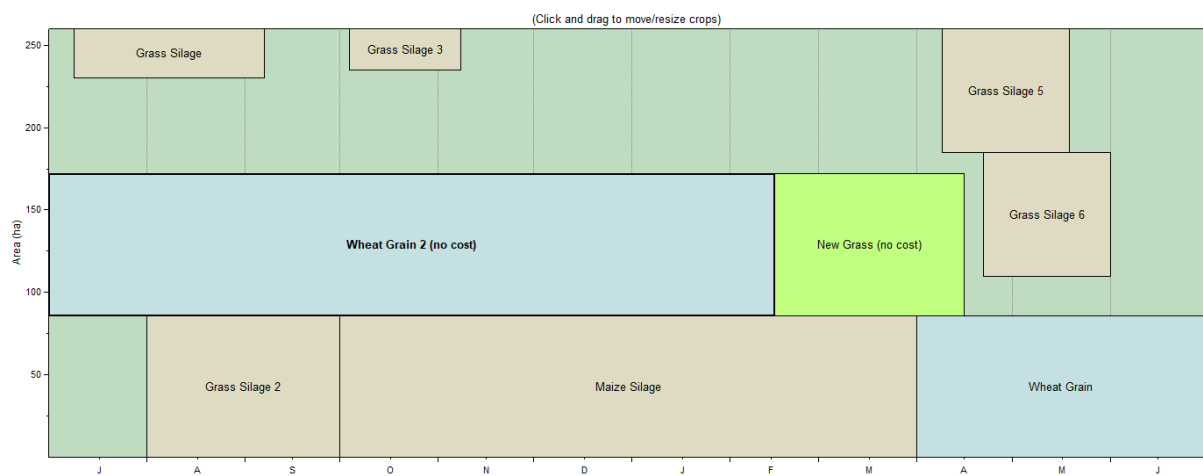
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		270 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	127,000	470.4	GRAZING	452,215	
VETERINARY AND ANIMAL HEALTH	9,105	33.7	SHEEP		
STOCKFEED - Grazing			WOOL		
STOCKFEED - Domestic			CATTLE		
STOCKFEED - Imported			MILK		
OTHER STOCK EXPENSES			DEER		
STOCKFEED - Conservation	102,760	380.6	VELVET		
CONTRACTING	43,700	161.9	GRAIN AND PULSE PRODUCE		
FREIGHT	19,620	72.7	Previous Yr Sales		
FERTILISER - Product	80,845	299.4	Current Yr Sales	536,580	
FERTILISER - Cart and Spread	18,176	67.3	Unsold At Year End		
SEED	83,764	310.2	SMALL SEED PRODUCE		
CERTIFICATION AND DRESSING	500	1.9	Previous Yr Sales		
AGRICHEMICAL - Product	56,354	208.7	Current Yr Sales		
AGRICHEMICAL - Application	30,822	114.2	Unsold At Year End		
REPAIRS & MAINTENANCE	44,500	164.8	MISCELLANEOUS INCOME	26,880	
VEHICLES - Fuels	33,973	125.8			
VEHICLES - Repairs and Maintenance	20,500	75.9	STOCK PURCHASES		
ELECTRICITY	58,480	216.6	Sheep		
OTHER WORKING EXPS	3,500	13.0	Cattle		
ADMINISTRATION	24,900	92.2	Deer		
STANDING CHARGES - Rates	7,020	26.0	Other		
STANDING CHARGES - Insurance & ACC	21,346	79.1			
STANDING CHARGES - Other	23,950	88.7			
CASH FARM WORKING EXPENSES	810,815	3,003.0	CASH FARM INCOME	1,015,675	3,761.8
EBIT (Earnings Before Interest and Tax)	204,860	758.7			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	17,027	63.1			
Rent					
Other					
CASH OPERATING EXPENSES	827,842	3,066.1	CASH OPERATING INCOME	1,015,675	3,761.8
CASH OPERATING SURPLUS/DEFICIT	187,833	695.7			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	16,000	59.3			
PLANT REPLACEMENT	129,000	477.8	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	972,842	3,603.1	TOTAL CASH INCOME	1,015,675	3,761.8
TOTAL CASH SURPLUS/DEFICIT	42,833	158.6			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	42,833	158.6			

Farmax Summary

Pasture Covers



Crops by Block



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Grass Silage	189		582		574	197
Maize Silage	163		1,548		262	1,449
Wheat Grain			832		303	530
New Grass						
Total	352	0.00	2,962	0.00	1,139	2,176

Stock Numbers by Month

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Heifer Calves						607	607	607	607	607	607	607
1-Year Heifers	607	607	607	607	607	607	607	577	577			
Total	607	607	607	607	607	1,214	1,214	1,184	1,184	607	607	607

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

ADC-Dairy Support 4-NPS

Analysis type Predictive
Is publication No
Application version 3.4.1.3
Printed date 21 Jun 2021, 12:43PM
Model version 6.3.5

Farm details

Total area	270 ha
Productive block area	260.00 ha
Nitrogen conversion efficiency (NCE)	108%
N Surplus	-10 kg/ha
Region	Canterbury
Dairy grazing stock rate (RSU)	3332

N: 6,432 N/ha: 24 P: 21 P/ha: 0.1 GHG/ha: 7,201 NCE: 108%

8.16. Appendix 16: Red Meat 3 - Forecast

Farm System Summary

Area:

Total	360ha
Effective	350ha

Irrigated balance:

- 50% Irrigated with centre pivots
- 50% dryland

Stock policy:

- 200 Dairy based Friesian bulls purchased at 100kg and finished before second winter.
- 250 head of angus weaner steers bought in March and sold as forward stores to Five Star the following December.
- 400 Dairy cross beef steers and heifers bought at 100kg as weaners and finished (mostly) before the second winter.
- 250 R2 steers wintered.
- 750 weaner deer traded.
- 2500 summer traded lambs.
- 2800 winter traded lambs.
- All cattle in winter barn from 1 April to 1 September.

Feeds:

- Maize silage fed as 25% of diet over summer period to balance the surplus pasture protein.
- Wheat grain and barley silage fed over winter in feed barn (straw bedding).
- All straw from wheat is retained for shed bedding.

Labour Policy:

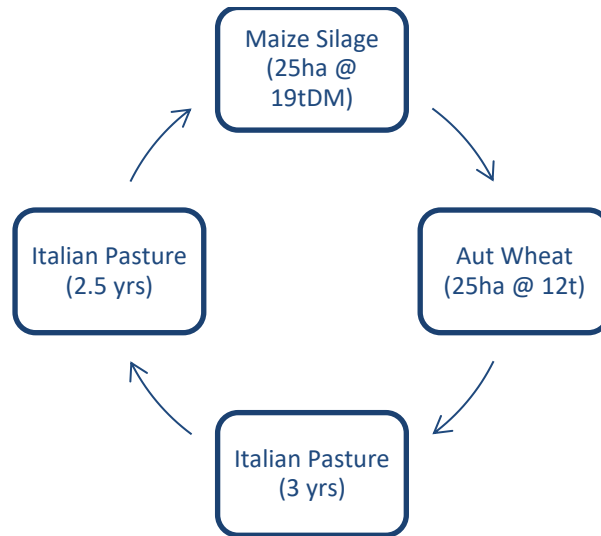
Waged:

- Four full time plus casual labour over calf rearing.

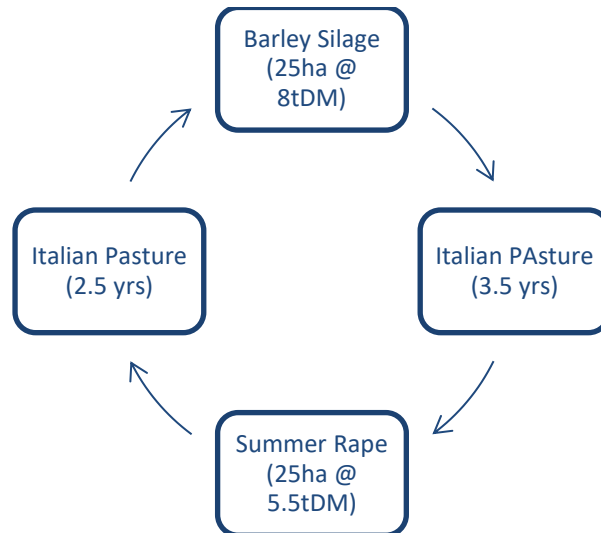
Contractors:

- Specialist contractors employed for all cultivation, drilling and forage making or freight.
- Solid manure spread by contractors with spreader wagon.

Crop Rotation (Irrigated):



Crop Rotation (Dryland):

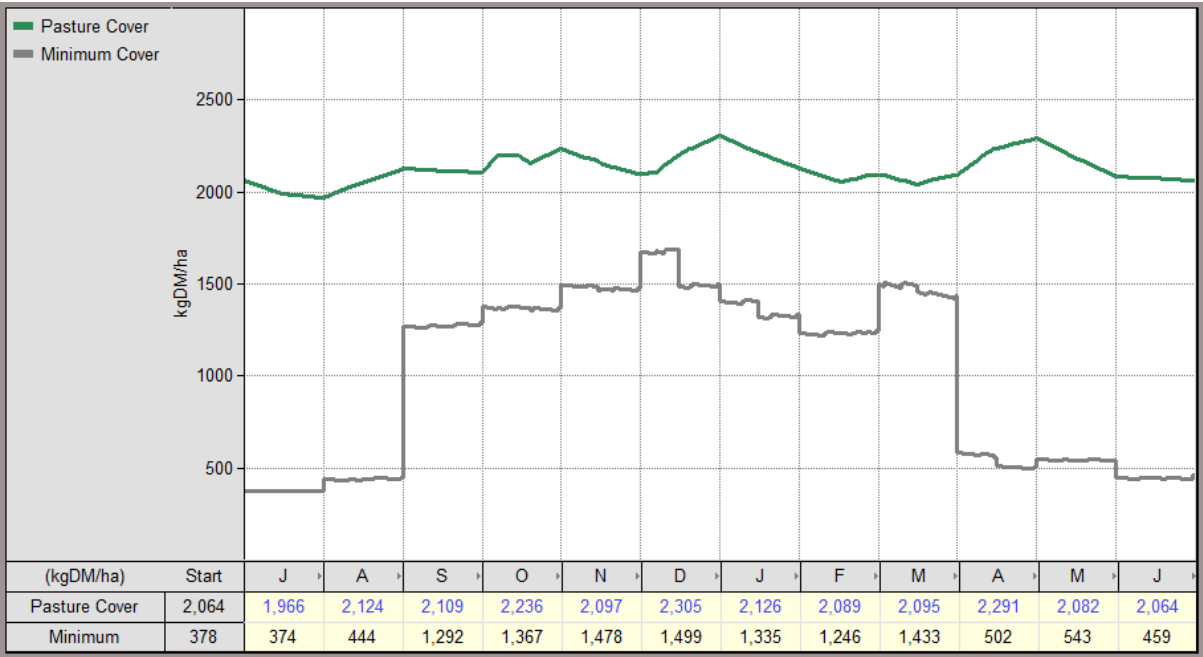


Budget Summary

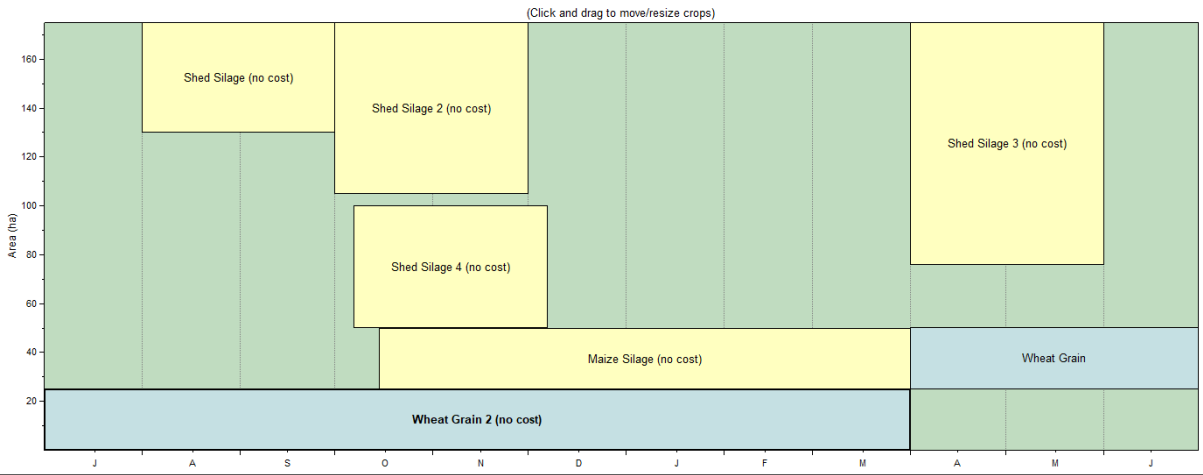
MACFARLANE RURAL BUSINESS LTD		BUDGET SUMMARY			
		360 Su or Ha			
	TOTAL \$	Income		TOTAL \$	Income
WAGES	167,089	464.1	SHEEP	626,586	
VETERINARY AND ANIMAL HEALTH	59,143	164.3	WOOL	21,465	
STOCKFEED - Grazing			CATTLE	1,626,349	
STOCKFEED - Domestic	26,644	74.0	MILK		
STOCKFEED - Imported			DEER	358,046	
OTHER STOCK EXPENSES	4,959	13.8	VELVET	9,219	
STOCKFEED - Conservation	151,020	419.5	GRAIN AND PULSE PRODUCE		
CONTRACTING	52,125	144.8	Previous Yr Sales		
FREIGHT	38,128	105.9	Current Yr Sales		
FERTILISER - Product	128,191	356.1	Unsold At Year End		
FERTILISER - Cart and Spread	21,128	58.7	SMALL SEED PRODUCE		
SEED	48,100	133.6	Previous Yr Sales		
CERTIFICATION AND DRESSING	500	1.4	Current Yr Sales		
AGRICHEMICAL - Product	28,625	79.5	Unsold At Year End		
AGRICHEMICAL - Application	14,300	39.7	MISCELLANEOUS INCOME	3,500	
REPAIRS & MAINTENANCE	46,750	129.9			
VEHICLES - Fuels	40,487	112.5	STOCK PURCHASES		
VEHICLES - Repairs and Maintenance	28,000	77.8	Sheep	-468,380	
ELECTRICITY	41,650	115.7	Cattle	-741,500	
OTHER WORKING EXPS	3,500	9.7	Deer	-187,688	
ADMINISTRATION	27,500	76.4	Other		
STANDING CHARGES - Rates	9,450	26.3			
STANDING CHARGES - Insurance & ACC	28,068	78.0			
STANDING CHARGES - Other	23,950	66.5			
CASH FARM WORKING EXPENSES	989,306	2,748.1	CASH FARM INCOME	1,247,598	3,465.5
EBIT (Earnings Before Interest and Tax)	258,292	717.5			
DEBT SERVICING					
Mortgage					
Term Interest					
Current Account	20,775	57.7			
Rent					
Other					
CASH OPERATING EXPENSES	1,010,082	2,805.8	CASH OPERATING INCOME	1,247,598	3,465.5
CASH OPERATING SURPLUS/DEFICIT	237,516	659.8			
PERSONAL DRAWINGS			NON OPERATING INCOME		
OTHER PERSONAL					
TAXATION	22,000	61.1			
PLANT REPLACEMENT	158,137	439.3	INVESTMENT INCOME		
INVESTMENTS					
UNPAID ACCOUNTS					
TOTAL CASH EXPENDITURE	1,190,219	3,306.2	TOTAL CASH INCOME	1,247,598	3,465.5
TOTAL CASH SURPLUS/DEFICIT	57,379	159.4			
Change in value of stock on hand					
Change in value of produce on hand					
Depreciation					
TRUE SURPLUS/DEFICIT	57,379	159.4			

Farmax Summary

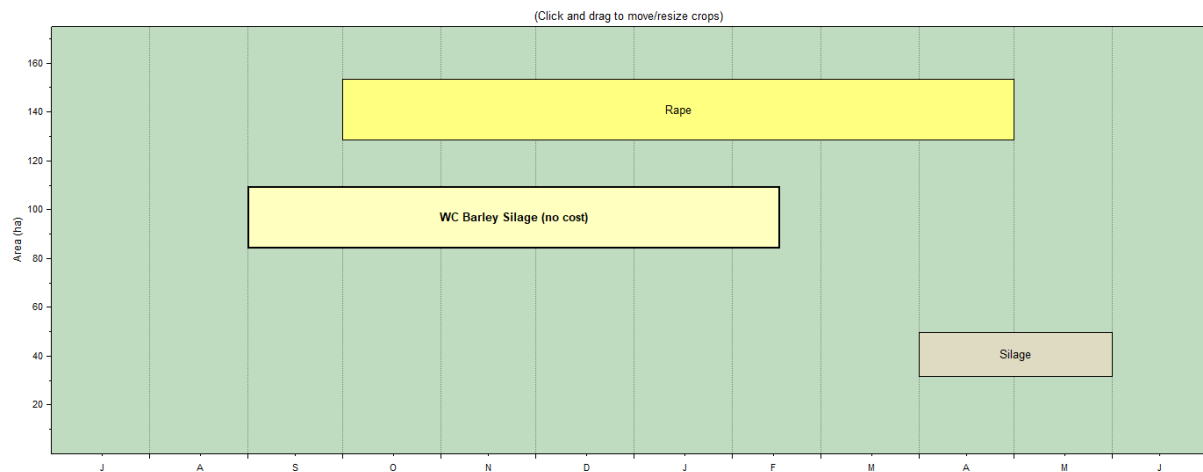
Pasture Covers



Crops by Block (Irrigated)



Crops by Block (Dryland)



Supplements

tonnes DM	Open	Buy	Produce	Sell	Feed	Close
Maize Silage	475		475		475	475
WC Barley Silage	200		200		200	200
Fallow						
Shed Silage	384		792		792	384
Wheat Grain			264		264	
Silage	60.0		54.0		54.0	60.0
Rape			138		138	-0.50
Total	1,119	0.00	1,923	0.00	1,923	1,119

Stock Numbers by Month (Bull Calves)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Beef Weaners					200	199	199	198	198	198	198	198
R1 Beef	198	198	198	198	198	197	197	132	66			
Total	198	198	198	198	398	396	396	330	264	198	198	198

Stock Numbers by Month (Lambs)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Lambs						1,300	2,418	1,766	1,533	2,848	2,843	2,024
Mixed Hoggets	2,019	1,511										
Total	2,019	1,511				1,300	2,418	1,766	1,533	2,848	2,843	2,024

Stock Numbers by Month (Deer)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Mixed Fawns								750	749	748	747	747
R1 Mixed Deer	746	745	596	447	299	149						
Total	746	745	596	447	299	149		750	749	748	747	747

Stock Numbers by Month (Five Star Beef Steers)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Steer Calf										250	249	249
R1/R2 Steers	249	248	248	185	93							
Total	249	248	248	185	93					250	249	249

Stock Numbers by Month (Finishing Beef Heifers)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Heifer Calf					200	200	200	199	199	199	198	198
R1/R2 Heifer	198	197	197	197	197	197	100	59	18			
Total	198	197	197	197	397	397	300	258	217	199	198	198

Stock Numbers by Month (Finishing Beef Steers)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
Steer Calf					200	200	200	199	199	199	199	198
R1/R2 Steers	198	197	197	197	197	197	197	122	72	26	26	26
2-Year Steers	26	26	13									
Total	224	223	210	197	397	397	397	321	271	225	225	224

Stock Numbers by Month (Finishing R2 Beef)

Mob	31 Jul	31 Aug	30 Sep	31 Oct	30 Nov	31 Dec	31 Jan	28 Feb	31 Mar	30 Apr	31 May	30 Jun
1-Year Steers										250	250	250
2-Year Steers	250	249	249	59								
Total	250	249	249	59						250	250	250

Overseer Summaries



MRB

189 Alford Forest Rd, Allenton, Ashburton 7700, New Zealand



OverseerFM

ADC-Red Meat 3-NPS

Analysis type	Predictive
Is publication	No
Application version	3.4.1.3
Printed date	21 Jun 2021, 2:24PM
Model version	6.3.5

Farm details

N: **6,371** N/ha: **18** P: **37** P/ha: **0.1** GHG/ha: **13,709** NCE: **31%**

Total area	360 ha
Productive block area	350.00 ha
Nitrogen conversion efficiency (NCE)	31%
N Surplus	142 kg/ha
Region	Canterbury

Total liveweight brought (kg/ha grazed)	1940	Beef / dairy grazing stock rate (RSU)	5463
Total liveweight reared (kg/ha grazed)	1596	Deer stock rate (RSU)	726
Total liveweight sold (kg/ha grazed)	3481	Sheep stock rate (RSU)	1162
Percent male beef animals	80		

8.17. Appendix 17: Mitigation Tools in the Forecast Models

- Italian pastures (for winter activity)
- Plantain in all pastures at 30% unless arable farming.
- No grazing pastures or forages with cattle between 1 April and 1 September to minimise N leaching risks from urine patches (cattle in a barn).
- No winter forages (only oats for lambs) to minimise fallow period exacerbating leaching risks.
- Planting not later than April and not earlier than September (maintain leaf cover and rooting depth over winter to intercept any potentially mobile nitrogen).
- Centre pivots or drip tape irrigation only.
- Variable rate irrigation where required.
- Soil moisture monitoring, 1 per 30ha.
- Deficit irrigation in shoulders more so than at peak to capture more potential rainfall and therefore reduce the risks of drainage.
- Diet balancing with high carbohydrate supplements.
- Regular tissue and ANM testing to ascertain nitrogen application requirements.
- Coated urea's only.
- No August or May N
- More frequent and lower volume N applications to pastures and crops
- Nitrification inhibitors where applicable.
- Gibberellic acid use on pastures.
- Within paddock and individual paddock testing.
- Variable rate fertiliser spreading.
- Yield mapping, sensor technology and target timing.
- Fallow periods set to 0 days.
- Full farm nutrient budgeting and considering N cycles and manure contributions.

8.18. Appendix 18: Commodity Inputs

Category	Item	Note	Rate				
Lamb	Spring/winter		\$6.80				
	Summer		\$5.70				
	Prime Lamb	A/S/O	\$6.80				
		J/F/M	\$5.40				
		A/M/J	\$5.70				
	Store lamb	N/D	\$3.00				
		J/F/M	\$2.70				
		A/M/J	\$2.90				
	Cull ewe		\$90				
	Winter margin		\$55 (calculate)				
	Summer margin		\$16 (calculate)				
Wool	Ewe		\$4.00				
	Lamb/hogget		\$4.50				
Crop	Wheat - Feed		\$410	del (less \$10 commission; \$20 freight)			
	Wheat - Premium Milling		\$445	del (less \$10 commission; \$20 freight)			
	Barley - Feed		\$390	del (less \$10 commission; \$20 freight)			
	Barley - Malting		\$430	del (less \$10 commission; \$20 freight)			
	Peas - Vining		\$320				
	Peas - Garden seed		\$1,000	del (less \$10 freight)			
	Potatoes		\$240				
	Onions		\$300				
	Sweet Corn		\$190	(nett of bypass pool)			
	Maize		\$230				
	PRG Ryegrass seed - Proprietary		\$2,300	del (less \$10 freight)			
	IRG Ryegrass seed - Proprietary		\$2,100	del (less \$10 freight)			
	White clover seed - Proprietary		\$5,750	del (less \$10 freight)			
	OP Cabbage		\$2.50	del (less \$10 freight)			
	Linseed		\$940	del (less \$10 freight)			
	Sunflower		\$820	del (less \$10 freight)			
	Hemp		\$4,000	del (less \$10 freight)			
	Lucerne /kgDM		\$0.20	/kgDM			
	Baleage (sell baled 250kgDM)	285kgDM	\$57	royalty (20c/kgDM)			
	Straw buy /bale						
	Straw wheat sell /kgDM (sell 500kg fresh; 90%DM)		\$36	/bale royalty (plus \$20 baling; \$7 freight cost to buyer)			
	Straw barley sell /kgDM (sell 500kg fresh; 90%DM)		\$43	/bale royalty (plus \$20 baling; \$7 freight cost to buyer)			
	Straw ryegrass/Pea Vine se 500kg fresh; 86%DM		\$74	/bale royalty (plus \$20 baling; \$7 freight cost to buyer)			
Grazing	R1 Calf (\$/head/week)		\$7.75	gross (less \$0.50 commission)			
	R2 Heifer (\$/head/week)		\$12.75	gross (less \$0.50 commission)			
	R2 I.C. Heifer (\$/head/week)		\$24.00	gross (less \$0.50 commission)			
	Cow winter (\$/head/week)		\$30.00	gross (less \$0.50 commission)			
	Standing winter feed		\$0.290	nett with no commission			
Dairy	Cull cow		\$638				
	Bobby calf		\$35				
	Milk solids base		\$6.20				
	Cull Heifer		\$816.75				
Beef			Works Price	100kg	230kg	330kg	450kg/18 mth
	Prime beef - Winter/Spring		\$5.60	\$4.50	\$3.20	\$3.00	\$2.80
	Prime beef - Summer kill		\$4.95	\$4.32	\$3.07	\$2.88	\$2.69
	Manufacturing - Winter		\$5.20	\$4.30	\$2.90	\$2.80	\$2.55
	Manufacturing - Summer kill		\$4.60	\$4.13	\$2.78	\$2.69	\$2.45
	Cull cow		\$900				
Deer	Store		\$4.55				
	Prime Oct-Dec average		\$8.50				
	Velvet - Spiker		\$125				
Dairy feed buy	Barley/Wheat average		\$400	landed	(average of wheat and barley)		
	Silage (incl chopped & landed)		\$340	landed	(\$120/t making on farm)		
	Baleage	285kgDM	\$113	landed	(20c/kgDM; \$52 mow/rake/bale/wrap; \$10 can)		
	Maize silage		\$310	landed in pit	(\$230/tDM to grower)		
	PKE (landed)		\$280				
	Calf meal		\$850				

Fertiliser	Superphosphate		\$350				
	triple Super		\$720				
	Sulphur Super 15		\$355				
	Sulphur Super 20		\$370				
	Sulphur Super 30		\$385				
	Moly S Super		\$410				
	10% Pot S Super		\$390				
	15% Pot S Super		\$400				
	20% Pot S Super		\$410				
	30% Pot S Super		\$460				
	Nitrophoska Select		\$890				
	CAN		\$750				
	Cropmaster 15		\$720				
	Cropmaster 20		\$675				
	DAP		\$850				
	DAP + B		\$940				
	DAP 13S		\$700				
	Sulphate of Ammonia		\$500				
	Ammo31		\$575				
	Ammo36		\$600				
	Urea		\$675				
	N Protect		\$743				
	Potassium sulphate		\$1,100				
	Potassium chloride		\$740				
	Lucerne mix + TE		\$530				
	Sulphur90		\$615				
	Magnesium oxide		\$570				
	Kieserite		\$570				
	Borate46		\$1,590				
	Sodium chloride		\$200				
	Molybor		\$17				
	Lime		\$32	\$50 supply, cart, spread			
	Cartage/tonne		\$18				
	Spreading/ha say		\$8				

Crop costs	Change as per budgets						
Repairs & maint	Change as per budgets						
Vehicles	Change as per budgets						
Electricity	Irrigation		198	based on sheme 57,000 supplied under pressure, 48,000ha s			
	Electricity		25c/kwh	includes lines charges off peak			
Water charges	Operating cost only		134	based on \$280/ha for scheme management on 105,000ha of			
Livestock capital	Stock unit		\$170				
	Dairy cow		\$1,850				
	Heifer		\$850				

Term debt interest rate		5.50%				
Current account		7.00%				
Wages	Dryland D Stock Manager	\$70,000	(cash only)			
	Dryland D Stock Staff/Head Shepherd	\$56,000	(cash only)			
	Dairy Manager	\$78,000	(cash only)			
	Dairy Assistant Manager	\$60,000	(cash only)			
	Dairy Assistant	\$52,000	(cash only)			
	Arable Manager	\$70,000	(cash only)			
	Arable Senior	\$62,000	(cash only)			
	Arable Junior	\$52,000	(cash only)			
	Casual per hour	\$28.50	(cash only)			
	+ Kiwisaver @ 3.5%					
	ACC	2.60%	total wages incl KS			
	Shearing	\$5.50	ewes/full shear			
		\$4.70	lambs			
		\$2.80	crutching sheep			
		\$1.50	crutching lambs (assumes trailer)			
Agwork	Harvest	\$310				
	Windrow	\$170				
	Drilling	\$110	std			
		\$140	Direct			
		\$175	planter	Precision?		
		\$140	maize planter			
	Full Cultivation	\$380				
	Spraying	\$22				
	Inter-row spraying	\$120				
	Dressing - Grass	\$350				
	Dressing - Small Seed	\$500				
An Health	Ewes	\$5.50				
	Lambs	\$2.60				
	Weaners	\$7				
	100kg Calf	\$25				
	FSB Steer	\$15				
	R2	\$10				
Freight	Lambs	\$3.00				
	Ewes	\$5.00				
	Wool bale	\$15				
	Cow	\$18				
	Heifer	\$15				
	Calf	\$6				
	Grain	\$20				
	Seed	\$28				

9. References

Scott, L. (2013); ***Hinds Plains water quality modelling for the limit setting process***; Report No. R13/93; (pp 34-35)

Everest (Macfarlane Rural Business Ltd) *et.al* (2013); ***Hinds catchment nutrient and on-farm economic modelling***; Report No. R13/109

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Appendix 2

Economic impact of freshwater environmental standards in Ashburton District

for Ashburton District Council

July 2021



Authorship

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Executive summary

Ashburton District Council (ADC) sought to understand how new National Environmental Standards for Freshwater (NES-F) will affect the District's farmers and community at large. ADC commissioned Mcfarlane Rural Business (MRB) to carry out detailed modelling of the economic impact of achieving the NES-F requirement of a maximum 2.4ppm nitrogen in ground and surface water. MRB have forecast how the District's land uses could be changed to achieve the requirement, and estimated the resulting changes in farm expenditure and profitability.

Infometrics were commissioned by ADC to model the economic impact of land use change as modelled by MRB. We have used an input-output multiplier approach to model these effects, considering direct, indirect and induced effects.

Large scale changes in land use, \$277m decline in farm profit

The MRB report indicates large scale changes in land use, as dominant existing land uses in Ashburton such as arable and dairy either reduce their intensity or change to forestry. Forestry is forecast to grow substantially; however, it requires very little in the way of inputs and has a far lower level of profitability. This leads to a \$277.3m decrease in gross profit (EBIT), and a \$65.6m decrease in wages and salaries.

Direct effect is \$343m decline in agriculture and forestry GDP...

The direct effect of the changes, as modelled by MRB, is for a \$343m (2020 dollars) decline in GDP across Ashburton's agriculture industries. This amounts to 51% reduction from 2020 levels. This is driven by a \$291m decline in dairy cattle farming GDP, followed by an \$93m decline in sheep, beef cattle and grain farming. This is only partially offset by GDP growth in forestry and logging of \$40m.

...and 1,176 decline in agriculture jobs

The direct effect on agriculture, forestry and fishing industry employment is a decrease of 1,176 jobs, a 26% decrease from 2020 employment. This is a result of a 1,258 decline in dairy industry employment, which is barely offset by an increase of 82 jobs in sheep, beef cattle and grain farming.

Overall negative effect on GDP and employment.

The total effect of the land use changes is estimated as a \$409m reduction in Ashburton's overall GDP, including negative indirect and induced effects which add to the direct effect of a decline in agricultural GDP. This represents a 16.3% decrease to Ashburton's GDP level in 2020. Similarly, the negative effect on employment is more pronounced once indirect and induced effects are considered, with an estimated total decrease in employment of 1,735 or a 9.1% reduction on 2020 employment.

Total effects concentrated in agriculture

The direct effect of the forecast land use changes is felt by the agriculture industry, so logically total effects are concentrated in that industry too. Agriculture, forestry and fishing GDP is estimated to decline by \$297m or 44.1%, and employment to decline by 1,475 or -32.6%.

Total earnings estimated to fall 8.7%

Total earnings across the Ashburton District are estimated to fall \$97.6m or 8.7% as a result of the reduction in employment, assuming average earning rates remain the same in each industry.

Changes unwind previous growth

Ashburton's economy has experienced sustained growth over the past two decades, with employment 35% higher in 2020 than 2000, and real GDP 63% higher over the same period. The forecast land uses changes effectively drive overall employment and GDP down to levels last seen in 2013. Within Ashburton's agriculture, forestry and fishing industry specifically, the decrease in employment represents a return to pre-2000 levels of employment and GDP.

Change in agriculture and forestry employment amounts to 8 years of replacement of lost workers

Infometrics forecasts that on average a net 187 workers will be required per year over the next five years across Ashburton's agriculture, forestry and fishing industry to replace workers that leave the industry due to retirement, leaving the country etc. This indicates that if the forecast land use changes were implemented over a period of at least eight years, then the decrease in agriculture, forestry and fishing industry employment could be accommodated within usual rates of net replacement. The effect on specific subindustries or communities may be more pronounced.

Ashburton's economy will adapt

The land use changes modelled by MRB represent a substantial shift to Ashburton's economy, however the effect on the community is highly sensitive to the length of time over which the land use changes take place. A transition over an extended period of time will give Ashburton's residents and businesses – their economy – a chance to adapt. The loss of jobs and reduction in farm values does present an opportunity for different industries to expand using the resources freed up by the changes. We would not expect the negative effects to persist over the long term; however, they may persist for several years if land use change is rapid.

One-off boost from MAR construction

The MRB report estimates that construction of Managed Aquifer Recharge (MAR) will cost \$23.5m over an unspecified period, which will create a one-off boost to the Ashburton economy. We expect the construction of MAR to contribute \$23m to the Ashburton economy and create the full time equivalent of 40 jobs.

Environmental benefits not quantified

We have not made an allowance for any positive economic benefits which may result from improved water quality in Ashburton District, nor the costs from not improving water quality.

Introduction

Ashburton District Council (ADC) sought to understand how new National Environmental Standards for Freshwater (NES-F) will affect the District's farmers and community at large.

ADC modelled the effects at a high level in late 2020, and Infometrics peer reviewed this work. ADC commissioned Mcfarlane Rural Business (MRB) to carry out detailed modelling of the economic impact of achieving the NES-F requirement of a maximum 2.4ppm nitrogen in ground and surface water. MRB has considered how the District's farmers may achieve the requirement by forecasting land use changes, and estimated the resulting changes in in farm expenditure and profitability.

We have taken the changes in farm expenditure and profitability from the MRB report and applied a regional input-output multiplier analysis to model the effects on Ashburton's economy.

Key assumptions and limitations

Land use changes

We have drawn upon the work of MRB¹ to understand how land uses may change as a result of NES-F, taking their assumptions and modelling at face value. We have mapped the land use types from the MRB report to the Stats NZ ANZSIC 54-industry framework.

Uncertainty around timing

Given uncertainty around the timeframe for implementation of the nitrogen requirement, the MRB work makes no assumption around timeframes, simply calculating the difference between the current state and the final future state, which could be 5-40 years away. This report therefore does the same – its results should be interpreted as applying to a non-specified future year in which Ashburton District fully achieves nitrogen loss requirement. In reality, the effects may be sensitive to timing, particularly given the strong role for forestry in land use change. If large areas of forestry are planted over a concentrated period, then the economic effects of forestry may be lumpy in future, with, for example, harvesting activity concentrated over a limited period in future as the trees reach maturity together.

We have assumed that the costs of land use change will take place over an extended period of time in order to coincide with scheduled on-farm asset renewals. Accordingly, we have not quantified the economic impact of land use changes as this capital expenditure would have occurred regardless.

Input-Output multiplier approach

We use a regional input-output (IO) multiplier model to estimate the impact of the construction and operating phases of the proposed facility. The IO model is based on inter-industry relationships within an economy, mapping how economic activity in one industry flows through to other industries and ultimately households.

Note that as part of this approach, we do not consider the impact on asset values, although this is covered in the MRB report. This is because we do not know where the owners of the assets reside – it is likely that many of Ashburton's farms have owners residing out of the District.

Our multiplier approach is described in more detail in the appendix. All dollar figures referred to are in 2020 prices.

Direct, indirect and induced economic effects considered

We consider the direct, indirect and induced economic effects as a result of changes to achieve the nitrogen target, as modelled by MRB. Direct effects include the direct effects on the agriculture industry, such as the reduction in profit and employment on dairy farms from reduced production. Indirect effects include effects on supplying industries,

¹ Mark Everest, *Economic Impacts of Achieving 2.4ppm N in Ashburton District Surface Water Draft 2.2*, 18 July 2021: Macfarlane Rural Business Ltd

such as dairy support farms, rural contractors and irrigation scheme operators. Induced effects include the effect of changes in wage earnings – such as lower spending in retail and hospitality businesses as a result of the decrease in agriculture employment.

Only net effects are modelled

This report is focused on the community-level impact; therefore, we only consider the net effect on the economy. This is a composite of the positive and negative effects felt by various individuals and groups within the community. This means that the effect could be far more pronounced for some than these net figures suggest. For example, the net effect for the agriculture, forestry and fishing industry is a composite of negative effects on dairy farming and positive effects on forestry (among others). Dairy farm workers who lose their jobs as a result of the reduction in dairying activity may struggle to gain employment in forestry contracting on similar terms.

Impact on rates

The MRB report includes a \$10m reduction in rates payable by farms due to a reduction in farm capital values, which has a flow on effect to farm profitability as it represents a net change in costs. While farm capital values are likely to decline if the forecast land use changes take place, ADC advises that the impact of this on the distribution of rates is yet to be determined, and expects that they will maintain a similar level of rating income and expenditure. As a result, the effect of the \$10m reduction in rates payable is not included in this EIA, and has been deducted from the farm earnings before interest and taxation (EBIT) estimated by MRB. This effectively assumes that farms continue to pay the same rates as they did under previous land uses.

Costs of Managed Aquifer Recharge

The MRB report models the use of Managed Aquifer Recharge (MAR) as a key element to achieving the nitrogen concentration requirements of NES-F. Given this, we have assumed that MAR takes place despite no clarity on how it will be funded. If these costs were borne by the farming community, then this would reduce farm EBIT and therefore direct GDP contribution by the same amount. On the advice of MRB, it is assumed that irrigation providers can provide water for MAR while reducing their costs overall, as there would be less work involved in farm-specific administration such as metering or dispatching water.

Economic benefit of environmental improvements not quantified

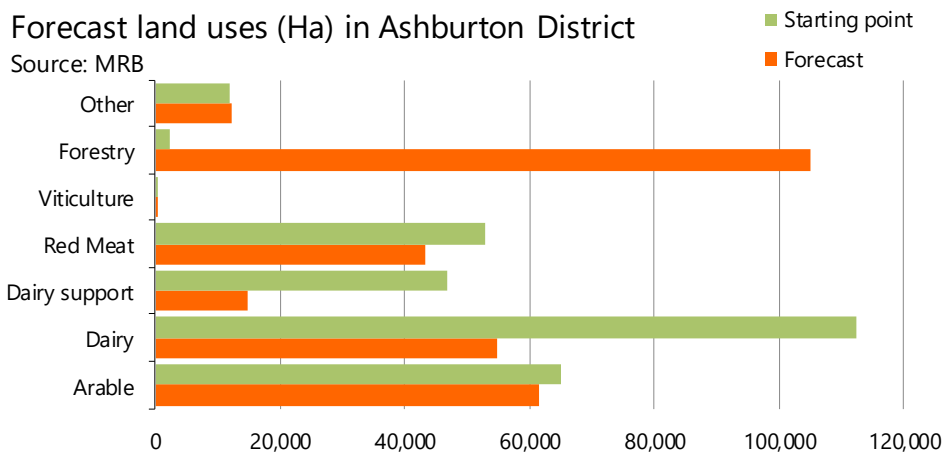
We have not made an allowance for any positive economic benefits which may result from improved water quality in Ashburton District. These may exist but would be challenging to quantify in economic terms.

Findings

Large scale changes in land use

The MRB report indicates large scale changes in land use, as dominant existing land uses in Ashburton such as arable and dairy either reduce their intensity or change to forestry. This has a multitude of impacts. Arable and red meat farm types are forecast to increase their expenditure, while dairy and dairy support substantially reduce expenditure. Forestry is forecast to grow substantially; however, it requires very little in the way of inputs and has a far lower level of profitability. Graph 1 shows the current and forecast land use from the MRB report, including a 56% decrease in the area of land used for dairy or dairy support, and an extremely large increase in forestry.

Graph 1



Decline in farm profit of \$277.3m

The MRB report forecasts a \$277.3m decrease in gross profit (EBIT), and a \$65.6m decrease in wages and salaries. We have reversed the reduction in local body rates payable from the MRB report, which decreases farm profit by \$10m.

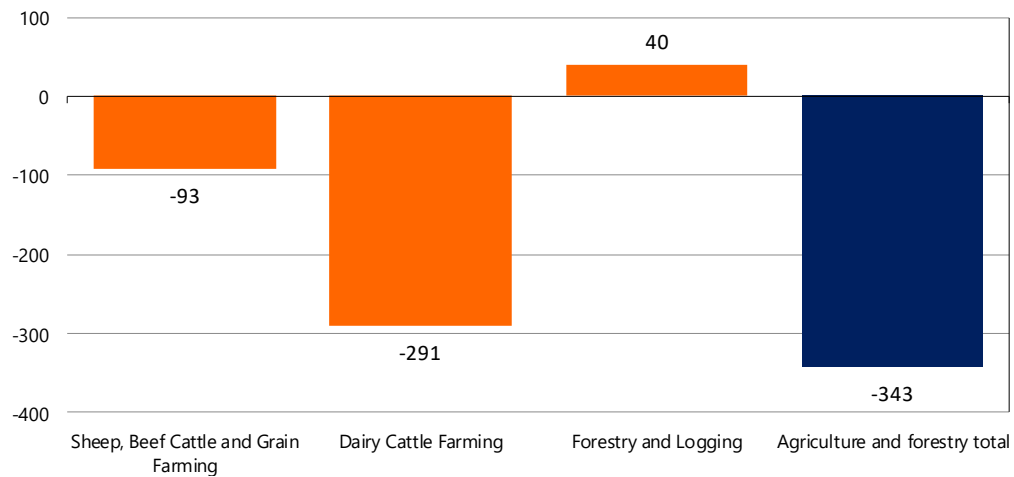
Direct effect is \$343m agriculture and forestry GDP decrease

The direct effect of the forecast land use changes is a \$343m (2020 dollars) decline in GDP across Ashburton's agriculture industries. This amounts to 51% reduction from 2020 levels. This is driven by a \$291m decline in dairy cattle farming GDP, followed by a \$93m decline in sheep, beef cattle and grain farming. This is only partially offset by GDP growth in forestry and logging of \$40m, shown in Graph 2.

Graph 2

Direct effect on GDP in Ashburton's agriculture and forestry industry

\$m, 2020



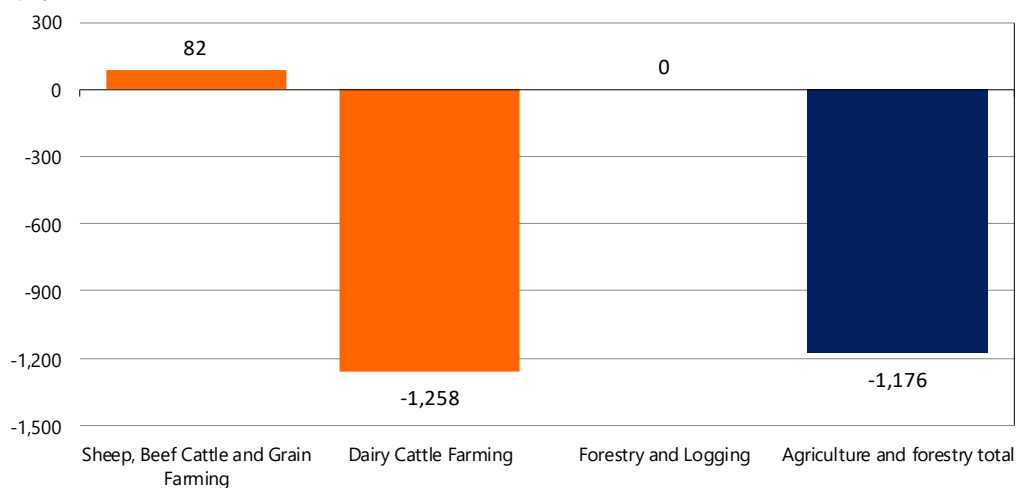
Direct employment effect is negative overall

The direct effect of the forecast land use changes on agriculture industry employment is a decrease of 1,176 jobs, a 26% decrease on 2020 levels. This is a result of an employment increase of 82 in sheep, beef cattle and grain farming, which barely offsets the 1,258 decline in dairy industry employment. No direct increase in forestry employment is expected as forestry management and operations are typically outsourced to other industries – this is an indirect effect.

Graph 3

Direct effect on employment in Ashburton's agriculture and forestry industry

\$m, 2020



Overall negative effect on GDP and employment

The total economic effect of the land use changes is estimated as a \$409m reduction in Ashburton's overall GDP, with negative indirect and induced benefits adding to the direct effect of a decline in agricultural GDP. This represents a 16.3% decrease to Ashburton's GDP level in 2020. Similarly, the negative effect on employment is more pronounced once indirect and induced effects are considered, with an estimated total decrease in employment of 1,735, or a 9.1% reduction on 2020 employment.

The indirect and induced effects are negative overall for both GDP and employment; however, this net effect does mask the positive indirect and induced effects in some industries resulting from land use changes. Notably, the agriculture, forestry and fishing support service sub-industry are estimated to gain a net 121 jobs, or an \$87m increase in GDP. This is largely driven by a greater need for contractors to service the expanded area of forestry.

Industry effects concentrated in agriculture

The direct effect of the forecast land use changes is felt by the agriculture industry, so logically total effects are concentrated in that industry too. Agriculture, forestry and fishing GDP is estimated to decline by \$297m or 44.1% compared to 2020 levels, and employment to decline by 1,475 or -32.6%. Table 1 details the effect on each industry, with industries beyond agriculture affected through changes in demand for their products and services by the agriculture industry and its workers.

Electricity, gas, water and waste services is hit by a reduction in demand for water for irrigation and electricity, leading to a 20.7% reduction in GDP and 7.8% reduction in employment. Rental, hiring and real estate services are affected by a reduction in overall incomes in the community, leading to a 13.0% reduction in GDP and 0.7% reduction in employment. Transport, postal and warehousing are largely affected through a reduction in demand for road transport services from the agriculture industry, leading to a 25.9% reduction in GDP and 15.0% reduction in employment. Other services, which includes vehicle and equipment maintenance, is affected through reduced demand for maintenance from the agriculture industry, leading to a 37.0% reduction in GDP and 11.4% reduction in employment.

Notably, all industries except one are estimated to experience a negative effect from the land use changes overall. The only exception is mining, which is expected to experience a fractional increase in GDP and employment as a result of quarried materials needed for maintenance of MAR.

Table 1

Total effect on GDP and employment

Includes direct, indirect and induced effects. % change from 2020

Industry	GDP (\$m)		Employment	
	Level	% change	Level	% change
Agriculture, Forestry and Fishing	-297.1	-44.1%	-1,475	-32.6%
Electricity, Gas, Water and Waste Services	-27.8	-20.7%	-18	-7.8%
Rental, Hiring and Real Estate Services	-19.1	-13.0%	-3	-0.7%
Transport, Postal and Warehousing	-13.2	-25.9%	-70	-15.0%
Other Services	-12.5	-37.0%	-72	-11.4%
Financial and Insurance Services	-6.8	-10.7%	-8	-2.4%
Retail Trade	-6.2	-5.5%	-22	-1.3%
Wholesale Trade	-5.8	-4.8%	-7	-0.7%
Professional, Scientific and Technical Services	-4.5	-5.1%	-5	-0.7%
Manufacturing	-4.0	-1.5%	-2	-0.1%
Administrative and Support Services	-1.9	-6.8%	-6	-1.0%
Accommodation and Food Services	-1.9	-5.3%	-15	-1.6%
Information Media and Telecommunications	-1.7	-5.8%	-3	-1.4%
Health Care and Social Assistance	-1.6	-1.9%	-6	-0.5%
Education and Training	-1.6	-2.7%	-13	-1.3%
Arts and Recreation Services	-1.5	-4.9%	-5	-1.2%
Construction	-1.3	-0.9%	-5	-0.3%
Public Administration and Safety	-0.5	-1.1%	-1	-0.3%
Mining	0.1	5.3%	0	1.2%
Total	-409	-16.3%	-1,735	-9.1%

Earnings estimated to fall 8.7%

Earnings across the Ashburton District are estimated to fall \$97.6m or 8.7% of the 2020 level as a result of the reduction in employment, assuming average earnings remain the same in each industry. This reduction is less than the decline in employment of 9.3% because average earnings in agriculture, forestry and fishing are lower than the average earnings across all industries.

Changes unwind previous growth

Ashburton's economy has experienced sustained growth over the past two decades, with employment 35% higher in 2020 than 2000, and real GDP 63% higher over the same period. The forecast land uses changes effectively drive overall employment and GDP down to levels last seen in 2013. Within Ashburton's agriculture, forestry and fishing industry specifically, the decrease in employment represents a return to pre-2000 levels of employment and GDP.

Change in agriculture and forestry employment amounts to 8 years of worker net replacement

Infometrics forecasts the number of net number of workers required in each industry to replace workers that leave due to retirement, emigration etc. Within Ashburton's agriculture, forestry and fishing industry, Infometrics forecasts average of 187 replacement job openings per year over the next five years. This indicates that if the forecast land use changes were implemented over a period of at least 8 years, then the decrease in agriculture, forestry and fishing industry employment could be accommodated within usual rates of workers leaving the industry.

Ashburton's economy will adapt

The land use changes estimated by MRB represent a substantial shift to Ashburton's economy, however the effect on the community is highly sensitive to the length of time over which the land use changes take place. A transition over an extended period of time will give Ashburton's residents and businesses – their economy – a chance to adapt. The loss of jobs and reduction in farm values does present an opportunity for different industries to expand using these resources. As a result, we would not expect the district wide effects of a 16.3% reduction in GDP and 9.1% reduction in employment to persist over the long term. However, these effects may persist for several years if land use change occurs more quickly than the economy can adapt.

One-off boost from MAR construction

The MRB report estimates that construction of Managed Aquifer Recharge (MAR) will cost \$23.5m over an unspecified period, which will create a one-off boost to the Ashburton economy.

We have assumed that a third of the construction cost of MAR will go towards the professional services industry and, two thirds to heavy and civil construction. Based on these assumptions, we expect the construction of MAR to contribute \$23m to the Ashburton economy and create the full time equivalent of 40 jobs. This includes indirect and induced effects. The economic effect of MAR construction by industry is not specified, as it is highly sensitive to the estimate of MAR costs, method of construction and industry apportionment.

The positive economic effect of MAR construction has not been included in the overall economic analysis, which reflects the annual, enduring effects of land use change, although it should be considered in developing a view on the overall impact of land use change.

Appendix

Multiplier analysis

We use input-output (I-O) multiplier analysis to estimate the impact land use changes. The IO model is based on inter-industry relationships within an economy, understanding how economic activity in one industry flows through to other industries and ultimately households.

For earnings and employment, we also apply marginal output-employment ratios based on econometrically estimated employment-output elasticities because when faced with changes in demand at the margin, many businesses will continue to operate with the same level of employment.

Our IO model uses regional multipliers estimated by Infometrics for each territorial authority in New Zealand. These are derived from the 2013 New Zealand Input-Output from Stats NZ. The 2013 Input-Output Table is the latest table available.

The IO model estimates the direct, indirect and induced effects of the project.

Direct effect. This is the effect associated with increased spending directly in each industry associated with the project. For example, if a dairy farm reduces its herd size and its profit (EBIT) reduces by \$10,000, then GDP (or value add) in the dairy farming industry will decrease by \$10,000.

Indirect effect. The indirect effects are the second round of economic effects associated with the direct effect. For example, a dairy farm which reduces its herd size may require less maintenance of its dairy shed. This in turn will lead to a reduction in demand for services from the repair and maintenance (other services) industry – this is an indirect effect.

Induced effect. The induced effect arises from changes in spending from changes in employment. For example, if a dairy farm worker works less hours due to their employer having a smaller herd, then will lead to a reduction in their spending, for example at local retailers or bars. The change in activity in retail and hospitality industries would be an induced effect.

Total effect. The total effect is the sum of direct, indirect and induced effects. Due to the small magnitude of induced effects, and for ease of reading, we only refer to the direct and total effect.

The various effects outlined above are measured in terms of value added (or GDP) and employment.

Earnings

Changes in the earnings are estimated based on the estimated change in employment by industry (described above), and mean earnings by industry across the Canterbury region in the 2020 calendar year.