Water purchases to save the Murray-Darling Basin

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Abstract

Murray-Darling Basin communities have suffered recurring and prolonged droughts over the past decade. Now that the rains have returned, these communities see the Sustainable Diversion Limits (SDLs) planned by the Commonwealth as a new threat.

Modelling with TERM-H2O assumes that since the SDL process is voluntary, Commonwealth purchases will proceed slowly over the next 12 years. This gives farmers time to utilize water saving technologies as they emerge. This is in contrast to the relatively rapid purchase of 920 GL up until September 2010 that has already occurred. These relatively rapid sales reflect hardship associated with drought.

If the Commonwealth is to reach the 3500 GL target, it may need to pay over $4 billion more to farmers for water (2010 dollars). The Commonwealth's budget constraint will limit the volume purchased.

Implementing (SDLs) will raise the price of water and the asset value of water held by farmers. At the same time, the value of irrigated land will fall, partly offsetting the increase in the asset value of water. This means that some irrigators may gain more than others. Those who do best will be those whose water entitlements have a high value relative to the value of their land.

Under a voluntary scheme that proceeds slowly and gives time for further water savings to occur, there will be modest job losses across the basin. These might fall to 500 jobs below forecast by the year 2026. The extent to which farmers who sell water to the Commonwealth leave the region will have a moderate influence on regional outcomes.

TERM-H2O is the only model which has been calibrated by using the drought of 2006-07 to 2008-09 to estimate regional impacts. In the drought scenario, over 6,000 jobs were lost in the short term relative to forecast across the basin. Therefore, SDL impacts are much smaller than drought impacts.

Introduction

Should regional communities of the Murray-Darling Basin be afraid of reduced irrigation water being used in production? Are there going to be severe impacts arising from this? The Nationals leader Warren Truss thinks so (*The Australian*, 11 June 2009):

> Buying up farms and water entitlements in NSW and Victoria to revitalize the ailing Murray-Darling river system will lead to a 'national tragedy', in which rural towns are slowly strangled to death.

This paper examines the impacts of water buybacks on the Murray-Darling Basin economy. But to put these impacts into perspective, we first summarise the impacts of drought on the basin. So far, buybacks have proceeded against a background of prolonged drought. Inevitably, that has led to buybacks being blamed for job losses when such losses have been a consequence of drought.

Small basin towns have been growing slowly or shrinking for decades

There are some grounds for fear of rural decline. Smaller towns across the basin have struggled over the past few decades. Yet, there appears to be a dividing line between larger towns that include health clinics and hospitals, aged care facilities and schools, and smaller towns in which some or all of these services are missing. Larger towns have taken on some of the characteristics of the capital cities, in that employment is dominated by the services sector. For example, 68% of employment in Griffith, a larger town in a rural region, is in the service sectors (ABS 2006 census).

The statistical local area of Griffith is the only one in the Lower Murrumbidgee statistical sub-division (SLA) in which the population grew from 2001 to 2009. Leeton's population remained almost unchanged in that time, while that of the remaining SLAs in the region fell in the same period. This is typical of a general pattern, that smaller communities have suffered declines through drought over the past decade, while the more services-oriented larger towns have grown or kept a steady population.

At present, some of the discussion concerning the impacts of buybacks is of the respective fortunes of large and small communities. The differences were observable long before the process of water buybacks started, and before the years of recurring droughts that started in 2002-03. Any policy measure such as buyback is in danger of becoming a scapegoat for a pattern that has been observable for decades.

Why the angst?

Since farmers have been and will be compensated for buyback water at market prices, they should be no worse off from the process than if it did not take place. When the Murray Darling Basin Authority (MDBA) toured regional centres late in 2010, communities responded to their message with hostility. Why did this happen?

The buyback process is voluntary and entails compensation at market prices

Some farmers have stated that they were forced by banks to sell water to the Commonwealth to pay off debt. Buybacks were not responsible for debt. The usual culprits, drought, price fluctuations and, in the case of winegrapes, oversupply, were to blame. In some cases of severe financial hardship, selling water may have been an alternative to foreclosure.

Buyback sales during and after the drought were relatively rapid, reaching 920 gigalitres by the end of September 2010. Financial stress due to drought accelerated sales. It is understandable that basin communities associate buybacks with hard times. These communities suffered extreme stress during the prolonged drought from 2006-07 to 2008-09. With an anticipated return to years of average water allocations, voluntary buyback sales are likely to slow. Future sales are likely to be motivated by ongoing restructuring, realised water savings or retirement plans. We might expect farmers to continue responding with hostility to further buybacks if they feel that they are being rushed into a decision. On the other hand, farmers feel they have a lot of time to act within a voluntary process, buybacks may come to be accepted broadly as an option in future farm management.

Farmers are part of the environmental solution

Part of the anger felt in irrigation communities arising from the efforts that farmers have put into maintaining their enterprises during a period of extreme hardship. They have had to manage with much less water. Drought had led to community-wide stress. There has been a feeling that outsiders have not acknowledged the difficulties faced by farming communities during this time. Without proper communication on behalf of the Commonwealth, the inference remains that farmers are the problem, not part of the solution, in environmental management.

To say that farmers are part of the solution is not to infer that their interests are primarily environmental rather than economic. Rather, reforms to separate land and water ownership have led to water pricing. Farmers contribute to the environmental solution by treating water with scarcity via the price mechanism. The pricing of water provides incentives both to trade water and improve water efficiency. Water efficiency improvements arise in several forms. They may arise from irrigation equipment upgrades, fine tuning of water application to crops or the introduction of new crops through R&D.

The importance of a land-water constraint

The switch to dry-land production underlines the importance of including a land-water constraint in irrigation sectors. The constraint implies that a given crop requires a fixed amount of water per hectare. If water allocations fall, either the farmer must switch some irrigable land to dry-land production or switch to an irrigation crop that requires less water per hectare. In order to replicate the observed response to worsening water scarcity, our model must allow irrigated dairy production to switch in part to dry-land production.

If we allow water trading between regions, some modelled water trading patterns are relatively predictable. As water scarcity worsens, rice production is likely to fall by a larger percentage than for other crops. Rice producers are likely to sell temporary water to other irrigators during drought. In order to capture differences in flexibility between activities, we introduced specific capital for perennials and irrigated livestock. Perennial crops including orchards and vineyards will require sufficient water in all years. Hence, producers of perennial crops are likely to be buyers of temporary water during drought.

In the context of buyback, the mobility between irrigated and dry-land production is particularly relevant, as there are more than 50 hectares of dry-land farming in the basin for each hectare of irrigated production. Dry-land farming accounts for more than 60% of farm output in the basin during a normal year. A reduction in irrigated output due to buyback sales will be offset partly by an increase in dry-land production.

Figure 1: Google.map view of Shepparton, Goulburn Valley, Victoria

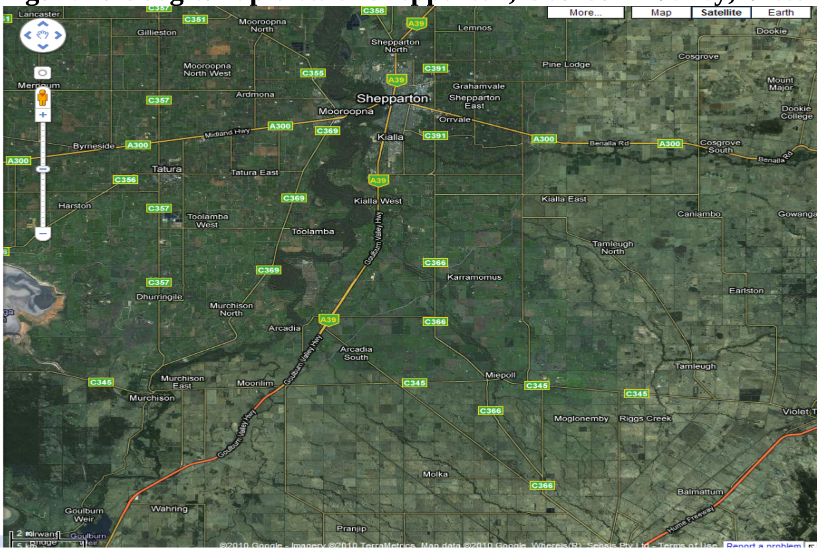
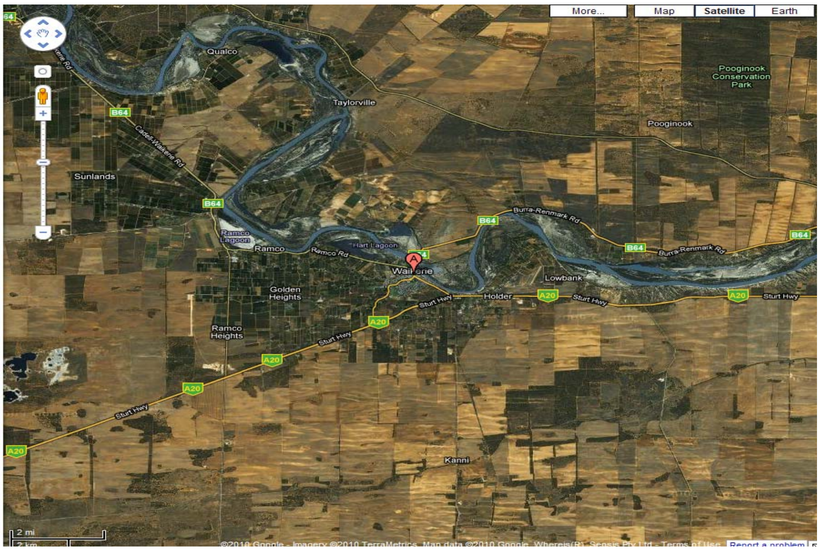


Figure 2: Google.map view of Waikerie, Riverland, South Australia



The extent to which dry-land production offsets irrigation production will depend on the farm production mix in a given region. The Goulburn region includes substantial dairy production, so that much of the adjustment in response to buybacks will be from irrigated to dry-land dairy production. The region averages 500mm rainfall per annum, high enough for relatively productive dry-land farming (Figure 1). 85% of farm output in the Riverland region of South Australia is of grapes and fruit, with most of the remainder being dry-land broadacre agriculture. Waikerie averages only 270mm of rainfall per annum, making dry-land activities marginal. There is almost no scope for switching to dry-land production (Figure 2). Therefore, assuming that buybacks from the Riverland are in proportion to their share of basin water entitlements, producers would become importers of water from other regions.

The longer the buyback process takes, the greater the scope for water savings over time to play their part in the adjustment process.

Table 1: Water consumption by crop in the Murray-Darling basin, 2001–02 to 2005–06

	2001–02	**2002–03**	**2003–04**	**2004–05**	**2005–06**
Water consumption (GL)					
Livestock pasture	2,971	2,343	2,549	2,371	2,571
Rice	1,978	615	814	619	1,252
Cereals (excl. rice)	1,015	1,230	876	844	782
Cotton	2,581	1,428	1,186	1,743	1,574
Grapes & fruit	868	916	871	909	928
Vegetables	152	143	194	152	152
Other agriculture	504	475	596	564	460
Total Agriculture	**10,069**	**7,150**	**7,087**	**7,204**	**7,720**

Source: ABS (2009), table 4.20.

Table 1 shows that in 2002-03 (a drought year), the water used in livestock pasture decreased and that used in cereal production increased relative to the previous year. This implies that livestock production in the basin moved in part from irrigated to dry-land technologies, underlining the importance of the land-water constraint and farm factor mobility between irrigated and dry-land production in TERM-H2O.

TERM-H2O: a general equilibrium model with considerable basin detail

TERM-H2O is the model used in this study. TERM-H2O has the following features, the combination of which is unique to a small-region model:

- It includes irrigation and dry-land farm sectors, with some farm factor mobility.
- For perennials, including vineyards, orchards and livestock herds, the model includes capital that is not transferable to other sectors.

- Livestock production can move from irrigation to dry-land technologies. In dry-land livestock production, land and fodder inputs are substitutable.
- The model includes on downstream processing of agricultural output, other manufacturing (non-agricultural), utilities, services that support agriculture and other services in each region.
- The model includes water accounts and also accounts for rainfall. This means that in a policy scenario in which a given fraction of irrigation water is taken out of production, there is a smaller fractional reduction in the water available to irrigators as rainfall is unchanged.
- The model is dynamic, meaning that simulations are run over time. The results of policy simulations are compared with baseline simulations. The baseline can include drought, for example, which raises the price of irrigation water and increases the economic costs of diverting water (which is more valuable during drought) to the environment.
- The model includes a dynamic link between annual investment flows and capital stocks. For example, under the SDL policy, water prices rise relative to the baseline forecast and this reduces perennial specific investment. Hence, specific capital used in perennial sectors shrinks relative to forecast across the basin.
- The model also includes detail of the economic structure of the rest of Australia.

Modelling the drought

This section provides a brief summary of the modelled outcomes of drought. Figure 1 shows that much of the southern Murray-Darling basin, and in particular, the main source of water, the Snowy Mountains, suffered the lowest rainfall on record in the three period to the end of 2008.

Figure 3: The three year drought in the southern Murray-Darling basin

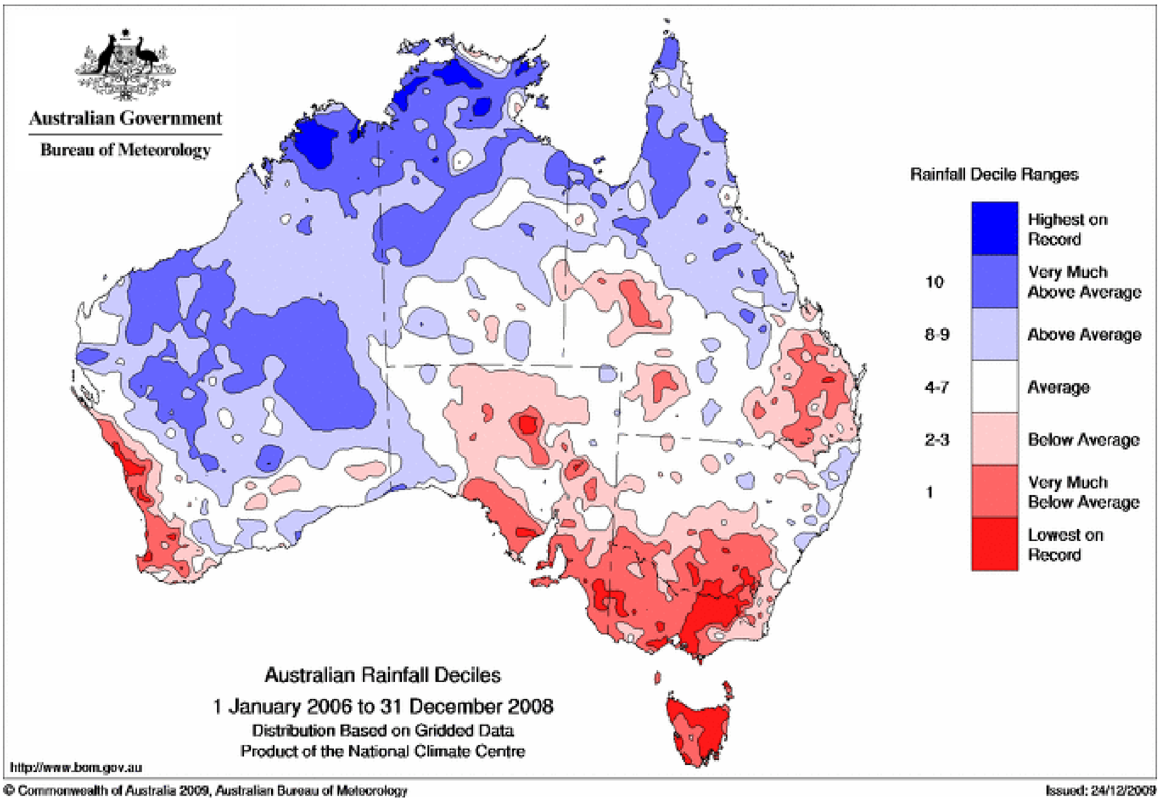


Table 2 compares naïve estimates of drought impacts, based on database weights, with modelled impacts. We can calculate a naïve or first-guess estimate of the contribution of a farm subset *k* of all industries *j* to a percentage change in GDP in region r (gdp_r) as:

$$gdp_r = \Sigma_k(PRIM_{kr}.q_{kr})/ \Sigma_j PRIM_{jr} \qquad (1)$$

PRIM is the level of value-added output of each sector and *q* is the percentage change in output. As a starting point for our naïve calculation, we assume that for irrigation sectors *i*, $q_i = xwat_i$ where the latter is the percentage difference in water allocations from normal. Additionally, our naïve calculation of lost output in dry-land sectors *j* equals the technological deterioration due to drought ($aprim_j$) so that $q_j = aprim_j$. Our initial estimate of the impact of drought, in which *a* refers to all industries in region *r* is:

$$gdp_r = [\Sigma_i PRIM_{ir}.q_{ir}+ \Sigma_j PRIM_{jr}.q_{jr}]/ \Sigma_a PRIM_{ar} \qquad (2)$$

In Table 2, row (1) shows dry-land productivity and row (2) an index of water availability relative to a normal year. Rows (3) to (5) provide estimates of the contributions of dry-land plus irrigation farming to GDP in each region. Rows (6) to (8) contain our first-guess contributions of irrigation and dry-land sectors to changes in real GDP in the regions of SMDB. The modelled contributions to changes in regional GDP by broad sector and irrigation water are shown in rows (9) to (14). Row (15) shows the volume of net water sold by region.

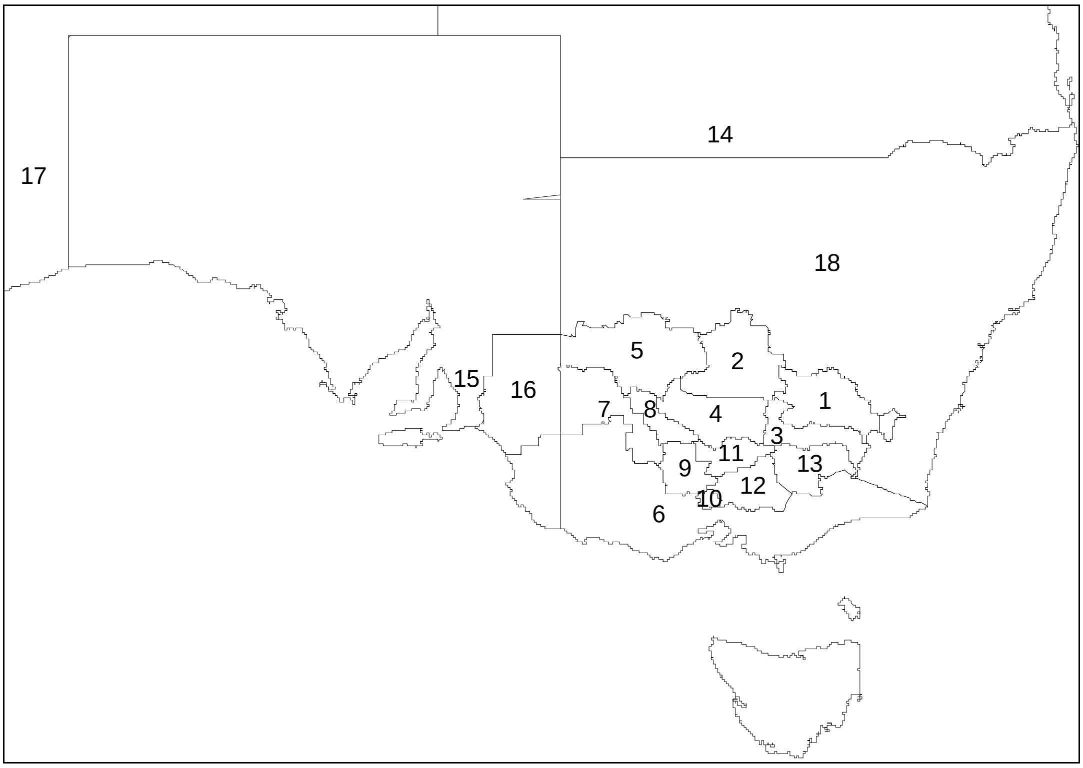
Comparing rows (6) and (9), we see that dry-land first-guess losses predict modelled broad sectoral losses quite closely in some but not all regions. Variations arise from some resource movements. In Lower Murrumbidgee, farm factors move from irrigated towards dry-land production as irrigation water is exported to other regions.

Table 2: Impacts of drought by region, 2007-08 relative to no-drought baseline (%)

	WagCntMrmNSW	LMrmbNSW	AlbUpMrryNSW	CentMrryNSW	MrryDrlngNSW	MldWMaleeVic	EMalleeVic	NthLoddonVic	SthLoddonVic	ShepNGoulVic	SSWGlbrnVic	OvnsMurryVic	MurrayLndsSA	All SthMDB
	Water allocations and productivity levels (100 = average)													
(1) Dry-land productivity [a]	42	42	42	42	42	36	36	69	69	69	69	69	36	51
(2) Water[b]	51	51	14	14	40	42	42	46	40	46	46	45	60	44
	Contributions to GDP in 2005–06 base (%)													
(3) Dry-land	8.3	8.4	6.4	2.3	8.0	13.6	14.4	3.9	1.4	6.9	7.4	3.8	8.0	6.8
(4) Irrigation	1.9	15.3	1.2	19.6	12.1	8.0	14.5	1.5	0.7	9.2	3.2	2.8	14.1	6.1
(5) Total	10.2	23.7	7.6	21.9	20.1	21.6	28.9	5.4	2.1	16.1	10.6	6.6	22.1	12.9
	Naïve estimates of contributions to GDP (%)													
(6) Dry-land	-4.8	-4.9	-3.7	-1.3	-4.6	-8.7	-9.2	-1.2	-0.4	-2.1	-2.3	-1.2	-5.1	-3.3
(7) Irrigation	-0.9	-7.5	-1.0	-16.9	-7.3	-4.6	-8.4	-0.8	-0.4	-5.0	-1.7	-1.5	-5.6	-3.4
(8) Total	-5.7	-12.4	-4.7	-18.2	-11.9	-13.3	-17.6	-2.0	-0.9	-7.1	-4.0	-2.7	-10.8	-6.7
	Modelled contributions by broad sector													
(9) Dry-land	-4.4	-2.6	-3.1	0.1	-3.0	-9.0	-9.2	-0.7	-0.3	-0.9	-1.4	-0.8	-5.6	-2.7
(10) Irrigation	-1.0	-10.2	-0.3	-13.2	-2.0	-1.1	-0.5	-0.5	-0.1	-2.1	-1.0	-0.8	-0.5	-1.9
(11) Food	-0.3	-0.6	-0.1	-0.2	0.0	-0.1	-0.2	-0.4	-0.1	-0.7	-0.1	-0.2	-0.6	-0.3
(12) Rest	-1.1	-0.5	-0.7	-1.6	-0.6	-1.7	-1.3	-0.2	-0.3	-0.6	-0.4	-0.9	-0.9	-0.8
(13) Net Water	0.4	3.8	-0.2	-4.9	-1.5	-0.7	-1.6	0.1	0.0	0.6	0.3	-0.2	-0.7	0.0
(14) GDP	-6.4	-10.0	-4.4	-19.7	-7.1	-12.7	-12.8	-1.6	-0.7	-3.6	-2.6	-2.8	-8.3	-5.7
(15) Net water sold (GL)	83	456	-38	-194	-33	-29	-86	5	-4	-104	2	-20	-39	0

a Authors' estimates based on rainfall deficiencies.
b Data provided by Murray-Darling Basin Authority.

Figure 4: Map of SMDB regions in TERM-H2O



Regions: 1 Wagga-Central Murrumbidgee, 2 Lower Murrumbidgee, 3 Albury-Upper Murray, 4 Central Murray, 5 Murray Darling, 7 Far West, 6 Rest of VIC, 7 Mildura-West Mallee, 8 East Mallee, 9 Bendigo-Nth Loddon, 10 Sth Loddon, 11 Shepparton-Nth Goulburn, 12 Sth/SthWest Goulburn, 13 Ovens-Murray14 QLD, 15 Rest of SA, 16 Murray Lands SA, 17 Rest of Australia, 18 Rest of NSW.

Comparing modelled outcomes and actual outcomes

Table 3 compares modelled outcomes for farm products in the SMDB with available data on percentage changes in 2007-08 relative to 2005-06. Columns (1) to (3) show the modelled deviations from forecast due to drought (versus a hypothetical no-drought baseline for 2007-08) and columns (4) to (6) estimated actual changes between 2007-08 and 2005-06. Hence, the comparisons are not between like and like, but are the best we can do.

Table 3: Comparing modelled SMDB outcomes to observed changes

	Output[a]	Price	Water used[b]	Output[c]	Price	Water used[b]
	Modelled outcome deviation from 2007-08 base (%)			Observed 2007-08 relative to 2005-06 (%)		
	(1)	(2)	(3)	(4)	(5)	Water (6)
Cereal	-55.3	43.6	-78.8	1.1	92.1	-55.9
Rice	-84.9	86.2	-90.7	-98.2	46.3	-97.8
DairyCattle	-13.6	29.5	-40.9	1.9	52.0	-64.9
OthLivestock	-23.1	41.4	-44.6	na	na	-76.8
Grapes	-17.9	18.0	-49.0	2.2	44.6	-14.4
Fruit	-7.7	13.5	-23.1	5.4	17.6	-17.8
Vegetables	3.5	6.8	-1.4	-2.0	3.1	-15.5
OthAgri	17.3	7.9	12.6	na	na	-50.0

a Value-added basis.
b Water used in irrigation production.
c Value of output, not value-added.
Source: ABS catalogue no. 7125.0 ; Anderson et al. (2009), ABARE.

Cereal production did not shrink as much in the observed period as we modelled. This reflects soaring cereal prices in the observed period: the actual price hike was twice the modelled drought-induced price hike. World prices of cereals in 2006-07 were driven up by increased use of bio-fuels and other international developments beyond price hikes arising from drought within Australia. The output outcomes for dairy cattle, grape and fruit turned out better than we modelled, again with observed prices rising more than the modelled deviation. Yet dairy cattle's use of water dropped more than we modelled: this reflects a larger-than-modelled movement from irrigated to dry-land production. Since dairy output prices were high in 2007-08, dairy producers were willing to move to dry-land and pay for cereal feed (grains and hay). Although the observed value of dairy cattle output rose by 1.9 percent (Table 3, column (4)), the value-added almost certainly dropped significantly, reflecting high feed costs and bringing the observed result closer to the modelled result. Overall, there was a greater movement of water out of rice production than we modelled.

Other than rice (for which the commodity price hike was smaller than modelled), only vegetables and the relatively small other agriculture sector did worse than modelled. Vegetables output did marginally worse than forecast due to the output price hikes of competing, more export-oriented products. The other agriculture sector includes nursery products: Australia's mainland capitals with the exception of Darwin all faced water restrictions in this period which drove down demand for this sector from household gardeners.

Next, we examine water prices. We would expect water prices to have increased between 2005-06 and 2007-08 by a larger amount than modelled, due to the observed surge in commodity prices for some major irrigation products. This is so: the modelled increase was $285 per megalitre relative to forecast in 2007-08, compared with an observed increase in the Goulburn region relative to 2005-06 of around $500 per megalitre. A weakening of commodity prices in

2008-09 resulted in the price of water falling to $275 per megalitre above 2005-06 levels, closer to the modelled outcome (Watermove weekly data, downloaded from www.watermove.com.au).

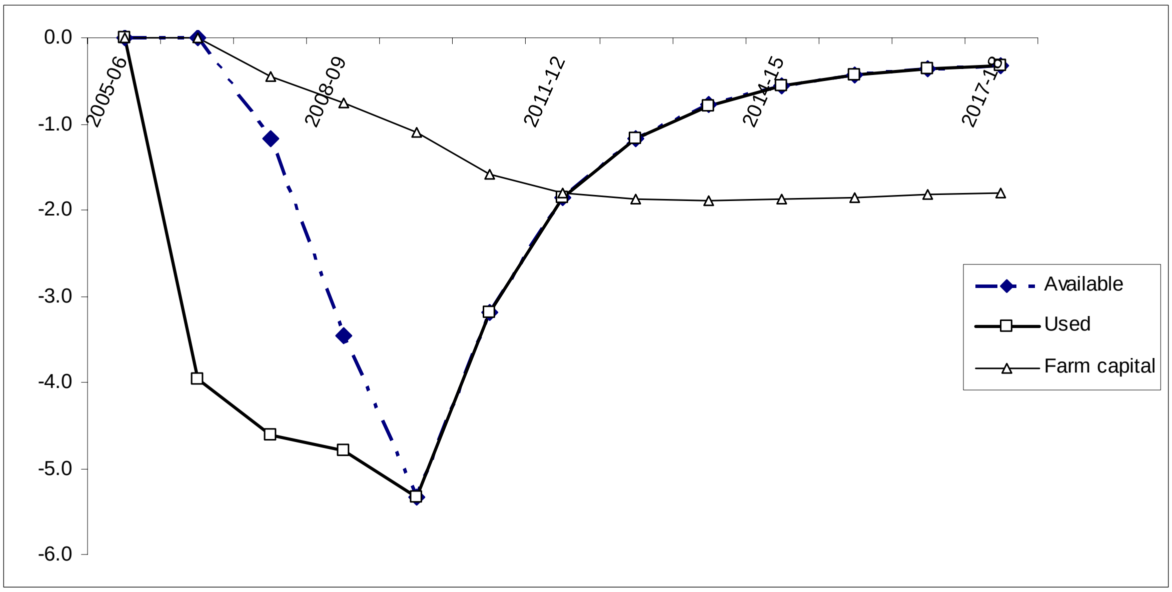
The response by farmers to drought and water shortfalls

One argument put forward by environmentalists is that the value of farm output in the basin during the drought did not fall substantially. This is misleading for two reasons. First, in 2007-08 for which small region data are now available, prices soared due to demand for bio-fuels, so that price hikes substantially offset falls in output – before collapsing early in the following financial year due to the GFC. Also, value-of-output figures are not in a value-added form. With severe water scarcity in 2007-08 and high dairy output prices, dairy producers responded by switching substantially to dry-land production with hand-feeding of cattle. Hand-feeding adds to input costs.

Employment impacts

The headline modelled impact is that 6,000 jobs were lost in the basin during the worst of the drought. That is not the end of the story. A long run story emerges from the years of lost investment during drought. Figure 5 shows the impact of drought on downstream processing and farm capital. TERM-H2O included a theory of excess capacity which resulted in some downstream capital being idle during drought, following Dixon and Rimmer (2010). The last impact of drought is that mobile farm capital remains 2% below forecast years after the end of the drought.

Figure 5: Downstream processing and mobile farm capital, SMDB
(% deviation from forecast)



The decline in farm capital relative to forecast years after recovery from drought results in a long-term decline in basin employment relative to forecast. In 2017-18, years after recovery, basin employment remains 1,500 jobs below forecast.

Buyback impacts – 3500 GL target

This section summarises key findings from previous modelling undertaken for the MDBA (Wittwer 2010). The following assumptions applied:

- Since the process is voluntary, with willing farmers selling part of their water entitlements to the Commonwealth, it proceeds slowly. That is, we assume that permanent water sales fit in with the forward planning of farmers.
- In each scenario, target volumes for environmental flows are not reached until 2022.
- Farmers are compensated at market prices for entitlements sold to the Commonwealth. This assumption applies to three scenarios but is dropped for a fourth scenario.
- Target volumes already include the 796 GL of entitlements sold to the Commonwealth by the end of January 2010 (but excluding buyback sales since then – which totalled 920 GL by the end of September 2010).

The relevance of a slow process is that technological gains that result in savings in water requirements in irrigation help alleviate losses in farm output over time. MDB communities have had to live with environmental challenges, including severe and prolonged drought over much of the past decade. Irrigators have made substantial water savings in the past through the use of new irrigation technologies. However, the adoption of new technologies takes time. In addition, without sudden reductions in local farm outputs that would result from large and concentrated water sales in a short space of time, the impacts on downstream processing sectors are smaller than otherwise.

As a first step, we use a simple calculation based on database weights to estimate the impact of removing 3500 GL of entitlements from production. Modelled GDP outcomes in most regions are slightly worse than this calculation (compared columns (3) and (2) in table 4). This is because the removal of water from irrigation production depresses farm land and capital rentals, which in turn reduces farm investment relative to forecast slightly. Consequently, farm capital in the basin falls relative to the baseline forecast. There is also a small reduction in employment in each region over time relative to forecast. Real GDP declines across the basin relative to forecast, but is little more than 0.2 percent below forecast by 2026.

Table 4: Comparing 2026 modelled outcomes relative to forecast with first estimate

	First	*Estimate*		*Modelled outcomes*	
	(1)	(2)	(3)	(4)	(5)
	water[a]	GDP %	GDP %	net water sold GL	B/C[b]
TmwthNSlpNSW	-13.3	-0.04	-0.06	0	0.15
NCentralNSW	-14.4	-0.33	-0.99	0	0.91
MacquarieNSW	-11.7	-0.04	-0.04	0	0.16
McqrieBarNSW	-10.9	-0.14	-0.31	0	0.55
UpDarlingNSW	-13.4	-0.13	-0.23	0	0.52
CntralWstNSW	-18.0	-0.03	-0.03	0	0.13
LachlanNSW	-6.4	-0.03	-0.01	0	0.23
WagCntMrmNSW	-25.9	-0.06	-0.10	18	0.24
LMrmbNSW	-28.2	-0.57	-0.19	-221	2.39
MurrayNSW	-14.5	-0.19	-0.28	185	0.92
MrryDrlngNSW	-21.7	-0.14	-0.15	-12	0.57
MalleeVic	-8.2	-0.06	-0.18	68	0.42
LoddonVic	-20.5	-0.02	-0.07	7	0.06
GoulburnVic	-17.8	-0.09	-0.28	-19	0.43
OvnsMurryVic	-11.8	-0.03	-0.15	9	0.14
DrlngDwnsQld	-20.7	-0.19	-0.77	0	0.60
SouthWQld	-21.0	-0.15	-0.58	0	0.61
MurraySA	-15.3	-0.10	-0.22	-35	0.44
All MDB	-17.3	-0.13	-0.25	0	0.41

Key:
a % of allocated water removed from production in addition to buybacks that have already taken place
b Compensation spending (5% of asset value) as a share of aggregate consumption

Figure 6 shows that the price of water rises due to buyback, providing a windfall to owners of water rights. But Figure 7 shows that the price of agricultural land across the basin falls. Hence, farmers whose water has a high asset value relative to the value of their land holdings will do better than farmers with a lower ratio of water to land assets. For example, vineyard and orchard growers may not do as well from sales to the Commonwealth as growers of annual crops. Growers of perennials may be keener to maintain the health of their vineyard or orchard than to sell their water. The composition of the distribution of water inputs and land inputs in total farm factor income may vary between regions. This results in regional and sectoral differences in outcomes.

Figure 6: Price of irrigation water in MDB

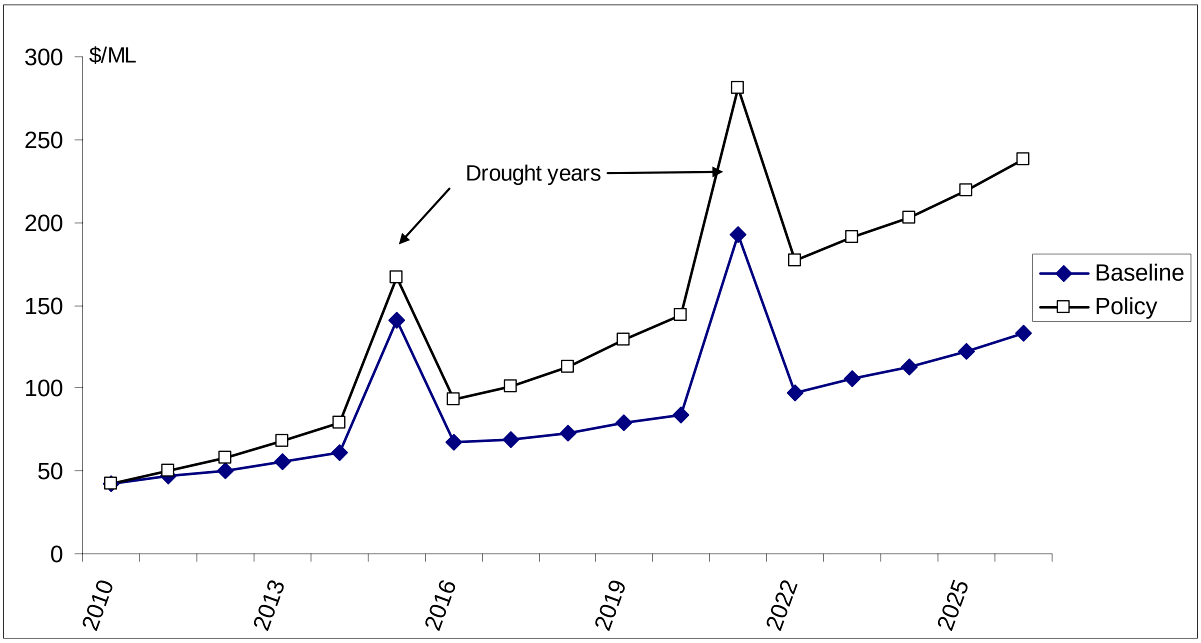
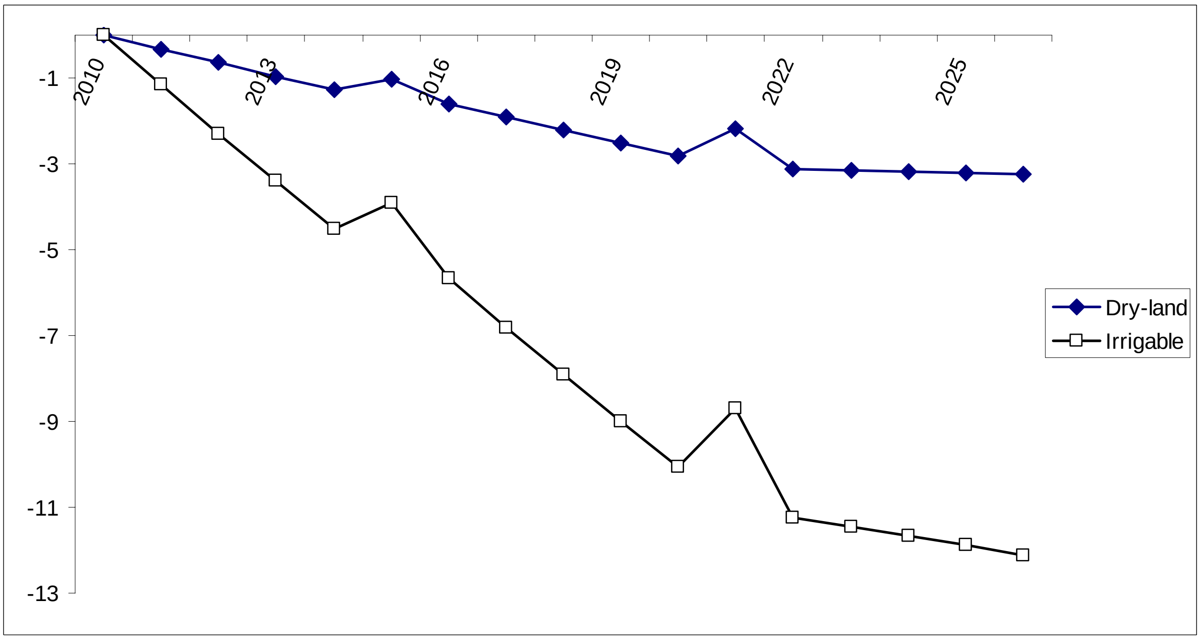


Figure 7: Price of agricultural land in MDB

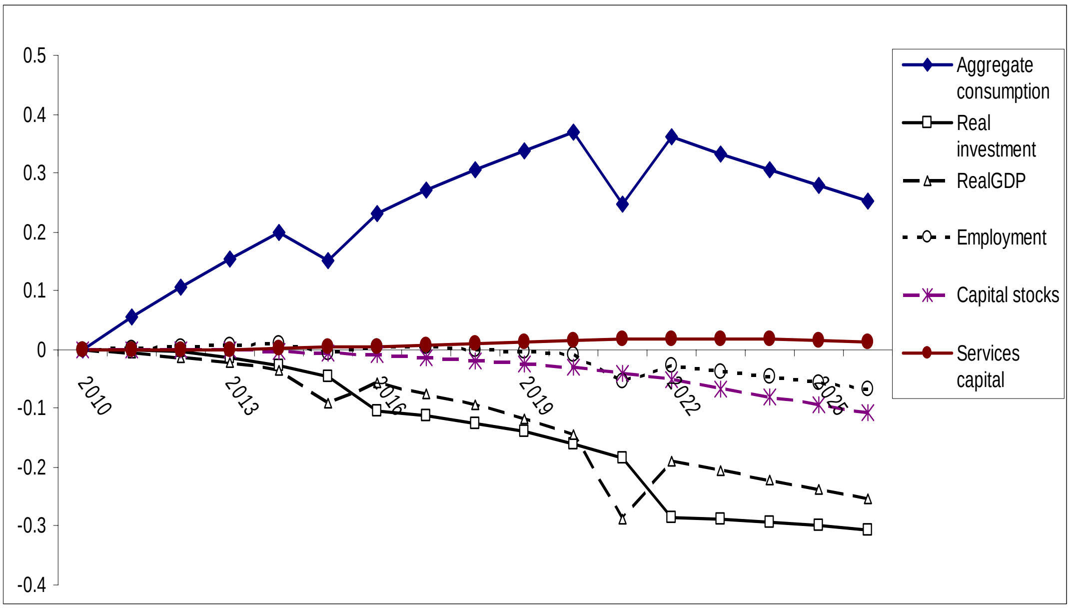
% change from forecast



Aggregate consumption in the 3500 GL scenario peaks at 0.3% above forecast across the MDB in 2022 (Figure 8). This reflects full compensation at market prices for water, and that farmers remain in the basin. Among regions, the Lower Murrumbidgee region has the largest increase in aggregate consumption relative to forecast, because it has relatively high water to land value ratio. The regions that gain least in terms of aggregate consumption are those in which irrigated agriculture is a relatively small share of the regional income base.

Figure 8: Macroeconomic impacts, MDB

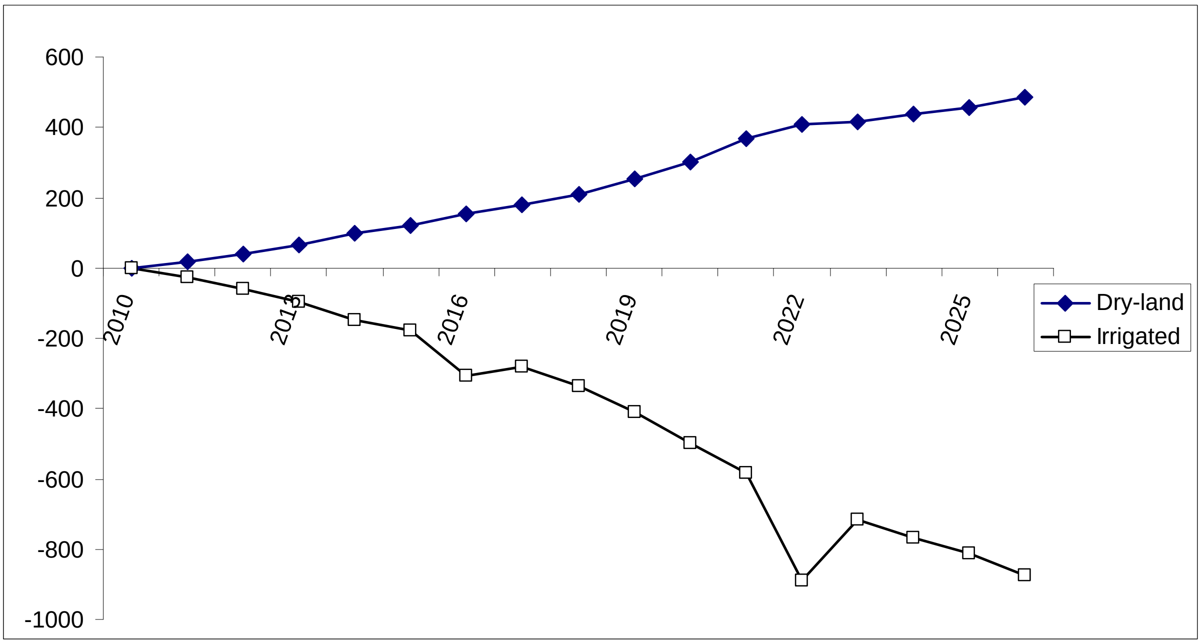
% change from forecast



The slightly lower levels of farm investment and consequent lower levels of farm capital result in a small deterioration in regional outcomes over time (that is, after water sales to the Commonwealth have been completed in 2022). We assume that farmers spend only that percentage of buyback payments that maintains the real value of payments over time. Thereafter, real consumption moves gradually back towards forecast after the assumed payments end in 2022. At the same time, employment across the MDB drops slightly below forecast, reaching almost 0.1% below forecast by 2026. This amounts to around 500 jobs lost across the region relative to forecast. Basin-wide employment in services sectors, which depend on household spending and are relatively labour-intensive, remain slightly above forecast in 2026.

Reaching the SDL targets will impose some upward pressure on farm output prices. The largest impact will by on rice, which rise to 7% above forecast by 2026. In the same year, irrigation output in the basin falls more than $800 million below forecast, but this is partly offset by an increase in dry-land output of $400 million (Figure 9).

Figure 9: MDB farm output
$m change from forecast



From the Commonwealth's perspective, the greater the volume of water purchased, the higher the cost, as the irrigation water entitlement price rises as more water is purchased and diverted to environmental uses. Since the Commonwealth's purchases push up the price of water, the real cost to the Commonwealth will not be proportional to the volume of water purchased by the Commonwealth. Rather, the total cost will increase by a larger percentage than the increase in the target volume.

The impacts on downstream processing sectors are relatively modest. A movement of farm factors from irrigated to dry-land production partly alleviates reductions in farm output supplies to downstream processors.

Calculating the asset value of water and its impact on regional disposable income

Several steps are required in calculating how much SDL compensation payments impact on regional spending. First, we need to calculate the asset value of a water right. Second, we need to assign a certain proportion of compensation payments to disposable income in each region. TERM-H2O is unique among models used in analysing SDLs in that it accounts for the impact of compensation on each region's household spending. Because there may be debate about the proportion of proceeds that stay within the region of sale, we can vary that proportion: in three scenarios we assume that all proceeds stay within the region of origin In a fourth scenario, we assume that there is no compensation at all for farmers for water taken out of production.

In practice, we might expect at least some of the proceeds of water sales to stay within the basin. In particular, some farmers in making investment plans may use water revenues as a substitute for bank finance. Therefore, it would not be surprising if banks anticipate a reduction in the value of loans they provide in the basin. Some farmers will cash in water rights rather than borrow to fund investments.

If only a fraction of compensation proceeds remain in the basin, the impacts will be less favorable than we have reported. Regions with relatively high proceeds as a share of regional income are more sensitive than others to the assumption concerning the proportion of proceeds that stay within the basin. Table 5 (column (4)) shows annual buyback spending as a share of aggregate regional consumption in each region in 2026. Across the basin, this fraction if 0.41% of aggregate consumption.

What happens to the asset value of water with a return to years of better rainfall? The method used to calculate asset values (Dixon et al., forthcoming) imposes a higher price on future years of expected drought. This is because demand for irrigation water is inelastic (that is, the value of water rises as the volume of allocations falls). The greater the expected frequency of droughts, the higher the present value of water. During the prolonged drought, expectations were that droughts would be relatively frequent in the future. With a return of rain (and once-in-generation floods), the expected frequency of droughts has fallen and with it, the asset value of permanent water. Anecdotal evidence is that the asset value of water per ML of average annual allocation has fallen from over $2000 to around $1500 with the end of the drought.

Further discussion

We can expect that acceptance of buyback in basin communities will broaden with the end of drought. This is not because buybacks in any way worsened the plight of farmers during drought, but rather that buybacks were associated with a time of extreme stress. That the volume of buyback water purchased is already in excess of one quarter of the eventual target (3500 GL) ought to send a message to various lobby groups campaigning for an end to buybacks that buybacks are having a relatively small impact on farming in the basin.

Before the heartening impacts of good spring rains across the basin were replaced by summer floods, Sunrice announced that it would be reopening the Deniliquin rice mill after it had been for closed for three years. This raises a difficult question for lobbyists who have asserted that job losses arising from buyback will run into many thousands. That is, since buybacks continued through 2010, if the employment impacts were so large, then how could a mill that processes the most water-intensive crop in the basin be re-opened? The answer will become increasingly obvious over time: drought has been responsible for job losses in the basin. Drought closed the Deniliquin rice mill and the end of drought led to its re-opening. Ongoing buybacks have had and will have a limited impact on basin employment and will not slow the recovery of the basin from drought. In making a business decision, Sunrice have effectively disregarded the exaggerated claims of various lobbyists.

Already, farmers have been split by the Victorian Farmers' Federation successful campaign of several years ago to cap permanent water sales out of each catchment to 4% annually. The impact of this interference with the business plans of farmers has been obvious: the stampede to trade water with the commencement of each season has led to an oversubscribed lottery every year for those wishing to sell water in the Goulburn region (Frontier Economics, 2009). Irrigators wishing to downscale permanent plantings due to an oversupply of grapes or depressed prices for citrus crops have been frustrated by the Victorian cap.

The risk of amending the act

The current act (*Water Act 2007*) concerning water purchased for the environment does not allow for temporary trading as part of environmental water management. While there may be efficiency gains from amending the act, there is the danger that amendments may leave to substantial dismantling of the act. The current Federal opposition has made it clear that they wish to end the buyback process, following the pattern of mixing up the impacts of drought and buybacks. This is despite Malcolm Turnbull being the political architect of the existing buyback scheme under the previous Howard government.

Available costings of infrastructure upgrades indicate that they are at least several-fold more expensive than buybacks. Given costings from Northern Victorian Irrigation Renewal Project, for example, each megalitre of water saved is going to cost between $4,000 and $10,000. This compares with buyback costs per megalitre of average allocation of around $1,500 to $2,500.

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