Manuherikia Catchment Economics

Discussion Document

March 2021

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UNLOCKING ENTERPRISE VALUE

Background and Purpose

Overview

Lewis Tucker was engaged in 2020 to develop a consolidated cash flow model with a user-friendly 'dashboard' that provides flexibility to assess a range of scenarios by Farm Type (Dairy, Dairy Support, and Sheep + Beef), Flow Scenario (six scenarios initially selected by the Reference Group) and Reliability Zone (three separate zones throughout the Manuherikia Valley). The purpose of the following paper is to provide an overview of the impact to on-farm economics within the Manuherikia Catchment (the Catchment) in response to changes in the six potential minimum flow and water allocation regimes. Lewis Tucker's analysis builds on the on-farm economics models developed by AbacusBio, which is based on the technical hydrology work undertaken by Davis Ogilvie and pasture growth forecasts generated by PZB Consulting.

Whilst the analysis in this report is a 'single-year' EBIT output, the model has been built to enable the progressive staging of flow restrictions over time, and to assess the impacts of other key assumptions such as on-farm productivity, inflation, water pricing and capital expenditure by farm type.

This report also refers to several limitations of the analysis in the absence of reliable reference data at the time of writing. In Lewis Tucker's view the most significant limitation is the exclusion of earnings from horticultural land, which although it only constitutes less than 624 Ha (or 4% of the 18,284 Ha of irrigated land within the Catchment), is likely to have a material contribution to Catchment earnings due to typically per-Ha profitability.

Key Insights

As illustrated below each of the proposed Flow Scenarios is expected to have a negative impact on earnings of the Catchment. As the minimum flow increases, the impact on returns is more significant. As described in the report, the extent to which on-farm economics are impacted by different Flow Scenarios is highly dependent on the season during which the farm economics are modelled – with a dry season being significantly more sensitive to minimum flow restrictions when compared with the mean. Similarly, each Farm Type has different sensitivity to seasonal and Flow Scenario impacts. A subsequent Flow Scenario of 1,200 l/s was assessed by the Davis Ogilvie, PJB Consulting and AbacusBio in March however this is not included in Lewis Tucker's analysis due to the limited incremental impact when compared with the Status Quo.

Total Catchment EBIT ($000's)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Mean	*$000's*	9,187	8,847	8,281	7,574	6,676	5,869
Wet	*$000's*	11,705	11,698	11,610	11,451	11,110	10,536
Dry	*$000's*	4,303	3,825	3,055	1,763	(335)	(2,228)
% Diff from Mean 'Status Quo' EBIT							
Mean	*% Change*	-	(4%)	(10%)	(18%)	(27%)	(36%)
Wet	*% Change*	27%	27%	26%	25%	21%	15%
Dry	*% Change*	(53%)	(58%)	(67%)	(81%)	(104%)	(124%)

Whilst Catchment EBIT remains positive under most seasonal conditions and flow scenarios (except for Sheep and Beef beyond minimum flows of 2,000 l/s), an equally, if not more important consideration is the return on assets – a measure commonly used by landowners and banks to determine attractiveness of investment decisions and financial sustainability. It is important to note that none of the scenarios in this paper assume any annual operating charges relating to water, nor any capital expenditure relating to developing on-farm storage or upgrades to on-farm irrigation infrastructure – both of which would adversely impact profitability and return on assets.

Modelling Methodology Overview

Extrapolating Single-Farm Economics across the Catchment

As outlined in AbacusBio's report, three different farm systems; sheep and beef; dairy support; and dairy, have been modelled based on *actual* farming properties within the three distinct areas (Reliability Zones) of the Manuherikia Catchment. These farms have been chosen by AbacusBio as reflecting the 'average operator' for each farming system within the Reliability Zones. Whilst there are numerous other farming models in the Catchment, together these three land-uses constitute ~95% of all irrigated area, and in the view of the Project Team therefore provide a reasonably reliable sample set.

The irrigated area within the Manuherikia is ~27,000 Eff. Ha of which 18,284 Eff. Ha in the Manuherikia valley will be significantly affected by higher minimum flows. The three Reliability Zones have been identified by Davis Ogilvie (hydrologists) as having different severity of irrigation take restrictions based on each Flow Scenario.

Report Exclusions

- Non-affected irrigation users - The landowners/farmers located on tributaries and areas of the Catchment whose access to, and reliability of, water will not be impacted by flow restrictions has been excluded from this analysis. This represents ~8,800 Ha in total.
- Horticulture– Given the broad range of land-uses that constitute Horticulture (i.e. various pipfruit and stonefruit), the variability in per-hectare returns between crop types, and the relative importance of irrigation reliability to returns – this makes a Catchment-average approach highly unreliable. For this reason, 624 Ha of Horticultural land has been excluded from this analysis.

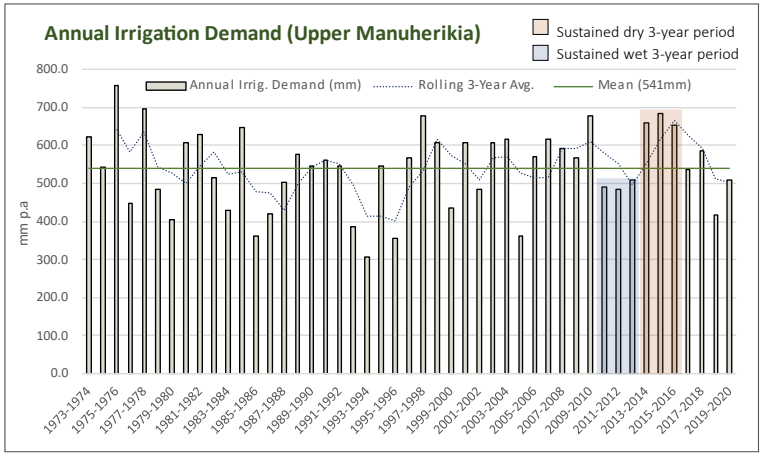
Seasons Representing 'Wet' and 'Dry' Scenarios

The adjacent chart illustrates the annual irrigation demand for the Upper Manuherikia between 1973 and 2020. The blue and red shaded areas represent two of the wettest (low irrigation demand) and driest (high irrigation demand) sustained 3-year periods on record, respectively.

These two periods form the basis for Lewis Tucker's analysis on the economic impact of each flow scenario during a 'wet' and 'dry' year. The model takes the average of the three years' financial performance and extrapolates that across the catchment.

Farm Type by Reliability Zone (Eff. Ha)	Dairy	Dairy support	Sheep and Beef	*Hort.*	Total
Upper Manuherikia	2,062	1,376	3,340	-	**6,778**
Tributaries *(Dunstan, Lauder, Thomsons and Chatto)*	452	951	5,672	-	**7,075**
Lower Manuherikia	-	886	2,922	*624*	**4,431**
Total	**2,514**	**3,213**	**11,934**	***624***	**18,284**

Flow Scenarios	l/s
Status Quo - *Assumes no minimum flow at Campground, only 500L/s at Falls Dam and 820 L/s at Ophir as currently stipulated*	~500-820
900 l/s - *current operational goal of the current water managers*	900
1,500 l/s – *future water management scenario*	1,500
2,000 l/s – *future water management scenario*	2,000
2,500 l/s – *future water management scenario*	2,500
3,000 l/s – *future water management scenario*	3,000



Catchment Economic Impacts – 'Average Season'

Economic Overview – Average Season

Fig. 3 illustrates the catchment-wide Earnings Before Interest and Tax (EBIT) by farm type (dairy, dairy support, and sheep + beef) based on an ***average*** rainfall season. As shown in Fig. 4. this applies to the 17,661 Eff. Ha of Irrigated land.

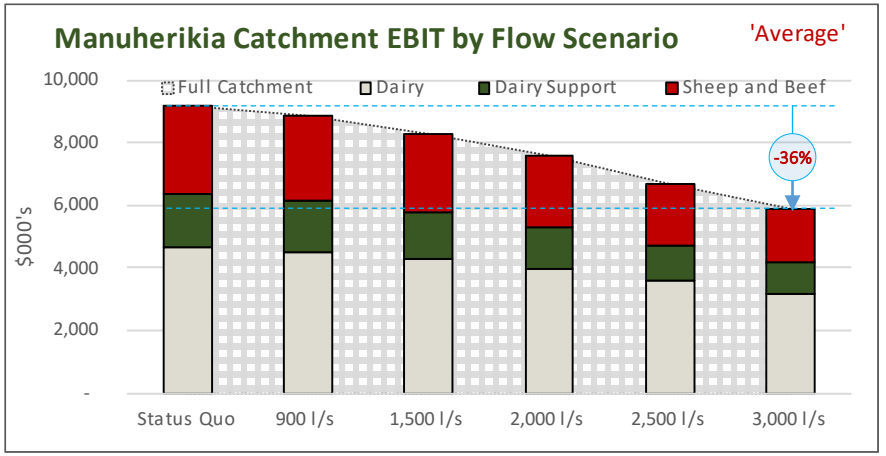
Under the status quo, the consolidated catchment EBIT across these three land-uses is estimated to be **$9.2m** (or $520 per Eff. Ha). As increasingly strict flow scenarios are imposed, therefore impacting the severity of irrigation restrictions, this causes a reduction in catchment EBIT, by up to **$3.3m** in an average year (a 36% reduction) to **$5.8m** under the 3,000 l/s scenario.

Individual Farm Systems

As shown in Fig. 4. the flow restrictions have a different impact on profitability by farm type. In an average year returns from Sheep and Beef are most sensitive to high flow scenarios, with the average EBIT dropping from $238 per Ha to $141 per Ha (or 41%).

Return on Assets

Whilst farmers have traditionally accepted a lower return on assets relative to many other asset classes, (often due to the opportunity to benefit from non-taxable capital gain of land values, and prospects of on-farm productivity gains), there is a threshold at which landowners have to consider the sustainability of their farming business. The decision to maintain operations at such low return levels will generally be dictated by the level of indebtedness (or pressure exerted by banks)



Average Season

Total EBIT by Farm Type		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	$000's	4,666	4,497	4,283	3,960	3,578	3,161
Dairy Support	$000's	1,686	1,641	1,492	1,317	1,113	1,026
Sheep and Beef	$000's	2,835	2,710	2,506	2,298	1,985	1,682
Full Catchment	$000's	**9,187**	**8,847**	**8,281**	**7,574**	**6,676**	**5,869**
Catchment EBIT Gain/(Loss) from Status Quo	$000's	-	(339)	(906)	(1,613)	(2,510)	(3,318)
% EBIT Reduction from Status Quo	% Change	-	(4%)	(10%)	(18%)	(27%)	(36%)

EBIT per Ha by Farm Type		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	$/Eff. Ha	1,856	1,789	1,704	1,575	1,423	1,257
Dairy Support	$/Eff. Ha	525	511	464	410	347	319
Sheep and Beef	$/Eff. Ha	238	227	210	193	166	141
% Change from 'Status Quo' by Farm Type							
Dairy	%	-	(4%)	(8%)	(15%)	(23%)	(32%)
Dairy Support	%	-	(3%)	(12%)	(22%)	(34%)	(39%)
Sheep and Beef	%	-	(4%)	(12%)	(19%)	(30%)	(41%)

Return on Assets (EBIT/Total Assets)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	% ROA	4.4%	4.2%	4.0%	3.7%	3.4%	3.0%
Dairy Support	% ROA	2.7%	2.6%	2.3%	2.1%	1.8%	1.6%
Sheep and Beef	% ROA	2.3%	2.2%	2.1%	1.9%	1.6%	1.4%

Catchment Economic Impacts – 'Dry Season'

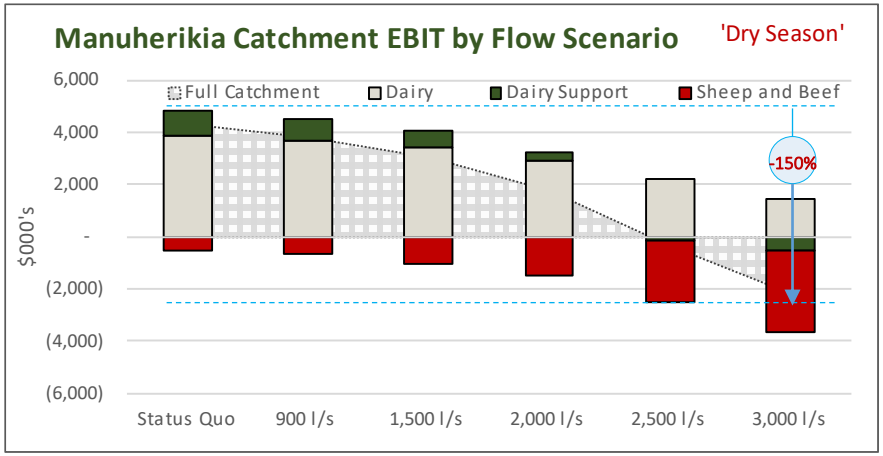
Economic Overview – Dry Season

The 'Dry Season' EBIT scenarios are based on the on-farm models which use the average pasture growth data from historically dry period in the Manuherikia Valley between 2014-2017. As outlined on page 3 these three years represented the driest sustained period on record.

Under the status quo in a dry season, the consolidated catchment EBIT across these three land-uses is estimated to be **$4.3m** (or $244 per Eff. Ha). As increasingly strict flow scenarios are imposed, therefore impacting the severity of irrigation restrictions, this causes a reduction in catchment EBIT, by up to $6.5m in a dry year (a 150% reduction) to -$2.2m under the 3,000 l/s scenario.

As alluded to in AbacusBio's report, although a single year of losses can often be withstood, consecutive years of poor financial performance could put many of the operators under intense financial pressure, and can force foreclosures or fundamental changes to farming systems.

Each of the farming systems are forecast experience steep reductions in profitability as minimum flow restrictions increase during a dry year. Sheep and beef assumes a loss under every scenario, whilst dairy support delivers a negative EBIT beyond 2,000 l/s. Although dairy is still forecast to deliver a positive EBIT under each Flow Scenario, the traditionally higher debt levels of dairy means that Net Profit is likely to be negative in the more severe cases.



Dry Season

Total EBIT ($000's)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	$000's	3,841	3,649	3,454	2,928	2,210	1,445
Dairy Support	$000's	968	870	628	307	(172)	(526)
Sheep and Beef	$000's	(506)	(694)	(1,027)	(1,472)	(2,373)	(3,146)
Full Catchment	$000's	**4,303**	**3,825**	**3,055**	**1,763**	**(335)**	**(2,228)**
Catchment EBIT Gain/(Loss) from Status Quo	$000's	-	(478)	(1,248)	(2,540)	(4,638)	(6,531)
% EBIT Reduction from Status Quo	% Change	-	(11%)	(29%)	(59%)	(108%)	(152%)

EBIT per Ha ($)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	$/Ha	1,528	1,452	1,374	1,165	879	575
Dairy Support	$/Ha	301	271	195	96	(54)	(164)
Sheep and Beef	$/Ha	(42)	(58)	(86)	(123)	(199)	(264)

% Change from 'Status Quo' by Farm Type							
Dairy	%	-	(5%)	(10%)	(24%)	(42%)	(62%)
Dairy Support	%	-	(10%)	(35%)	(68%)	(118%)	(154%)
Sheep and Beef	%	-	(137%)	(203%)	(291%)	(469%)	(622%)

Return on Assets (EBIT/Total Assets)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	% ROA	3.6%	3.4%	3.3%	2.8%	2.1%	1.4%
Dairy Support	% ROA	1.5%	1.4%	1.0%	0.5%	(0.3%)	(0.8%)
Sheep and Beef	% ROA	(0.4%)	(0.6%)	(0.8%)	(1.2%)	(2.0%)	(2.6%)

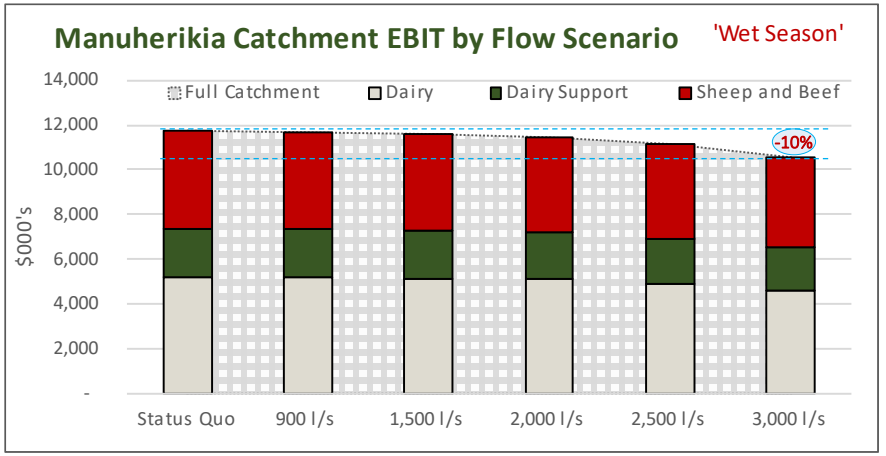
Catchment Economic Impacts – 'Wet Season'

Economic Overview – Wet Season

The 'Wet Season' EBIT scenarios are based on the on-farm models which use the average pasture growth data from historically wet period in the Manuherikia Valley between 2011-2013. As outlined on page 3 these three years represented one of the wettest sustained periods on record.

Under the status quo in a wet season, the consolidated catchment EBIT across these three land-uses is estimated to be **$11.7m** (or $663 per Eff. Ha).

Given the lower reliance on irrigation to drive pasture production during a wet year, Catchment EBIT is far less sensitive to Flow Scenarios, with restrictions reducing total EBIT by up to **$1.2m** in a wet year (a ~10% reduction) to $10.5m under the 3,000 l/s scenario.



Wet Scenario

Total EBIT ($000's)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	$000's	5,190	5,183	5,128	5,088	4,903	4,551
Dairy Support	$000's	2,170	2,170	2,156	2,084	2,028	1,951
Sheep and Beef	$000's	4,345	4,345	4,326	4,279	4,179	4,033
Full Catchment	$000's	**11,705**	**11,698**	**11,610**	**11,451**	**11,110**	**10,536**
Catchment EBIT Gain/(Loss) from Status Quo	$000's	-	(7)	(96)	(254)	(595)	(1,170)
% EBIT Reduction from Status Quo	% Change	-	(0%)	(1%)	(2%)	(5%)	(10%)

EBIT per Ha ($)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	$/Ha	2,064	2,062	2,040	2,024	1,950	1,810
Dairy Support	$/Ha	675	675	671	649	631	607
Sheep and Beef	$/Ha	364	364	363	359	350	338

% Change from 'Status Quo' by Farm Type							
Dairy	%	-	(0%)	(1%)	(2%)	(6%)	(12%)
Dairy Support	%	-	-	(1%)	(4%)	(7%)	(10%)
Sheep and Beef	%	-	(0%)	(0%)	(2%)	(4%)	(7%)

Return on Assets (EBIT/Total Assets)		Status Quo	900 l/s	1,500 l/s	2,000 l/s	2,500 l/s	3,000 l/s
Dairy	% ROA	4.9%	4.9%	4.8%	4.8%	4.6%	4.3%
Dairy Support	% ROA	3.4%	3.4%	3.4%	3.3%	3.2%	3.1%
Sheep and Beef	% ROA	3.6%	3.6%	3.5%	3.5%	3.4%	3.3%

Limitations and Other Considerations

Limitations of Analysis

- Returns from horticultural land uses have been excluded due to the wide range of land uses and lack of reliable data for each enterprise
- The catchment returns are based on several case study farms. Many properties in the catchment are likely to have different operating systems, or different proportions of irrigated/dryland, each of which has an impact on management and investment decisions.
- Ultimately on-farm decision making is linked to a range of factors including current and forecast commodity prices, emerging land-use opportunities, feed and input costs, management expertise, and degree of capital flexibility (debt to equity). This mix of variables is highly complex and difficult to accurately model
- A landowner's ability to sustain low cashflow (such as that in dry periods with higher low-flow restrictions) is highly dependant on the quality of management, strategic focus, and in particular the level of indebtedness of individual farmers. In many cases a sustained dry period could force landowners to sell their property
- The model makes no assumption for the cost of water (operating charge) – i.e. pumping costs, water offtake, stored water charges

Investment Decision Making in Regulated Environment – Questions for further investigation

- What is the likely impact on capital values of land in response to changing minimum flow and water allocation regimes
- Consider the use of a landowner decision matrix – summarising likely behaviours under different water availability scenarios
- The decision matrix should include change in land-use in response to new opportunities arising
- Consider environmental and regulatory constraints (NES-FW) in conjunction with irrigation water availability
- Consider likely investment (capital expenditure and ongoing maintenance capital) for efficient-spray technologies with removal of flood irrigation
- Ability to build on-farm storage to mitigate reliability (would this remove productive land? is it viable from a consenting perspective?)