



Motivating the Market

A brief review of options for improving water purchases

FINAL REPORT

Dr Andrew Reeson and Dr Stuart Whitten

29th May 2015

CSIRO Land and Water Flagship

For The Department of the Environment in response to RFQ 1415-0609

Commercial-in-confidence

COMMERCIAL IN CONFIDENCE

Citation

Reeson, A. and Whitten, S.M. (2015) Motivating the Market: A brief review of options for improving water purchases, A Report to The Department of the Environment, CSIRO, Australia.

Copyright The Department of the Environment

Important disclaimer

CSIRO advises that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, CSIRO (including its employees and consultants) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

Contents

Executive summary	5
1 Introduction	7
1.1 A brief overview of Australian water markets	7
1.2 Recent water market experience and its relevance.....	7
2 Water recovery experience	10
2.1 Relationship between benchmark prices and water market	10
2.2 Impact of demand on water market prices.....	11
2.3 Other sources of price advice.....	11
3 Water recovery tender issues.....	14
3.1 Factors influencing participation.....	14
3.2 Impact of revelation of purchase prices and willingness to pay.....	15
4 Discussion of variation in purchase strategy	18
4.1 Where are tenders and similar approaches likely to be appropriate?	18
4.2 Increasing the benchmark or reserve price above valuations	18
4.3 Impact of increasing the benchmark price on the water market	19
4.4 Inclusion of a premium based on other justifications.....	19
4.5 Other options for improving market performance	20
4.6 Options where markets are not likely to perform	21
5 Conclusions and recommendations	23
6 References	25

Executive summary

- Recently several rounds of the water recovery tender have seen no bids priced below the benchmark. In large part this appears due to the benchmark price being low relative to the (rising) market price.
- Where there are active water markets it is unrealistic for a new purchaser to come in and secure large volumes of water at or below the currently prevailing market price.
- Where large volumes of water are sought and there are many potential sellers, a single competitive tender in which the price is determined by the bids received would offer a cost effective mechanism consistent with general public sector procurement principles.
- A reserve price should be used which represents the purchaser's absolute maximum willingness to pay for water entitlements. One perspective on this is that the purchaser should feel no regret if a tender results in no water is acquired because they would not be willing to pay more than the reserve they set prior to the tender.
- Setting a 'benchmark price' based in part on estimates of the estimated market clearing price is not consistent with the normal use of a reserve price, and appears intended to provide a safeguard against insufficient competitive pressures in the tender process.
 - Using such a 'benchmark price' as a reserve price risks a genuinely competitive tender process failing to achieve its objectives, including situations where the tender fails to procure water at a price lower than the purchaser's willingness to pay, and particularly in contexts where prices are rising, or expected to rise.
 - In situations where the true reserve price is likely to be below the current market price serious consideration should be given to not proceeding with a tender process, and the associated implementation costs.
- The report identifies several options for enhancing competition, while also promoting participation. These include:
 - To ensure bids are competitive, sellers should not be afforded repeated opportunities to submit bids (through rolling tenders or repeated tender rounds), as it facilitates strategic bidding and inflated prices and the format essentially positions the Department the price maker in the wider market when purchases occur. Announcing a non-binding benchmark price (set in part on historical market prices), while also applying a binding reserve price that is not disclosed, could mitigate price expectations of participants (but will still be a price maker role in the short run). The incentive effects of revealing the benchmark price could be managed by also announcing that the tender will only purchase X% of the volume of water offered at or below the reserve price. This would allow the Department to purchase some water above the benchmark price (but below the reserve) in situations where it receives no bids below the benchmark, while providing a strong incentive for bids by entitlement holders willing to sell at or below the benchmark price.
 - Running once-off (or long delays between repeats of) tenders for different entitlement classes would enable the program to be implemented in stages without allowing

COMMERCIAL IN CONFIDENCE

individual bidders multiple bidding opportunities. However, every effort needs to be made to ensure participation by eligible irrigators in each tender.

- Options for reducing bid prices include minimising transaction costs compared to the open market (particularly by removing the need for irrigators to use brokers), and increasing landholder flexibility by measures such as allowing bidders to nominate a transfer date up to two years into the future (allowing better management of on-farm adjustment and investment).
- For regions and/or entitlements of which the government requires small amounts of water relative to the volumes traded on the open market, making opportunistic purchases on the existing market is likely to be the best strategy with lower administrative costs and greater flexibility.
- For regions and/or entitlements where there are few potential sellers relative to the volume sought, a tender is not likely to be effective; and direct negotiation may be the most viable option (including bundled land and water purchases with the land sold on).

1 Introduction

1.1 A brief overview of Australian water markets

Markets offer a structured process for exchanging items of value and apply to a wide variety of commodities, goods and services in open economies. Water markets are structured according to the legal requirements to transfer either access or entitlements to water between agents (landholders, investors or others). Allocation markets effectively allow short term transfers of fixed volumes of water within a 'water year', while entitlement markets transfer an entitlement to a share of available water from a specified source into the future. These two markets interact with each other although we do not consider the effect of these interactions in this report.

Key features of markets relevant to water recovery¹ purchases include:

- **Short and long run market supply:** The flexibility available to potential market participants in the short run will be substantively less than that available in the long run. This translates into lesser quantities of water being available in the short run than the long run, as well as the supply curve being steeper reflecting higher costs of exiting or otherwise adjusting enterprises.
- **Parallel markets:** When a reverse auction (tender) is in progress landholders have at least four options available to them in the short term (or a mix of these):
 - Sell water entitlements to government through the tender process
 - Sell water entitlements through the open market
 - Hold water entitlements while selling allocations
 - Hold water entitlements to consume water allocations in farming activities
- **Strategic interaction between markets is expected across these options:** Water entitlement holders will weigh up the returns from these options in deciding which mix to pursue and over what time period (i.e. the short and long run supply curve difference).

In summary, water market participants are not forced sellers and so are able to consider the options available to them in the short and long term (so market trade valuation is not necessarily appropriate as we discuss later). Across much of the Murray Darling Basin where larger quantities of water are in use there is an established market price which typically acts as a floor for any sales, and government is not necessarily the preferred buyer (Zuo et al. 2015a).

1.2 Recent water market experience and its relevance

Water markets in some parts of Australia are now relatively mature, with long term trends in prices and volumes well apparent to participants. Recent experience in four water entitlement markets of interest in the southern MDB is shown in Table 1 and Figures 1-1 to 1-3 to illustrate the discussion that follows. The attributes of water supplied and its potential use for water traded in these markets varies substantially which is reflected in prices, volumes and numbers of trades. For example, more than ten times as many trades have occurred in the Victorian Murray below Barmah (high reliability) as in the Murrumbidgee (general security), but the total volume of water

¹ Note that while water recovery focuses solely on purchase of entitlements the management of eFlows might contemplate trade in allocations.

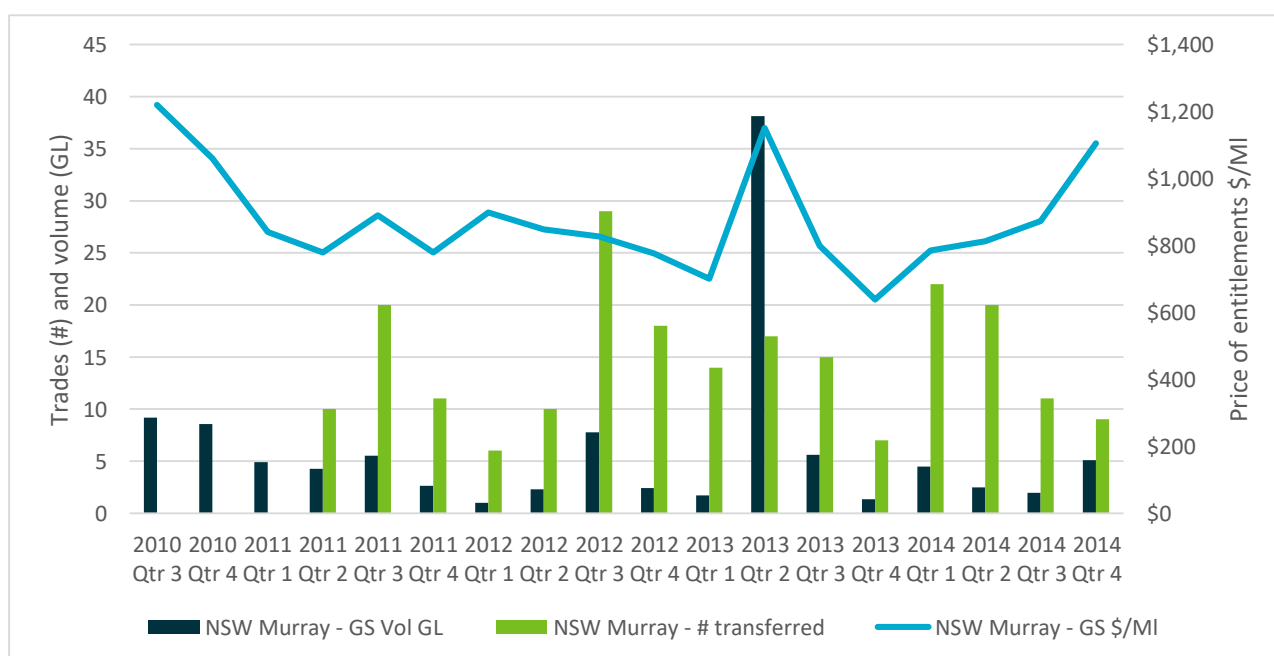
COMMERCIAL IN CONFIDENCE

traded is similar. Also apparent is the price variability over relatively short periods – for example prices have been increasing in all markets over recent periods.

Table 1: Average trade history from September Qtr 2010 to December Qtr 2014 (GS = general security; HS = high security).

Entitlement type	\$/MI average	Av Qtly MI trade	Trades / quarter	Average MI / trade*	Total MI traded	Total trades
NSW Murrumbidgee GS	873	12,437	15	924	223,861	222
NSW Murray GS	877	6,068	15	395	109,219	219
NSW Murray HS	1,811	2,152	12	183	38,734	186
Vic Murray below Barmah	1,662	12,924	169	66	232,625	2,538

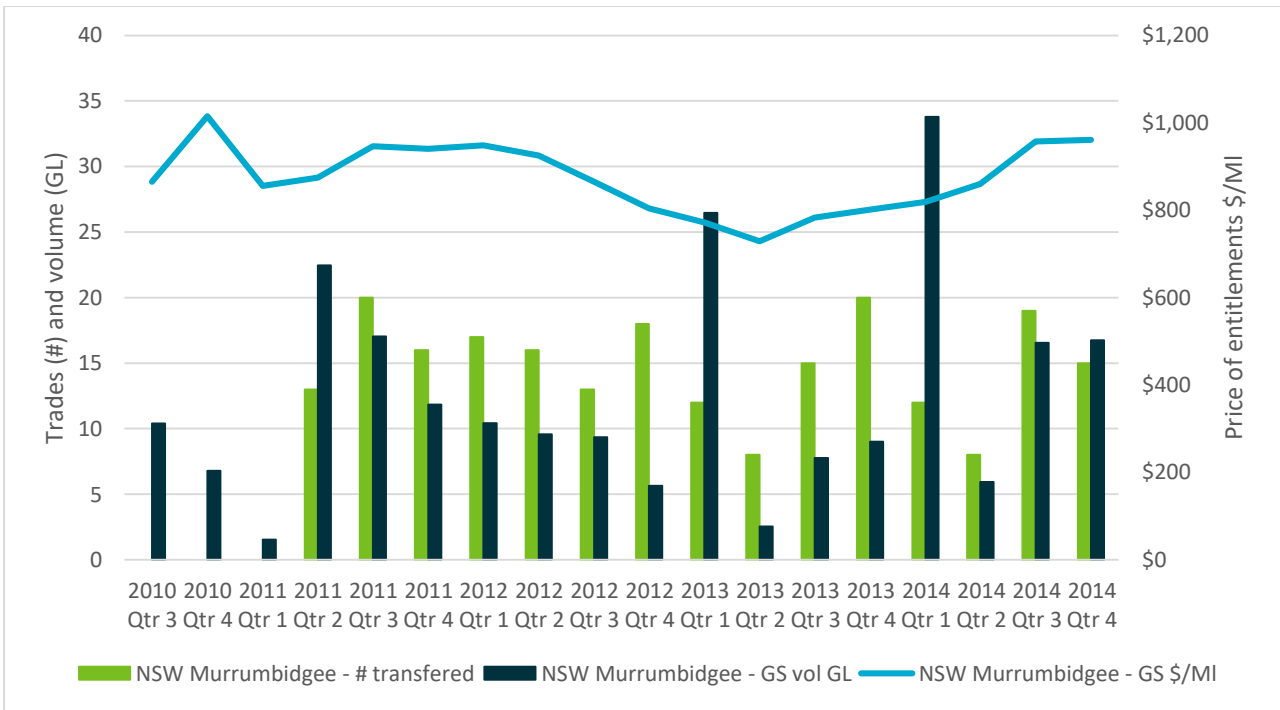
* Data on the number of trades is only from March Qtr 2011 to December Qtr 2014 and average MI per trade reflect trades in this period.
 Source: Compiled from <http://www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/market-price-information>



Source: Compiled from <http://www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/market-price-information>

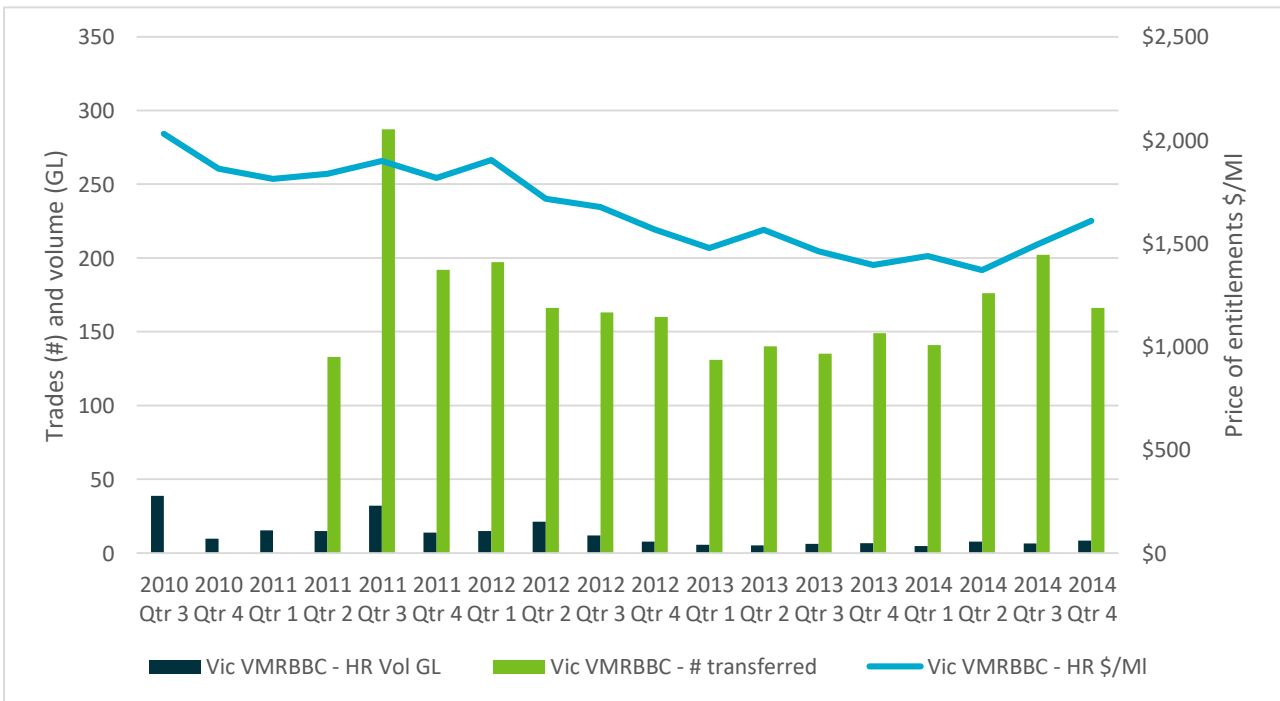
Figure 1-1: History of water prices and trades in NSW Murray (General Security)

COMMERCIAL IN CONFIDENCE



Source: Compiled from <http://www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/market-price-information>

Figure 1-2: History of water prices and trades in NSW Murrumbidgee (General Security)



Source: Compiled from <http://www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/market-price-information>

Figure 1-3: History of water prices and trades in Victorian Murray below Barmah (high reliability)

Importantly similar diagrams cannot be drawn for all ‘markets’ of interest because in many markets there are periods in which no trades take place.

2 Water recovery experience

2.1 Relationship between benchmark prices and water market

Benchmark prices are used to indicate the maximum the government is willing to pay in a tender. That is, benchmark prices are forming the role of the reserve price (see Box 1). Benchmark prices are set in part based on a valuation of the water entitlements sought in the relevant tender. We have been advised that the general instructions for estimating water entitlement valuations (given to a registered valuer) are:

“provide a single value and range on the current value of water. The analysis would include information relevant to the value of water such as data on historical trades, trades of comparable water entitlements, analysis of property sales, factors affecting the productive capacity of the landscape, tradability of the water product, opinion on the current value of water in the absence of trade data and types of agricultural products in the region, and factors currently influencing the market for these products, plus any other factors considered to be relevant.”

Box 1: Reserve and benchmark prices

Benchmark price: An estimate of the long-term value of water prices taking into account the various use options available, market history and likely trajectory, and other factors as deemed relevant.

Reserve price: In a procurement tender the reserve price is the maximum amount that the government is willing to pay to recover water in the market. It may be guided by (amongst other things) the lesser of cost of water recovery in other locations or through other mechanisms such as infrastructure and the environmental values that are generated from recovered water. There may also be other willingness to pay considerations identified such as the appearance of paying very high prices for water.

These instructions are effectively to identify a single value for each entitlement type that would broadly be expected to be the prevailing price in a market, and a likely trading range. In a rising market, as has recently been the case, the resulting benchmark prices have mostly been below reported trading prices. For example, recent prices for Murray (general security) water have been above the benchmark price (Table 2).

Table 2: Recent benchmark prices for water recovery tenders and average trade prices in the open market.

Entitlement type	Round 25		Round 31		Round 34	
	Benchmark	Qtr Ave	Benchmark	Qtr Ave	Benchmark	Qtr Ave *
NSW Murrumbidgee GS	\$830	\$783	N/A	\$860	\$975	\$961
Murray GS	N/A	\$799	\$830	\$813	\$830	\$1,105
NSW Murray HS	\$1,760	\$1,715	\$1,760	\$1693	N/A	\$1,941

* Dec Qtr 2014 used as more recent data not yet available.

Source: Compiled from <http://www.environment.gov.au/water/rural-water/restoring-balance-murray-darling-basin/market-price-information> and data supplied by the Department of the Environment.

COMMERCIAL IN CONFIDENCE

In seeking best value for money the department is essentially setting a benchmark (reserve) price at around current market prices and then only purchasing offers at or below that price. However, irrigators are likely to see the water market as a fall-back option and therefore offer a higher price in the tender (there will of course be some exceptions). For example, in round 31 the average offer price in the Murray (general security) was \$975 (weighted) compared to an average water market price of \$813 and a benchmark of \$830. Prices paid in the water recovery tenders will also influence prices in the open market. Irrigators are likely to be aware of the average prices announced after each round (and also that the maximum or reserve price will be higher given it is a 'pay-as-bid' discriminatory price tender), which will in turn influence the price at which they are willing to trade on the open market.

2.2 Impact of demand on water market prices

The quantity of water sought in water tenders will certainly impose upward pressure on prices in the open water market. For example, the volume of water offered in round 25 for Murrumbidgee (general security) was three times the actual volume traded on the open market in that quarter.

An alternative way of looking at the relative influence on supply is to consider the volume of water recovered as a proportion of total trades. Although we do not have data across the basin for the entire period of the "Restoring the Balance" program we note that in the Murrumbidgee (general security) total water recovery purchases in tenders are 84% of trades July 2010 through December 2014, in the Murray (general security) 182% and Victoria below Barmah (high reliability) 74%.² That is, volumes of water recovered through the tenders (over an eight year period) are at least at similar levels to the volumes traded on the open market over the last five years in these sub-basins. Total trade over this period (assuming no repeat trades) is around 10% of the entitlements in the Murrumbidgee. Cheesman and Wheeler (2012) report that approximately 25% of total volume traded between 2007 and 2011 was to the Commonwealth and 15% of irrigators sold water to the Commonwealth.

In accessing such relatively large volumes of water from the market it must be accepted that water recovery purchases will influence the market – particularly in the short run. A price premium will need to be paid which is valid for the quantity extracted. This price may be markedly different to that previously set in the market itself because of the impact on short run supply curves. That is, accessing larger amounts of water than is normally traded will require a price higher than is normally paid, and this in turn will influence ongoing trades in the open market. Over the longer term these impacts will wane through the ongoing process of change in the industry.

2.3 Other sources of price advice

There have been two relatively recent papers by the same team (Zuo et al. 2015a,b) examining the prices at which landholders would be willing to sell their water. The first of these examines landholder willingness to accept water prices and leave the industry. The assumption around leaving the industry is relatively restrictive as many landholders indicate they have sold water to

² Water recovery began before 2010, however this data still suggests that the price advice data excludes water recovered through tenders, although a notes in the PSI Delta reports suggests these would be included in trade data.

COMMERCIAL IN CONFIDENCE

the Commonwealth but remained in the industry (Cheesman and Wheeler 2012). The proportion of respondents willing to exit at different prices as estimated by Zuo et al. (2015a) is shown in Figure 2-1. While different water types cannot be distinguished, the large price range suggests a substantive premium is required for many landholders to exit (which would indicate the value in use of their water entitlement is substantively higher than current market prices). Zuo et al. (2015b) suggest the required premium is between 81% (Vic) and 174% (NSW); the estimated long-run supply curve estimated is shown in Figure 2-2.

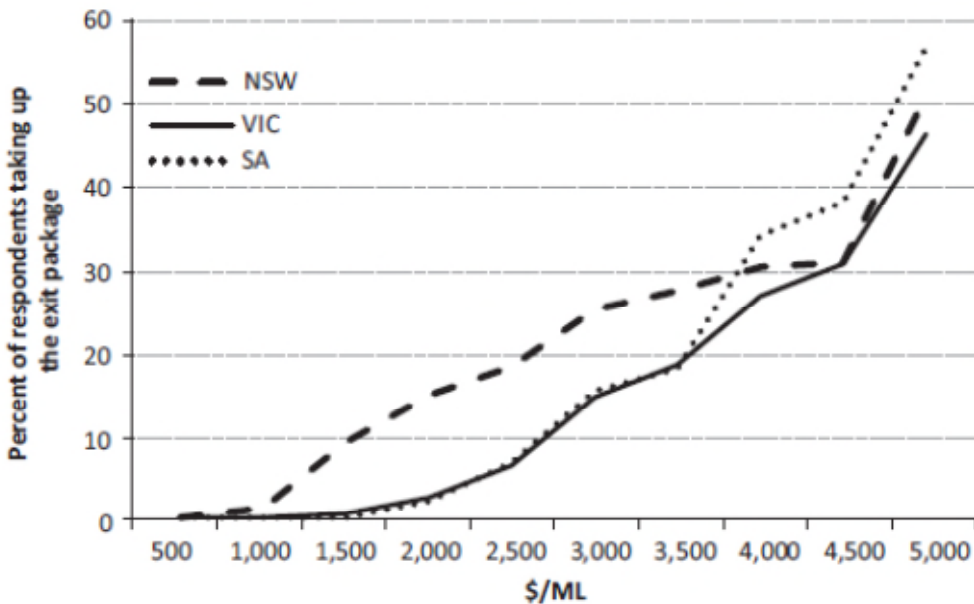


Figure 2-1: Water prices at which landholders indicate willingness to exit industry. (Source: Zuo et al. 2015a, Figure 2).

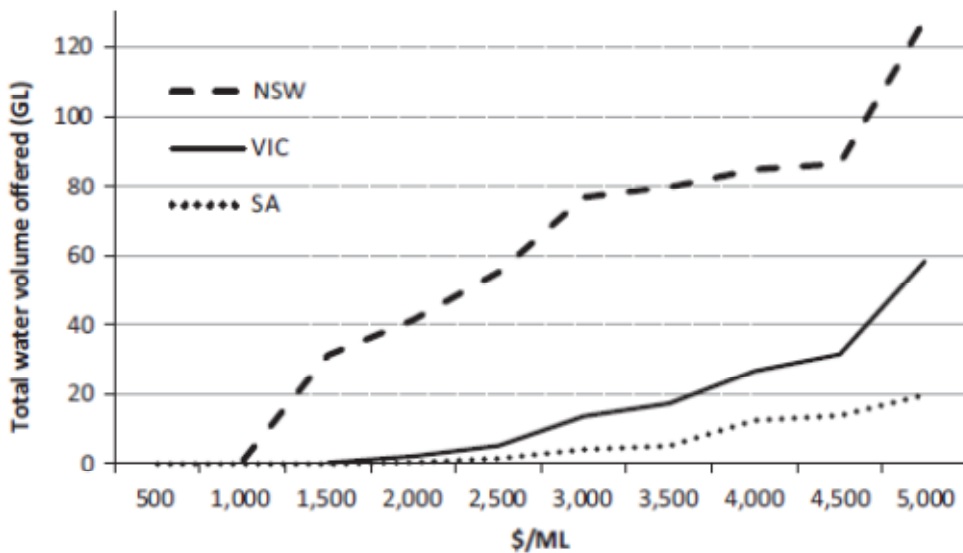


Figure 2-2: Total volume of water entitlements offered for sale in the form of an exit package (Source: Zuo et al 2015a, Figure 3)

The other paper by Zuo et al. (2015a) combines survey and market data to examine the supply response to changes in market prices (price elasticity). They find that water entitlements tend to be price inelastic which means that the amount supplied to the market does not change

COMMERCIAL IN CONFIDENCE

significantly in the short run in response to price changes. High security and general security allocations are relatively similar but much less price inelastic in supply than low security water. Allocations are however price elastic. This reflects the difference in flexibility to adjust a portfolio of entitlements over short-run water use. Zuo et al. (2015a) further suggest this supports acquiring water across a period of time. Zuo et al's research suggests that, while some entitlements may have been purchased in early rounds at relatively low prices, further purchases are likely to prove increasingly expensive.

3 Water recovery tender issues

Data from rounds 25 (August 2013), 31 (April 2014) and 34 (April 2015) in the Murray and Murrumbidgee indicate that participation rates remained similar, with 36, 29 and 41 bids respectively received. Bid prices increased across these three rounds, particularly in round 34. Eight bids were accepted in round 25, but none in rounds 31 and 34 as all bids were priced above the benchmark. However, as described in section 2.1, prices in the open market were also rising over this time.

3.1 Factors influencing participation

What factors are likely to influence water holder's willingness to sell to government?

We preface this section by noting that a significant report has already been undertaken in this space by Marsden Jacobs and Associates (Cheesman and Wheeler 2012). Sarah Wheeler and colleagues have published several papers from that study and others (see for example Wheeler et al. 2010; Wheeler et al. 2013; Wheeler et al. 2012; Wheeler and Cheesman 2013). We do not attempt to review those papers in detail here.

It is certainly possible that some water holders may be reluctant to sell water to the government, given it is to be taken out of the agricultural production system. However, many tenders have seen good participation over repeated rounds. Nor are the current issues primarily due to participation; the main problem is that prices are tending to come in on the high side compared to the benchmark (reserve) price. The lack of successful bids may, however, reduce participation in future rounds as the tender process gains a reputation for being difficult to succeed in.

The Commonwealth water recovery tenders are operating in parallel to the existing open market for entitlements and annual allocations. Holders of water entitlements always have the option to sell in the open market, so a government tender does not offer a unique opportunity (unlike most other environmental market-based instruments). To be attractive to water holders a one-off tender must either offer higher prices, the opportunity to sell larger volumes, or lower transaction costs than the existing market.

Transaction costs in the open market are in the order of 3% (see Allen Consulting 2006), representing a significant impost on traders. Lower transaction costs are a potential advantage of a government purchase process. However, in previous years the majority (60%) of irrigators used brokers in the tender process, so the transaction costs are likely to be similar (Cheesman and Wheeler 2012). Encouraging more irrigators to submit bids themselves online could reduce transaction costs, and potentially bid prices. Selling water entitlements may in some cases result in additional costs, such as exit fees from irrigation cooperatives, in the southern basin in particular. However, most irrigators sell only a portion of their entitlements and do not exit the industry (Cheesman and Wheeler 2012).

Bidding behaviour will be determined by irrigators' perceptions of the current and future market price of water. The entitlement market is relatively thin in many settings (i.e. the number of trades and the proportion of total water volumes are both small), and information is limited, so participants will have imperfect knowledge of the true market price (which can only be estimated). Other programs will also play a role in irrigators' price expectations – for example, there have

been a number of programs combining water use efficiency improvements with water acquisition. The prices received by irrigators in these programs have often been higher than water trade prices in \$/ML terms, which would be expected to signal that Government willingness to pay is higher than market prices, and may also reduce irrigators' willingness to participate in regular water recovery tenders.

Many bidders may therefore be inclined to seek a price premium from the water recovery tenders. This is exacerbated by the discriminatory-price (pay-as-bid) format, along with the rolling tender framework and the expectation of further rounds in the future. The discriminatory price mechanism means irrigators have to build their own profit element into their bid, rather than revealing their true cost. If there are likely to be subsequent tender opportunities, a strategic bidder may choose to err on the high side. If their price is too high they can reduce it in a subsequent submission period; if their price is too low their water will be sold and they have no further opportunities. The rolling tenders employed recently in the water recovery program make it particularly easy for irrigators to resubmit modified bids, which would be likely to further encourage such strategic behaviour.

3.2 Impact of revelation of purchase prices and willingness to pay

How would revealing the AG's purchase prices influence the water market?

Revealing previous prices will influence bidding strategies in future rounds. In this type of tender, bidders are uncertain about the level of competition (i.e. the quantity and prices of other bids), and the maximum price the purchaser is willing to pay. Expected competition from other bidders will reduce prices. However, if the purchaser is known (or believed) to have a large budget, and to be seeking a large quantity relative to the likely number of bids, then the key parameter is the purchaser's maximum price.

In practice bidders in the water recovery tenders are not competing against each other. The program budget is sufficient to purchase all the water offered during the early stages of the program (or early submission rounds in the southern basin). This means that bidders are essentially competing only against the benchmark (reserve) price. In the rolling auction format recently employed the government the government is essentially the price maker when it is purchasing (and the market remains the price maker when no purchases are made). Revealing the average price paid provides information on the level of the benchmark – bidders can assume it would have been higher than the average prices paid in the past (which are easily available on the Government's website), but are uncertain by how much. (Given the accepted bids in round 25 were close together they may over-estimate the benchmark from the average).

As discussed above, in repeated discriminatory-price tenders, rational bidders will bid high initially, as they have the opportunity to drop their price in later rounds. If the unknown benchmark is close to the announced average it is likely that many may be prompted to bid too high. At the very least an announced benchmark price is likely to act as an anchor (both in the tender and the wider market in the short run), with future bidders unlikely to bid significantly lower. The situation is further complicated as the benchmark price changes between rounds based on estimates of market movements. Previously announced prices will still be used as a guide by bidders, but the information is incomplete, and potentially inaccurate. Bidders may end up bidding against an inaccurately assumed benchmark, resulting in over-priced bids which benefit no one.

COMMERCIAL IN CONFIDENCE

Revealing the average price paid would be likely to motivate participation if it is high relative to the prices on offer in the ongoing private market. Setting the benchmark price close to estimates of the current market price mean that is unlikely to motivate participation in this program.

Would revealing the AG's willingness to pay improve the liquidity and success rate of AG water tenders?

Given the scale of the program (and its discriminatory price format), announcing the benchmark price prior to a tender would make it very unlikely that any bids would come in priced significantly lower. However, given recent experience in the tender, in which there are relatively small price spreads amongst competitive bids, this strategy may have merit.³ Bidders currently appear to have price expectations that are higher than the actual benchmark, resulting in large numbers of unsuccessful bids (and transaction costs incurred by all parties). Revealing the benchmark price could at least avoid this problem, though if the benchmark price is too low to be attractive few bids will be received. It could also be helpful where expectations were erroneously low, resulting in low participation (though this does not appear to be the case here).

Noting that the benchmark price is currently used as the reserve price, announcing the benchmark price also avoids the problem of maintaining the security of a piece of information which could potentially be very valuable to bidders. Significant probity issues would arise if some bidders had access to such highly sensitive market information prior to the tender. If the price is to be kept secret, there is a case for determining it after the tender has closed, immediately before the bids are opened, so there is no information which could be released unintentionally (or otherwise) to potential bidders.

Note that this advice does not apply to the use of a 'reserve price' which is higher than the 'benchmark price' as currently applied.

Would the public release of the AG's water purchasing budget be expected to motivate competitive behaviours from willing sellers?

If the overall budget is large, revealing it would be expected to boost participation as potential bidders can see they have a good chance of succeeding in the tender. However it would not necessarily boost competition among sellers if the budget is likely to be larger than the value of bids received. As discussed above, sellers would primarily be competing against the benchmark price (assuming it is unknown). An expectation that money will run out, and/or there will be limited future opportunities in the tender, would motivate seller participation and competition. An alternative format is to clearly identify a quantity purchase target (i.e. a target based tender). Both approaches should not be combined because the desired price is then clearly revealed (quantity divided by budget).

Would there be any detrimental impacts to the market if the AG reveals its willingness to pay?

As discussed above (and noting that maximum willingness to pay would form a reserve price above the benchmark price), revealing willingness to pay is likely to provide an anchor for bid prices, particularly with repeated discriminatory-price tenders and a large budget. It is likely that

³ Early water recovery tenders achieved much larger degrees of price discrimination than have been observed more recently as water entitlement holders become more familiar with water markets and the options available to them.

COMMERCIAL IN CONFIDENCE

most bids would be priced at or just below the willingness to pay (or would not be submitted at all if, as appears likely, the maximum willingness to pay is too low). While this may not secure the lowest possible prices, it may be a better outcome than having all bids priced rejected! However, provided maximum Government willingness to pay is set at a reasonable level (and irrigators don't have erroneously high expectations of it), revealing this is not recommended.

4 Discussion of variation in purchase strategy

4.1 Where are tenders and similar approaches likely to be appropriate?

Tenders and other market-based instruments are most appropriate where there is heterogeneity among market participants (i.e. they have different costs or values for the resource) and information asymmetry (i.e. costs and values are not known to everyone). Markets work by revealing privately held information about the costs and values of the various participants, expressed by their willingness to trade at different prices. Competition is essential for the market mechanism to function; without it participants have no reason to reveal their private information (i.e. sellers will overstate their costs and buyers will understate their values).

In the case of water recovery tenders there is clearly a degree of heterogeneity, as irrigators have different private values for water (see Zuo et al. 2015a,b). Information asymmetry is limited in much of the basin, as values for water have been established over many years in the existing water markets – even where trade is relatively thin. Given the existence of an ongoing water market, the first option for a buyer would be to purchase entitlements through that market. However, if the volume of water required exceeds the volumes typically traded a tender may be used to seek a one-off boost to supply (though as discussed above, most sellers are likely to be seeking prices above those observed in the ongoing market).

4.2 Increasing the benchmark or reserve price above valuations

Should the Government increase its benchmark prices above independent valuation prices in order to encourage participation, and if so, to what extent?

In a competitive market, the observed market price is valid only for the current supply and demand schedules of market participants (it is the point at which they intersect). The emergence of a new buyer, seeking large quantities relative to the amounts currently being traded, will inevitably push up prices in catchments where water has sufficient scarcity value to be traded in the first place.⁴ Therefore a large scale procurement program will need to offer prices above the current market equilibrium.

The benchmark price applied in water recovery tenders is close to the current market price, in the absence of significant additional demand represented by the tender, which means that in a stable market the Government is essentially attempting to purchase large quantities of water below the prevailing price. The basic economic principles of supply and demand functions indicate this strategy is unlikely to succeed. While there may be some willing sellers at lower prices, once they have sold out future supply will be at a higher price. This problem might be mitigated in markets with falling prices, but is exacerbated in markets with observed or expected increases in price – if the market price of water is falling, a benchmark price set some time earlier may become competitive (albeit contrary to its stated aim); if prices are rising it will prove too low. Most water markets currently have rising prices.

⁴ Unless the supply curve is flat and perfectly elastic unlike the water supply inelastic curve estimated by Zuo (2015b)

COMMERCIAL IN CONFIDENCE

Determining how high the price should be is difficult in the absence of complete information about private values for water. A good market-based instrument can reveal the minimum required price, provided there are sufficient bidders to make it competitive. In an ideal world, such a program would employ a single, large scale uniform price tender which would establish and pay the market price for the quantity of water required. There may be a secret reserve price to ensure the purchaser does not end up paying prices it considers too high, in the event that competition is limited (due to low participation or collusion), or seller costs prove higher than anticipated.

Of course in practice achieving such high levels of participation is not straightforward (though should not be insurmountable, particularly if irrigators know this is their only such opportunity). The situation is also complicated by the diversity of water entitlements.

4.3 Impact of increasing the benchmark price on the water market

What impact would increasing the price above the independent valuation prices have on the water market (in the short and long terms)?

As discussed above, the presence of a large purchaser in the market can only impose upward pressure on prices, particularly if that purchaser is willing to pay more than current market prices. Private buyers and sellers will include the possibility of selling to the government in a future tender in their valuations of water. This could be considered not so much a distortion of the market, but rather a natural response of the market to the increase in demand. Unlike other market interventions, there should not be significant deadweight losses. Including flexibility (within reason) of the timing of effective transfer of water would likely minimise both transaction and any minor deadweight losses. The market impact will only last while the program is running (though retiring water entitlements can only increase the market price of those remaining due to overall scarcity). Once the program is complete, and there is no prospect of selling at a premium in a government tender, the price will return to equilibrium in the long term.

4.4 Inclusion of a premium based on other justifications

Should the government factor into its 'willingness to pay' a 'Compensating Variation', 'Equivalent Variation' or some other premium in response to the perception that purchasing for the environment reduces the consumptive pool for irrigation? If so, how would such a premium be calculated?

The water recovery program does reduce the consumptive pool. As discussed above, this will increase prices of remaining entitlements to some extent, to the advantage of those who hold them. This is not a 'problem' that would be addressed by paying even higher prices! Water recovery does mean that the costs of irrigation infrastructure will be spread over fewer entitlements, but this cannot be usefully addressed through increased payments to sellers.

Some irrigators may be liable to pay exit fees to irrigation groups if their entitlements are sold and retired, which would increase the price they are willing to sell at. The purchaser could offer to pay any exit fees in addition to the water purchase price. However, the cost to the purchaser of these fees would need to be included in the evaluation of bids in order for the buyer to identify and secure the best value bids. This strategy might also lead to irrigation groups increasing their exit fees. Alternatively the program could use a price premium to account for exit fees and other related costs. This would require a great deal of information, most of which is unlikely to be

readily available. However, the point of running a tender is to overcome such information asymmetries and establish the price at which irrigators are willing to sell, otherwise a fixed price scheme would be more appropriate. Therefore, there is no substitute for a genuinely competitive tender to reveal and account for such issues, though the buyer will need to set the reserve price at their absolute maximum willingness to pay, rather than using a benchmark price which is attempting to second guess the market.

4.5 Other options for improving market performance

Tenders, like all other market mechanisms, require competition. A significant issue in large procurement programs is that the available budget may be sufficient to fund all bids in any given tender, which means there will be minimal competition among bidders. As discussed above, this is exacerbated by the repeated tender rounds and discriminatory price format. The alternative uniform price format, in which all sellers are paid the same price (set at the level of either the highest accepted or lowest rejected bid), is in theory a more incentive compatible mechanism.

Under the uniform price bidders do not stand to benefit from strategically inflating their bid price above the minimum they would be willing to accept. However, it only works if sellers understand this (economic experiments show that many people still try to game it, even though they shouldn't!). And in situations where the available budget exceeds the number of acceptable bids, the uniform price would end up being the benchmark/reserve price (so all bidders would get the benchmark price). While this would reduce the pitfalls of sellers attempting to price bids just below their best guess of the benchmark price (and all too often going too high), it does little to maximise value for money. In practice it is likely that this would be equivalent to a fixed price purchasing scheme (which given the well-known nature of the commodity, may be a reasonable way to proceed, without the complications of running a tender).⁵

These problems could be mitigated by limiting the budget available in any given tender round in order to engender competition among bidders. However, if bidders know there will be further opportunities in the future the competition is unlikely to be serious. Ensuring there is uncertainty about if, and when, there will be future tender opportunities is important in reducing strategic bidding (as a seller who misses out due to bidding too high may not get another chance). Participation is therefore crucial, but bids need to be independent and competitive. 'Consortium bids' should be avoided; as Adam Smith (1776) wrote: "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

Another option is to adopt the mechanism used in the Emissions Reduction Fund of accepting no more than X% (e.g. 80%) of bids that come in at or below the reserve price. This forces a degree of competition among bidders, as by definition not all can succeed even if they beat the benchmark. Again there would need to be limited or uncertain future opportunities in the tender, otherwise bidders need have no fear of missing out. This would afford the opportunity to set a relatively high reserve price as it is less likely to be reached in the tender.

⁵ There are also other auction design formats which may be appropriate in particular settings which we do not introduce for reasons of brevity.

COMMERCIAL IN CONFIDENCE

The program might also consider delaying the transfer of entitlements, for example by contracting to acquire the water rights in two years' time (or to select when entitlements are transferred from a set menu). This would give irrigators more time to adjust, for example through developing infrastructure or investing in new equipment (or making retirement plans). Offering such flexibility should shift the supply curve from the steeper short-run curve towards the flatter longer-run curve. Having a contract in place might also assist with securing or maintaining finance for on farm or other adjustment activities. Another option is for governments to share risk by part payment of a future price rise.

4.6 Options where existing reverse auctions are unlikely to perform well

Markets depend on competition. If there are very few potential sellers, a market-based instrument is unlikely to be effective. This may be the case in some regions for the water recovery program, where the ongoing market is extremely thin and the Government is seeking significant volumes of water. Most entitlement markets in northern NSW and Southern Queensland have very few trades – even where there may be a large number of water licence holders (e.g. there have been just 19 trades since 2010 in the Gwydir System). In such circumstances alternative approaches such as expressions of interest and direct negotiation would be worth considering. Where land and water are typically bundle a combined purchase may be optimal with land sold on.

Conversely, if the Government is seeking to purchase small quantities of water relative to the volumes typically traded on the open market there may be no need to run a separate tender process. Here a buyer may be better served simply engaging one or more brokers to make the requisite purchases on its behalf. A synopsis of the options available is shown below in Figure 4-1. Generally the more sellers required and the larger the pool of entitlement holders the more appropriate a market-based approach such as a tender. Where less water is required from fewer sellers either purchase from existing markets or negotiate with individuals. What is not shown is the implication of a larger proportion of water recovery requirement with many potential sellers – which may become difficult or expensive using a tendering approach. In such settings other variants may be required.

COMMERCIAL IN CONFIDENCE

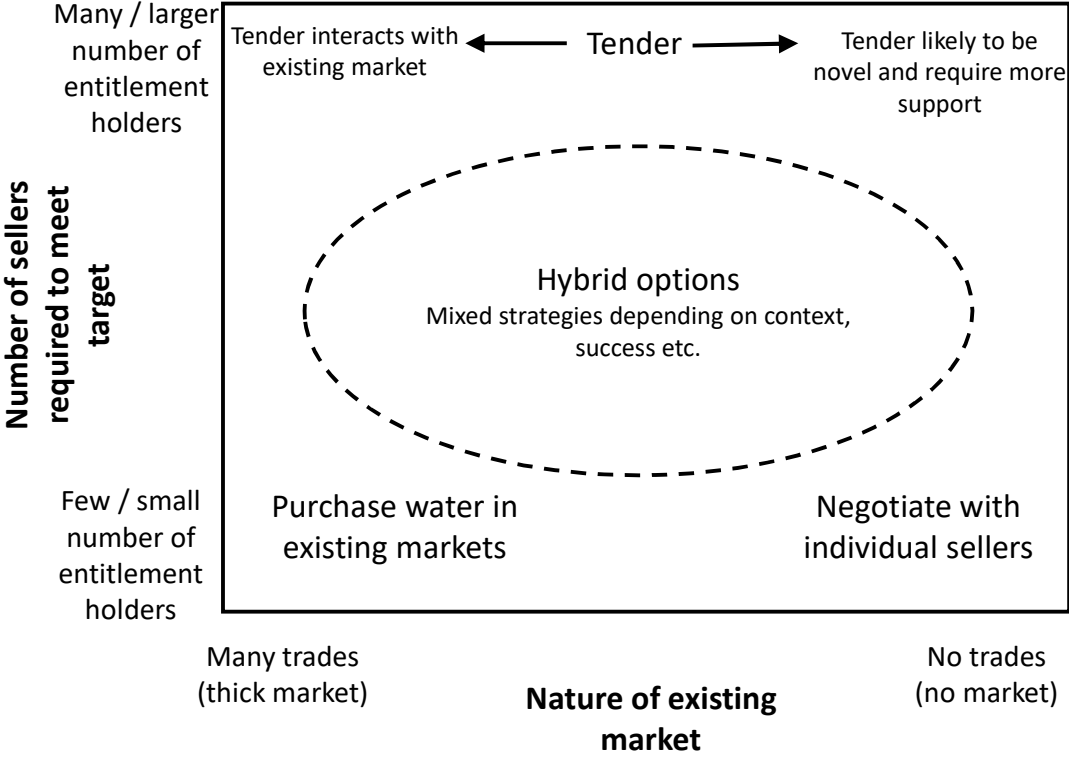


Figure 4-1: Synopsis of main water recovery options available and market context

5 Conclusions and recommendations

Recently a number of rounds of the water recovery tender have not succeeded in purchasing water entitlements from irrigators. The program is being run as a market-based instrument in the form of a competitive tender. In a true market-based process the forces of supply and demand are allowed to determine the price (though safeguards such as a reserve price may be used in case the anticipated competition fails to materialise). However, the water recovery tenders are overlaid by a benchmark price that is applied as a reserve price, which is set based in part on the current market price and requires purchases to be made at or below this price. This benchmark price is unlikely to be the maximum price the government is willing to pay.

Unlike most other environmental commodities, most water (both entitlements and allocations) are traded in an open and competitive market, and its values are increasingly well known to irrigators and others. This means a government purchase program is far from the only show in town for those wishing to sell. It is therefore unlikely to be realistic to expect to purchase significant volumes of water at or below the current market price. The laws of supply and demand that apply to this market indicate that a major increase in demand (in this case from the water recovery program) will lead to an increase in price (the magnitude of which will depend on the shape of the supply function). It is therefore recommended that the benchmark price not be applied as a reserve price to future tender rounds.

Provided there are a sufficient number of potential sellers, a single competitive tender is the recommended mechanism to secure large volumes of water – provided measures are included to flatten the relatively steep short run entitlement supply curve. Given the scale of the program, a single tender may be logistically difficult. Instead the program could run a series of single tenders for each major entitlement class. The tender would offer holders of those entitlements a once-off opportunity to sell to the Government. Subsequent tenders would focus on different entitlements and/or different areas. Allowing sellers repeated opportunities to submit bids, whether through a rolling tender and/or multiple tender rounds, is not conducive to competition, as there is always another chance if they price their bids too high. While future tenders may not be ruled out entirely (e.g. it may be necessary to return to some regions to purchase more), the prospect should be made as distant and uncertain as possible in order to motivate sellers to get serious.

In a truly competitive tender the market, through competing bids from sellers, will determine the price that needs to be paid to secure a given volume of water entitlements. However, ensuring such competition eventuates is not straightforward, particularly for a program seeking to purchase relatively large quantities of water. There need to be more bids than can be accommodated within the budget constraint. One way of ensuring this would be to allocate a discrete sum of the total funding to each entitlement tender (though perhaps retaining some flexibility to increase the budget if more bids than anticipated are received).

The department should still seek to understand current market conditions in order to assess value for money, so price estimates are useful. A reserve price is still recommended in case competition proves to be limited (which may occur due to limited participation, collusion, or other unforeseen events), but this should be well above the latest market price. Ideally the reserve should reflect the purchaser's absolute maximum willingness to pay. It may be useful to distinguish between a

COMMERCIAL IN CONFIDENCE

publicly revealed non-binding benchmark price, based on current market prices against which relative value for money can be assessed, and a binding reserve price.

There are advantages to the Department retaining some flexibility as to how many of the bids which come in under the reserve price to accept in any given tender. Examining the bid supply curve shows how they compare in terms of value for money, and judgement may be applied as to where to make the cut-off point below which bids are accepted. This can be based on comparisons with a market benchmark, prices for other entitlements, or the shape of the supply curve (for example, the cut-off point may be set before a sharp price rise). Such a process is still fair and transparent, as all bidders below the line are successful (and none above), but allows judgement to be applied to secure good value purchases across different tenders and entitlements.

A uniform-price tender is in theory more incentive compatible for sellers, as it means they do not stand to gain from strategically inflating their bid prices. However, if there are insufficient bids to exhaust the budget below the reserve price, a uniform price mechanism would result in all successful bidders receiving that price (while this may be disappointing to the purchaser, it is still a market-determined price). Judgements about the best pricing mechanism, and associated tender rules, will ultimately be determined by the specific context, and is likely to vary between regions and entitlements. For example, tenders in regions with established markets are likely to require less support than tenders in regions with very thin or absent water entitlement markets.

Where governments require relatively little water relative to total trades and existing markets are active these provide a suitable low cost alternative to the tendering approach.

Competitive tenders should not be pursued where irrigators are unlikely to offer more water than the government is willing and able to purchase. Here direct negotiation, or even a fixed-price offer, will be more appropriate. In some instances bundled land and water purchases may be required with land being sold on.

6 References

Allen, 2006. Transaction costs of water markets and environmental policy instruments. The Allen Consulting Group.

Cheesman, J., Wheeler, S., 2012. Survey of water entitlement sellers under the Restoring the Balance in the Murray-Darling Program, Final Report for the Department of Sustainability, Environment, Water, Population and Communities. Marsden Jacob Associates, Melbourne.

Commonwealth of Australia, 2014. Water Recovery Strategy for the Murray- Darling Basin.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations*, London: W. Strahan.

Wheeler, S., Bjornlund, H., Zuo, A., Shanahan, M., 2010. The changing profile of water traders in the Goulburn-Murray Irrigation District, Australia. *Agricultural Water Management* 97, 1333-1343.

Wheeler, S., Garrick, D., Loch, A., Bjornlund, H., 2013. Evaluating water market products to acquire water for the environment in Australia. *Land Use Policy* 30, 427-436.

Wheeler, S., Zuo, A., Bjornlund, H., Lane Miller, C., 2012. Selling the farm silver? Understanding water sales to the Australian Government. *Environmental & Resource Economics* 52, 133-154.

Wheeler, S.A., Cheesman, J., 2013. Key Findings from a Survey of Sellers to the Restoring the Balance Programme. *Economic Papers* 32, 340-352.

Zuo, A., Wheeler, S.A., Boxall, P., Adamowicz, W.L., Hatton MacDonald, D., 2015a. Identifying water prices at which Australian farmers will exit irrigation: Results of a stated preference survey. *Economic Record*, in press.

Zuo, A., Wheeler, S., Adamowicz, W.L., Boxall, P., Hatton MacDonald, D., 2015b. Measuring price elasticities of demand and supply of water entitlements based on stated and revealed preference data. *American Journal of Applied Economics*, in press.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

AT CSIRO WE SHAPE THE FUTURE

We do this by using science to solve real issues. Our research makes a difference to industry, people and the planet.

As Australia's national science agency we've been pushing the edge of what's possible for over 85 years. Today we have more than 5,000 talented people working out of 50-plus centres in Australia and internationally. Our people work closely with industry and communities to leave a lasting legacy. Collectively, our innovation and excellence places us in the top ten applied research agencies in the world.

WE ASK, WE SEEK AND WE SOLVE

FOR FURTHER INFORMATION

Land and Water Flagship

Dr Stuart Whitten
t +61 2 6246 4359
e stuart.whitten@csiro.au

Digital Productivity Flagship

Dr Andrew Reeson
t +61 2 6216 7323
e andrew.reeson@csiro.au