

Interim Economic Assessment of the Healthy Catchments Project proposed “Solutions Package”



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Purpose

Assess the effect of changes in farm incomes across the different sectors, following:

- Changes to the Opihi River flow and allocation regime, and the establishment of new minimum flows
 - ZIPA Initial Minimum Flow Recommendations (Step 1 & Step 2 in page 53 and 55)
 - Cultural flow preferences (COMAR)
 - “Flow and Allocation Party” flow preference
 - Ecological minimum flow requirements, NIWA

This presentation shows the interim results for Step 1 and Step 2. COMAR flow regime is still being reviewed, and the Flow and Allocation Party flow preference and NIWA flow requirements are yet to be determined.

Assumptions

- Surface water supply availability under different regimes provided by ECAN (1998 – 2015), post Opuha dam.
- There was one significant drought year (2014-15) during this period, with the remaining years being relatively mediocre.
- ZIPA Initial Minimum Flow Recommendations are Step 1 (5-years) and Step 2 (10-years)
- ZIPA recommendations incorporate 150 day stream depletion calculation
- No drought mitigations (e.g. increase in supplements purchased) are factored into this analysis
- Apparent anomalies in some flow data allocation blocks (Temuka A block moving to Temuka B in some instances)

Methodology

The impact of proposed flow regimes on Cash Operating Surplus for different land uses

Calculate the impact of existing and proposed flow regimes



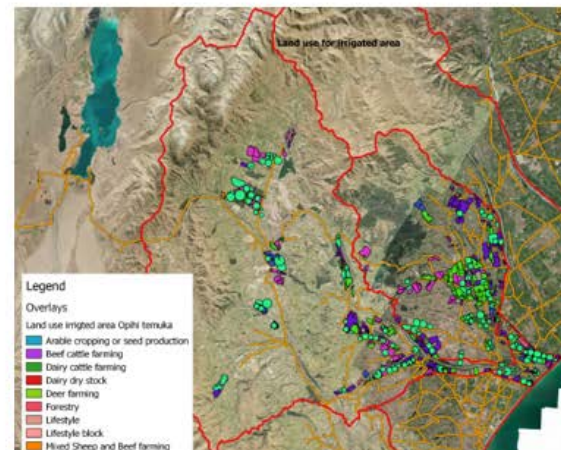
Conversion into
agronomic effects



Financial Impact
on irrigated Farm
Financial Models



Financial
impact on
total area



Flow-on
effects

Calculate the impact of supply reliability of irrigation Aqualinc

- Daily modelled irrigation demands:
 - For a range of crop / soil / climate combinations,
 - Based on demand modelling done for the OTOP groundwater modelling project.
- Supply reliability calculated on a daily basis (accounting for both supply and demand)
- Reliability summarised for each combination of scenario / allocation block / soil / crop

Calculate the impact of supply reliability of irrigation

Aqualinc

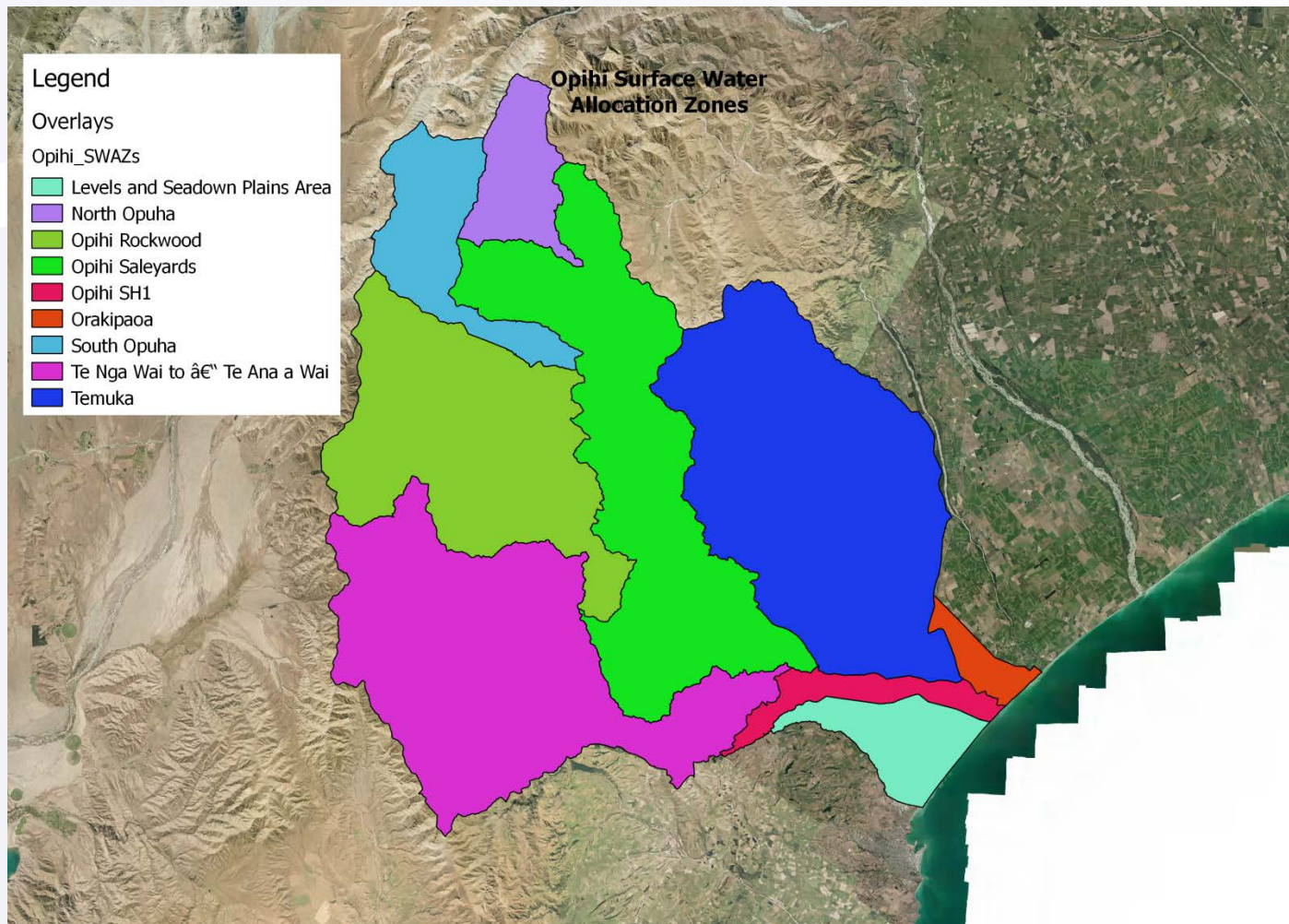


Irrigation consents are classed into four categories:

- Non-Affiliated A Permits (AN)
- Non-Affiliated B Permits (BN)
- Affiliated A Permits (AA)
- Affiliated B Permits (BA)

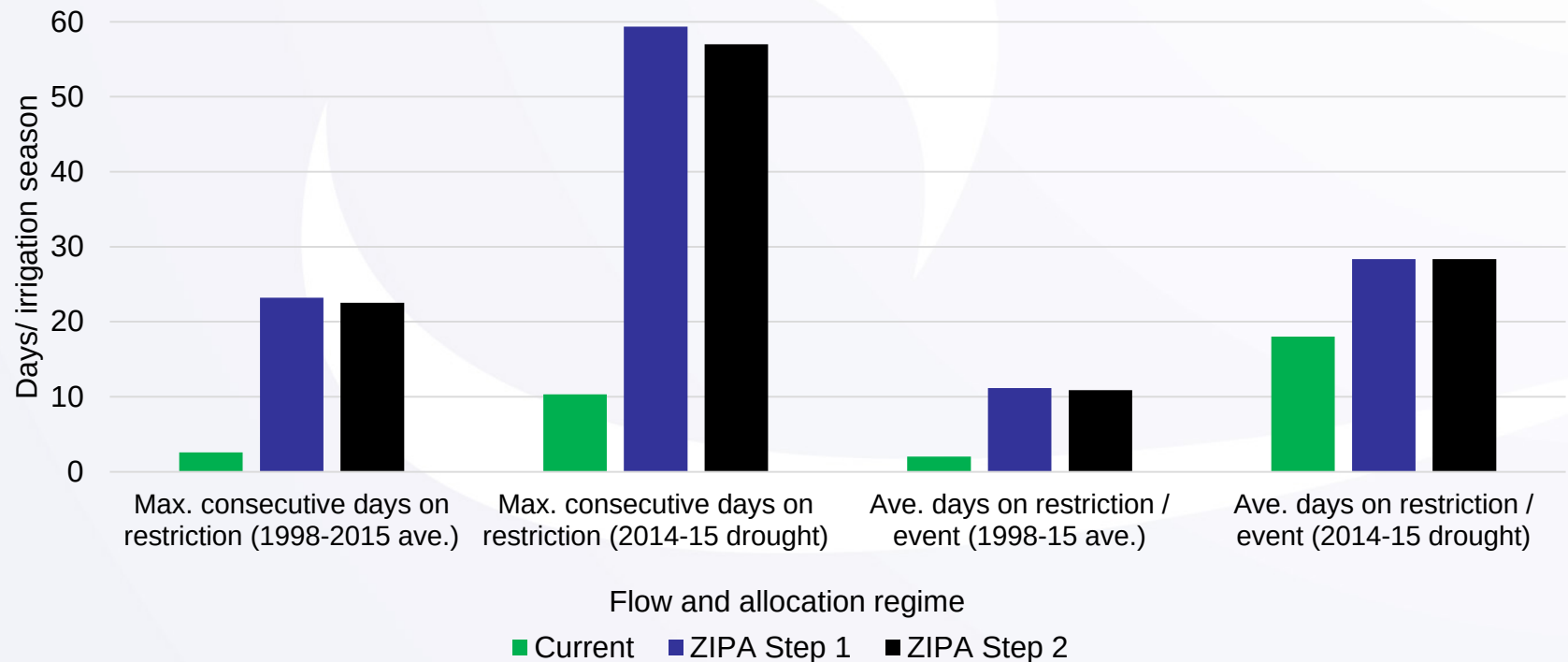
Surface Water Allocation Zone	Allocation blocks
Opihi SH1	AN
	BN
Opihi Saleyards	AA+BA
North Opuha	AA +BA
	AN
South Opuha	AA +BA
	AN
	BN
Opihi Rockwood	AA +BA
	AN
	BN
Te Ana Wai	AA +BA
	AN
	BN
Temuka	A
	B

Calculate the impact of supply reliability of irrigation Aqualinc



Calculate the impact of supply reliability of irrigation - Aqualinc

Comparison of the impact of the current situation and ZIPA Step 1 and Step 2 on irrigation reliability in Temuka (A Block), 1998-2015 average and 2014-15 drought



Calculate the impact of supply reliability of irrigation Aqualinc



Conclusion

- The proposed flow regimes for Steps 1 & 2 are relatively small in most cases; this is reflected in relatively small changes to the supply reliability.

Conversion of agronomic impacts

Four elements of Supply Reliability:

- Severity – full or partial days restrictions.
- Frequency – how often it occurs.
- Duration – period of consecutive days.
- Timing – when in the season it occurs.



Conversion of agronomic impacts

Conversion of Plant Available Water (PAW):

- PAW is 80 MM.
- The soil is full at the commencement.
- Evapotranspiration is 4.0 mm / day.
- After 20 days without irrigation, plant growth stops completely.
- Loss of production assumed to start after 6 days
- Recovery is not necessarily instantaneous.

Conversion of agronomic impacts

Formula for the calculation is:

Pasture production (kgDM/ha) = D x GR x F

Where: D = average days lost

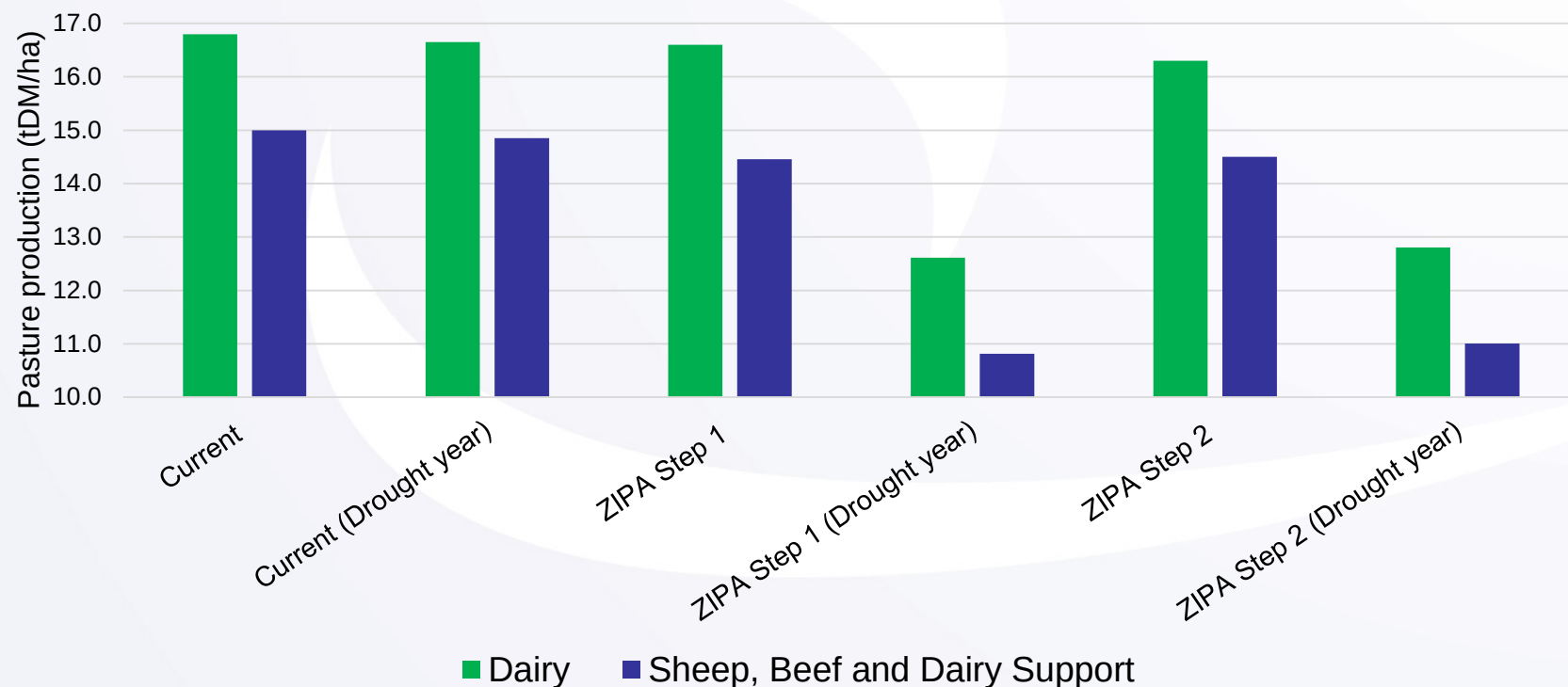
GR = average daily growth rate

F = loss modification factor



Conversion of agronomic impacts

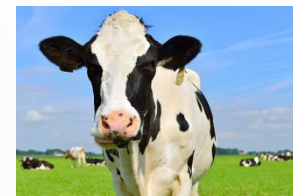
The impact of the current situation and ZIPA Step 1 and Step 2 on pasture production in Temuka (A Block), 1998-2015 average and 2014-15 drought



Impact on farm financial models

Representative models used:

- Dairy Production System 3
- Dairy Production System 4
- Arable
- Sheep, Beef and Dairy Support



Use of SOPI data to create averages for product returns

Impact on farm financial models

Dairy Model

Key assumptions

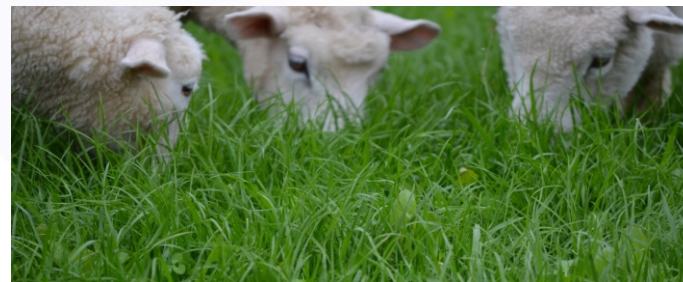
- 230 ha effective
- System 3: 10% of cows diet imported supplements
- System 4: 25% of cows diet is imported supplements
- Cow numbers and total MS production are driven off kgDM/ha.
- Cow numbers drive variable expenses



Impact on farm financial models

Sheep, Beef and Dairy Support Key assumptions

- 220ha trading and finishing property
- 16.3 ha kale (13.5t/ha base), contract grazing dairy cows
- 16.3ha spring barley (9t/ha grain base)
- Pasture production drives stock units per hectare. Stock units drive variable expenses.
- 68% SU- lambs; 32% SU- steers.



Impact on farm financial models

Arable

Key assumptions

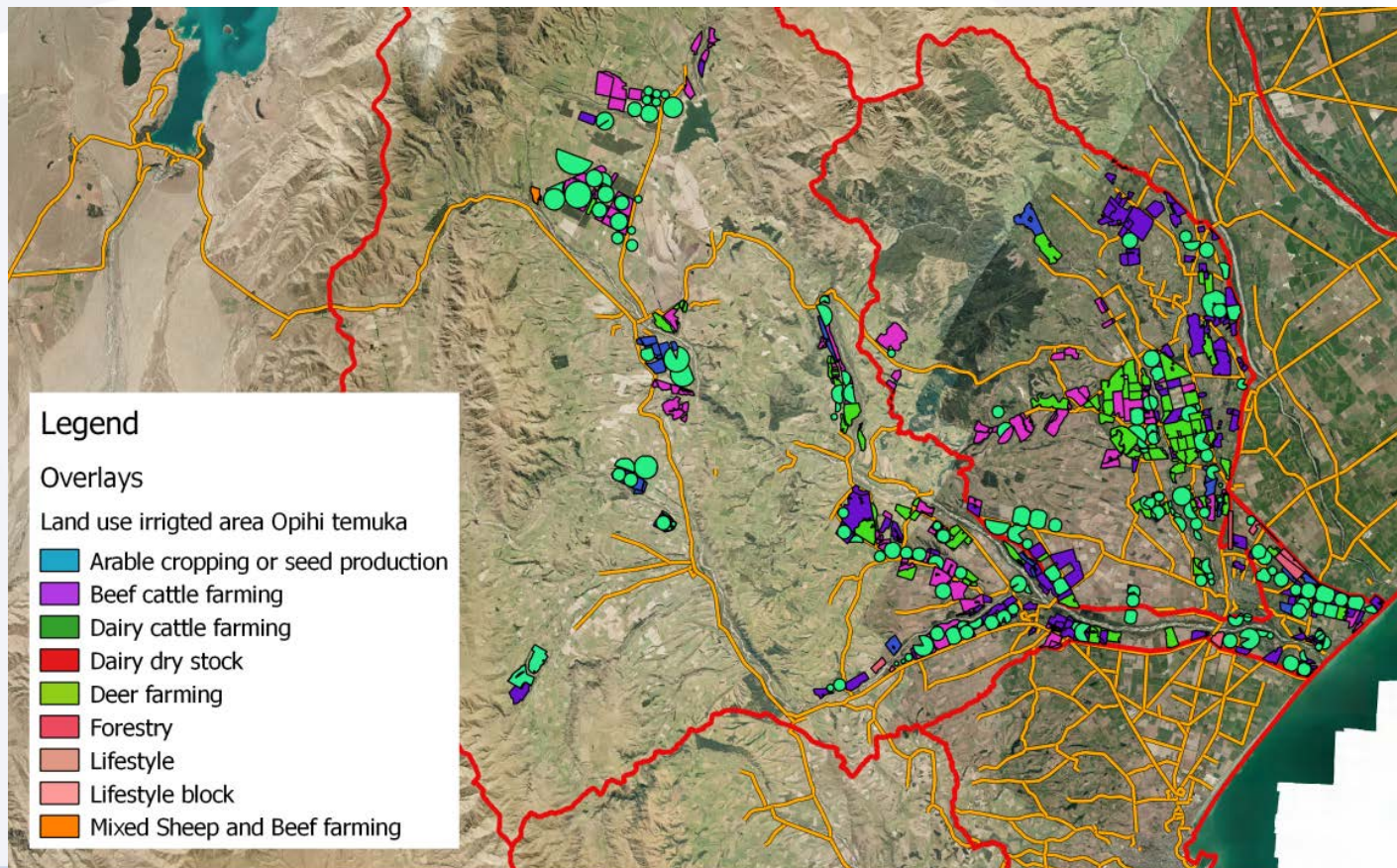
160ha mixed cropping property

Crop	Ha	Yield tDM/ha (base model)
Ryegrass seed	40	2.0
Kale	20	13.5
Potatoes	20	50.0
Wheat	20	12.0
Barley	40	9.0



Rating up the existing model

Irrigated land use in Opihi and Temuka catchments



Rating up the existing models

Total hectares by land use, SWAZ and allocation block

SWAZ	Allocation blocks	Dairy System 3	Dairy System 4	Sheep, Beef and Dairy Support	Arable	Total
Opihi SH1	AN	450	300	177	82	1009
	BN	115	76	82	82	354
Opihi Saleyards	AA+BA	1212	808	1178	168	3366
North Opuha	AA +BA	0	0			0
	AN	0	0			0
South Opuha	AA +BA	237	158	99	0	494
	AN	30	20	12	0	62
	BN	30	20	12	0	62
Opihi Rockwood	AA +BA	757	504	631	210	2102
	AN	42	28	23	23	117
	BN	42	28	23	23	117
Te Ana Wai	AA +BA	673	449	456	0	1577
	AN	42	28	18	0	88
	BN	42	28	18	0	88
Temuka	A	2271	1514	968	792	5545
	B	1373	915	528	440	3256
TOTAL		7314	4874	4225	1821	18235

Flow On Effects

- Utilised multipliers created from the 2013 55 sector industry sector for Canterbury:
 - Gross Output,
 - Value added,
 - Employment (FTE) and
 - Personal Income.

The tyranny of averages

Impacted by:

- The variability of the flow regime.
- The use of average income data.
- The use of representative farm models.

Financial Results

Average data (1998-2015 average)

(\$ million)

Scenario	Total revenue	Total expenses	Total Cash Operating Surplus
Current	133.4	82.2	49.5
Step 1	129.9	77.9	47.7
Step 2	131.1	78.4	48.4

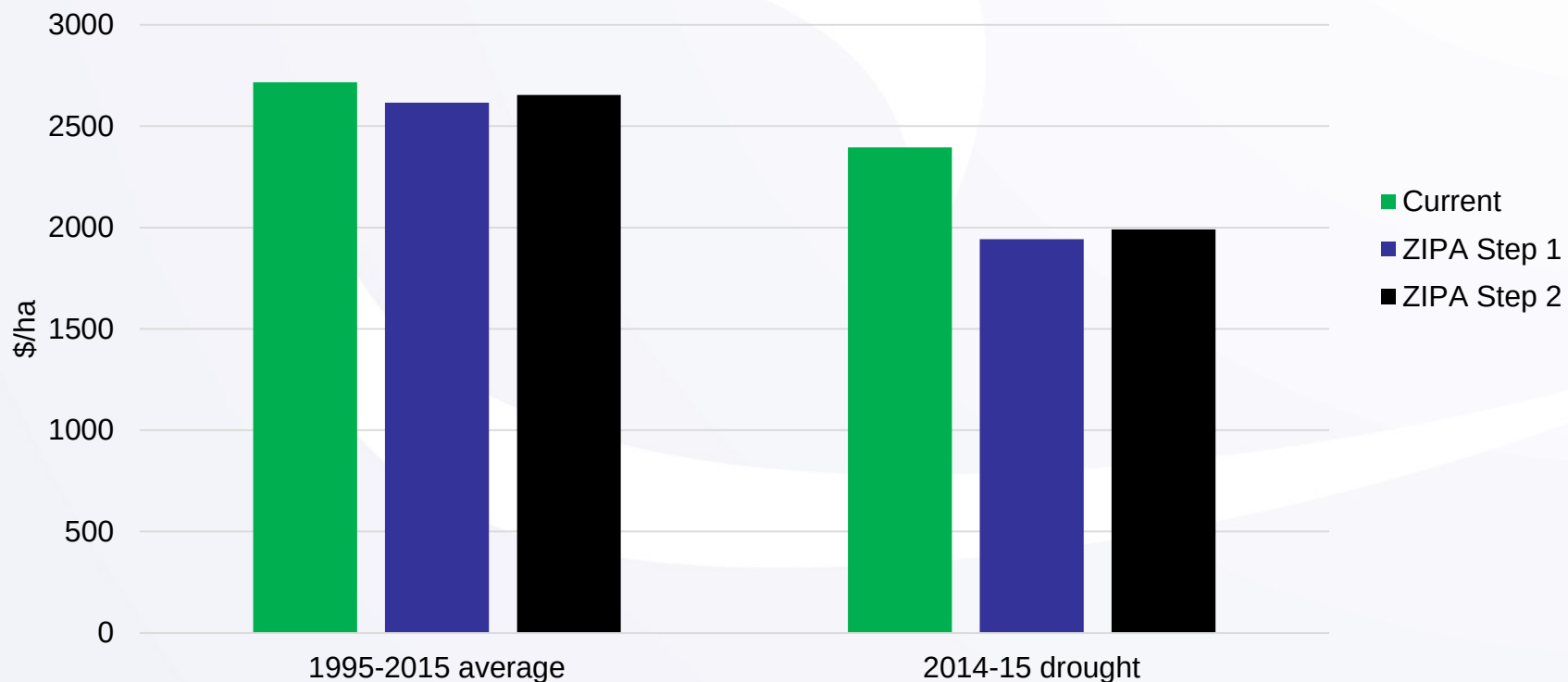
Financial Results

Maximum data (2014-15 drought)

(\$ million)			
Scenario	Total revenue	Total expenses	Total Cash Operating Surplus
Current	123.7	77.8	44.4
Step 1	107.2	67.8	35.4
Step 2	108.8	68.5	36.3

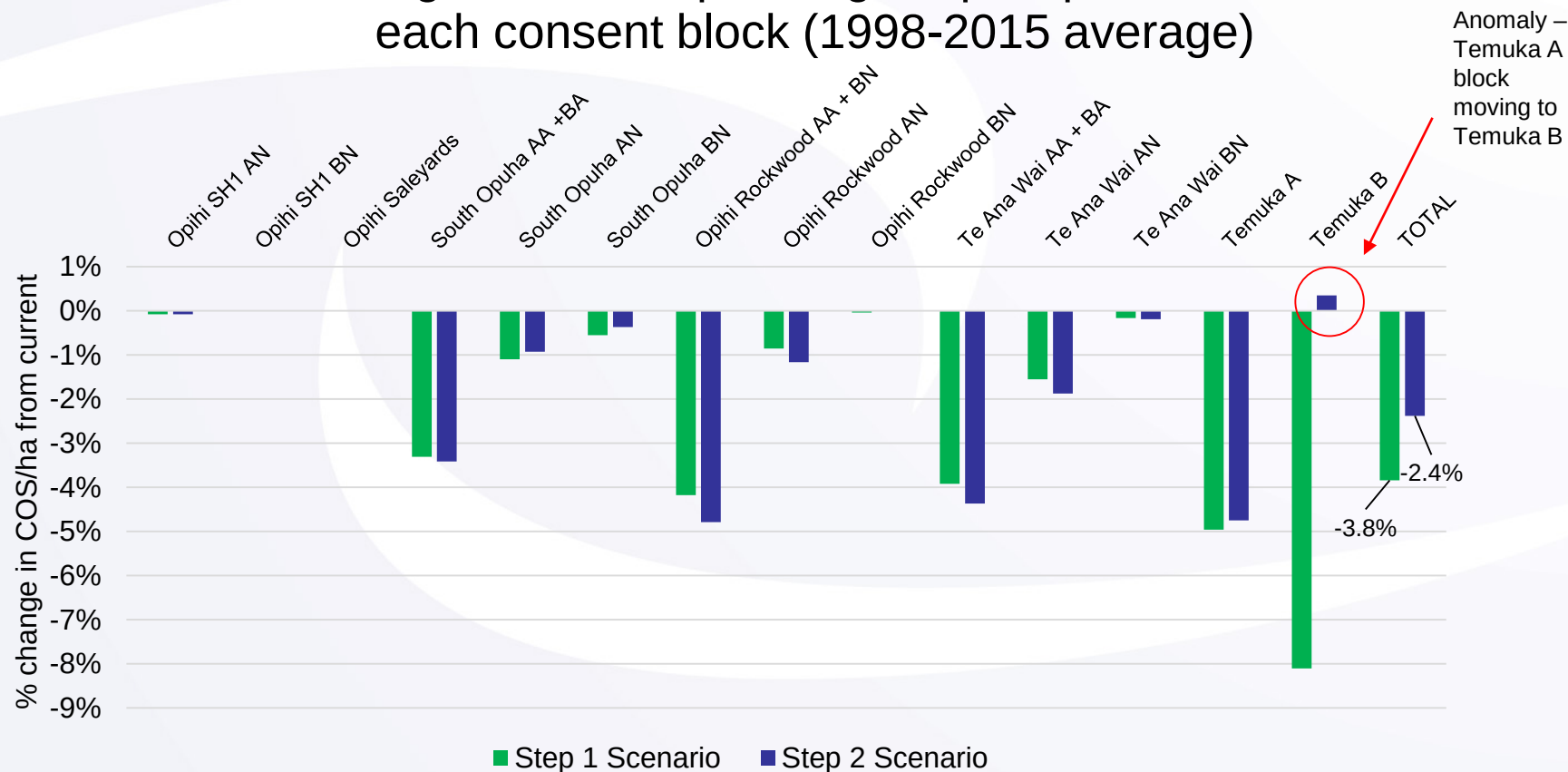
Financial Results

The impact of the current situation and ZIPA Step 1 and Step 2 on farm financials averaged over all land uses and allocation blocks, 1998-2015 average and 2014-15 drought



Financial Results

% change in Cash Operating Surplus per hectare for each consent block (1998-2015 average)



Financial Results

% change in Cash Operating Surplus per hectare for each consent block (2014-15 worst drought)



Gross Output (flow-on effects)

1998-2015 average

Gross Output (\$ million)

Land Use	Current	Step 1	Step 2
Dairy	152.1	148.1	149.5
Sheep and Beef	19.2	18.8	17.6
Arable	13.8	13.3	12.5
TOTAL	185.0	180.2	179.7

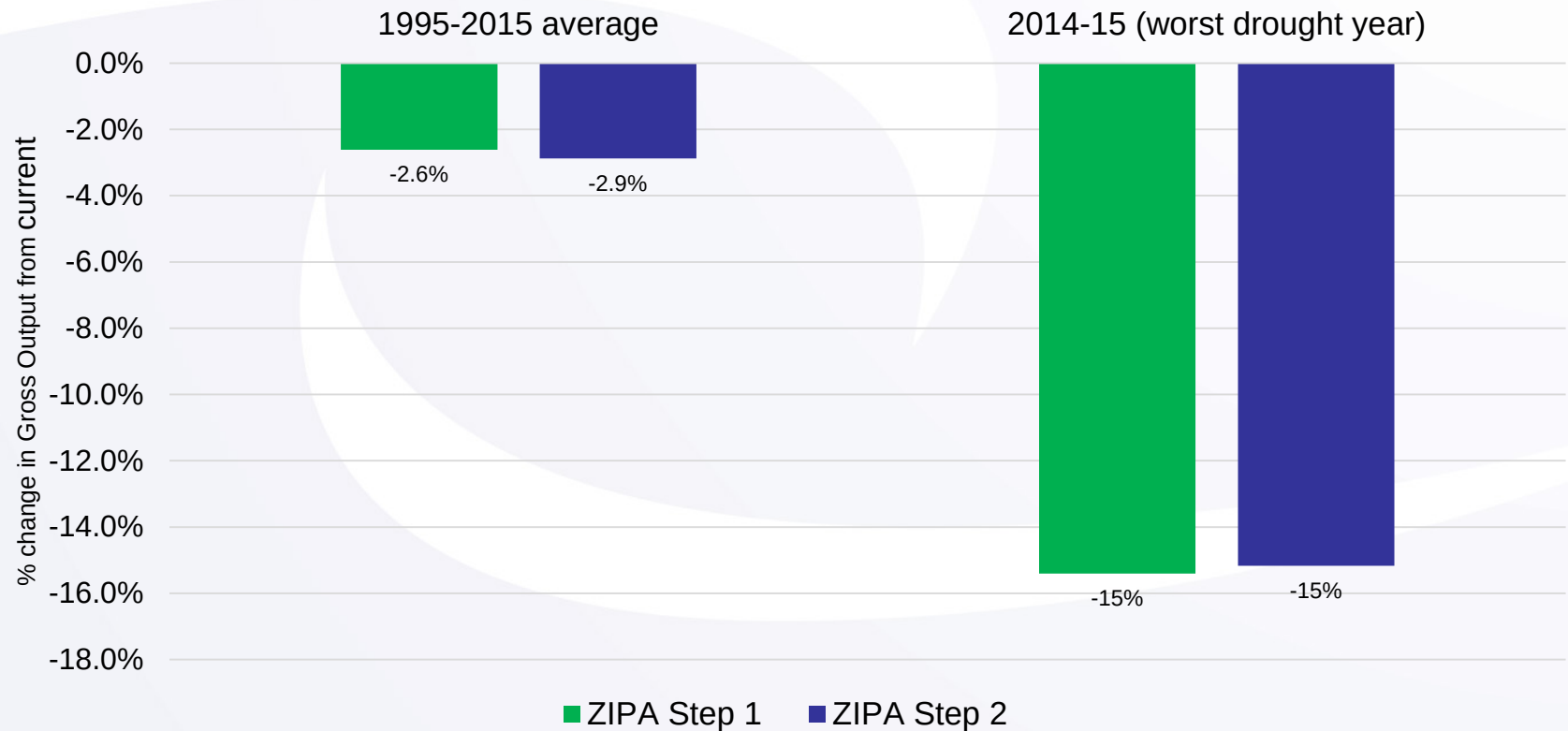
2014-15 drought

Gross Output (\$ million)

Land Use	Current	Step 1	Step 2
Dairy	140.6	121.8	123.7
Sheep and Beef	18.0	16.5	15.5
Arable	12.9	10.4	9.9
TOTAL	171.6	148.7	149.0

Financial Results

Percentage change in Total Gross Output from the Current Scenario



Consideration of the data.

- The average data indicates that there is a marginal change from the current and very little difference between Step 1 and Step 2
- Because of the nature of the river flow regime consideration of the average data should be taken with caution.
- The impact of a maximum restriction event is quite severe.
- Depends upon the frequency of events modelled.
- It is the difference between allocation regimes which is the most relevant more than the absolute values.

Possible next steps

- Review the Aqualinc data
- Create financial models representative of each SWAZ
- Report individual SWAZ impacts
- Test variability of different product prices