Ruataniwha Demand Forecast Update

29 November 2013

1 Introduction

Castalia produced a demand forecast for water uptake in the Ruataniwha command area in September 2012. The forecast at that time identified a range of expected outcomes under different conditions based on the best information available. It did not include a model that allowed variables to be manipulated to see the impact that each variable is expected to have on the outcome.

The model that this note accompanies enables variables to be manipulated to allow Crown Irrigation and other parties to test a wide range of sensitivities.

2 Information Sources

The model draws on a range of sources, some of which were included in the original demand forecast and some that have since become available. The major sources are described below:

- **Survey:** Castalia undertook a survey in August 2012 to gauge farmer sentiment towards irrigation uptake and land sale rates (among other factors) in the command area. These form a part of the farmer sentiment inputs in the model.
- **EOI:** Hawkes Bay Regional Investment Company (HBRIC) sought Expressions of Interest (EOIs) from farmers for irrigation water in October 2013. These form a part of the farmer sentiment inputs in the model.
- **BNZ financial model:** This financial model identifies a range of conversions that are profitable under different conditions. This model is used in the demand forecast model to determine the possible, and profitable, conversions in each scenario.
- **MacFarlane report:** MacFarlane Rural Business produced a report in September 2012 titled *"Ruataniwha Water Storage Project: Review of Farm profitability"*. This report is fundamental to the financial model prepared by the BNZ and is also used to identify starting land uses, water demand profiles and other regional data inputs.

3 Demand Model

The final forecast is made up of the sum of incumbent irrigation investment and new investor irrigation investment in each year converted into water demand at the rate identified by MacFarlane. This section explains how these irrigation investments are determined. It defines what inputs are used, how they are used, and what inputs can be varied to affect the final forecast.

The two sources of farmer sentiment are the EOI and the survey

Farmer sentiment has two alternative sources in the model.

- The survey is one source of sentiment for the first six years. This survey was conducted anonymously and had a response rate of around 50%. Therefore when this is used as the measure of sentiment an assumption is made for non-respondents. Scalars are available to identify the degree to which the survey is believed, and the extent to which it applies to non-respondents.
- The EOI returns are the most recent source of information regarding farmer sentiment. Expressions of interest reflect a stated intention to purchase an amount of water, however it does not state when. It is assumed that this would be immediate demand. The investment assumption is that a three year lead time is sufficient to enable the investment to occur prior to construction close. As with the survey of sentiment conducted in 2012, beyond six years is assumed beyond the planning horizon. When the EOI is used as the source of incumbent sentiment, limited extrapolation is made for non-respondents (20% in the baseline) and a higher degree of certainty is applied to respondents (90% in the baseline). These factors can all be adjusted to test sensitivity.

Irrigation demand stems from stated intentions

Irrigation demand is considered separately for incumbents and new investors (or new managers when land is handed over):

- **Incumbent irrigation demand** is determined by <u>either</u> the EOI or the survey. It is possible to overwrite either with a new source of information if one subsequently becomes available. The expectation is that, as the project becomes more imminent, more recent information will supersede these initial stated intentions. The model converts the stated intention into an expectation of demand.
- **New owner irrigation demand** is applied to land that is sold, leased and handed over to new management. The amount of land sold is determined by the survey (or a choice of base rate). The EOI does not give information about land sold, leased or handed over. Therefore some combination of survey intentions and base rates must be chosen.

The model allows the user to overwrite the surveyed land sale rate. The model also allows for scaling of the survey results.

When land is turned over, the destination land use and the irrigation investment, is determined by the financial model conversion returns in each period. This is in turn determined by the variables set under each scenario.

The financial transformation combines sentiment and profitability incentives

The financial transformation converts the stated intention into an expectation of demand. The model takes the amount of land to be irrigated in each period and

determines the land use change based on financial scenarios. Only profitable conversions are allowed. In reality this may not be strictly true because mistakes can be made but it is a reasonable approximation.

There are five financial scenarios available. In each scenario a setting for the following variables must be chosen:

- Milk solids pay-out
- Starting gearing level
- Interest rate
- Water price
- Wool price

These financial scenarios determine the profitability of each land use change. Three probability decisions can then be applied to the profitability outputs to determine what land use change occurs. These are:

- Land is converted proportionate to the proportional returns of conversion
- Land is converted to the highest return option only
- Land is only converted to irrigate the current use, and only if a positive return is present

The financial scenarios can apply separately to five time periods:

- Very short run (the first year)
- Short run (years 2 and 3)
- Medium term (years 4,5,6)
- Long term (years 7-12)
- Very long term (years 13-35)

The application of different financial scenarios to different periods enables the modelling of farmer's expectations over the 35 year period. The variable financial inputs are therefore not what will happen or what has happened, they are a representation of what the farmer thinks will happen. Future investment will be based on estimations of future forecasts. Our model allows the application of different forecasts for the very short run to very long run.

The possibility of nitrogen controls being added to the area is reflected in a choice of scalar applied to the productivity returns that dairying achieves in the financial models. Consideration was given to a limit on the area that can be converted to dairy but, following MacFarlane, it was considered that a better way to reflect the possibility is to limit the productivity to reflect nitrogen runoff reducing practices that may be required.

Outputs

The outputs are expressed in terms of:

- Years to full allocation (which is assumed to be the year after irrigated land uses are consuming 104 million cubic metres of water per annum.
- The share that each land use is consuming of the total water demand.
- The proportion of irrigated land types by Hectare at full allocation

- The total water demand in each year

4 Conclusions

The model is sensitive to all inputs but in particular the following are material:

- Farmer sentiment
- The milk solids pay-out
- The rate at which land is turned over
- The cost of water

The baseline scenario uses the following settings:

Table 4.1: Baseline Settings

Input Settings	
Farmer sentiment source	EOI (This is the most recent information source)
Conversion of survey sale rates to revealed sales rates	200% (Assume half the sales are unintentional and nobody says they will sell if they don't intend to)
	100%
EOI conversion to sales	90%
EOI non respondent sales rate	20%
LR Incumbent irrigation demand (after six years and as a percentage of EOI demand expression)	100%
Land sale rate non respondent and out years	4.5%
Financial scenarios	S3,S3,S2,S2,S2
Nitrogen productivity limitations	100% (No limitations are assumed for nitrogen runoff)
Outputs	
Years to full allocation	11
Water demand by land use at full allocation	
Sheep and Beef	14.05%
Mixed Livestock	0.00%
Finishing	0.00%
Mixed Arable and Dairy Support	0.00%
Arable	44.37%
Dairy Heavy	5.64%
Dairy Light	34.36%
Orchard	1.59%

Vineyard	0.00%

One limitation of the approach taken in the model is that changes in dry land use are not captured. The focus is on the profitability and likelihood of conversion to irrigated uses only. A significant amount of change could occur from one dry land to another type of dry land use without the model identifying this. MacFarlane is a better source of the likely uses that dry land might be put to – including the level of mixed arable and dairy support categories and the finishing category.

The baseline financial scenario input settings are described below. Fonterra is currently forecasting a payout of $8.32 for 2013/14 (plus 0.32c per share). The baseline settings assume a pullback from this outlook in the medium term. The model allows changing the scenarios as well as changing the time period that each scenario applies to.

Table 4.2: Baseline Financial Scenario Settings

Scenario	1	2	3	4	5
Milk solid payout ($/kg MS)	$6.50	$7.00	$7.50	$8.00	$8.75
Start Gearing (%)	15%	15%	15%	15%	15%
Interest rate (%)	7%	7%	7%	7%	7%
Water price ($/m3)	$0.25	$0.25	$0.25	$0.25	$0.25
Wool price ($/kg)	$3	$3	$3	$3	$3