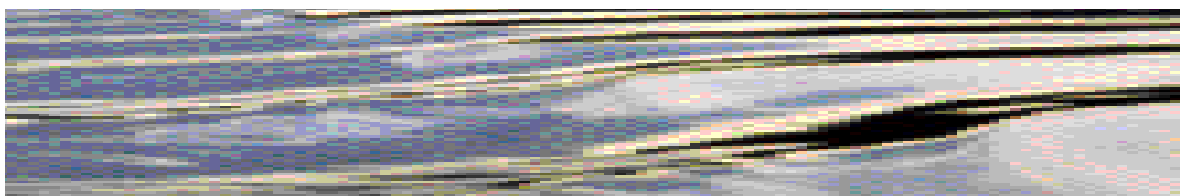
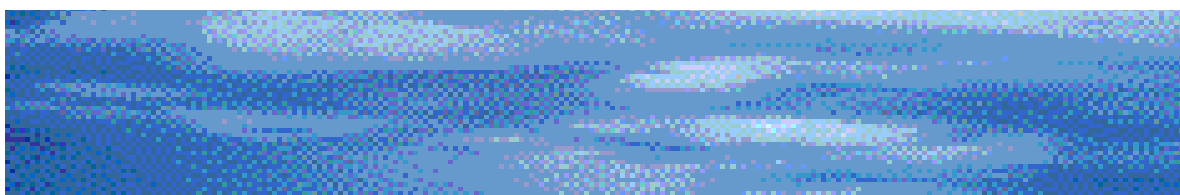


# **IRRIGATOR AND COMMUNITY ATTITUDES TO WATER ALLOCATION AND TRADING IN THE MURRUMBIDGEE CATCHMENT**

**TECHNICAL REPORT**  
**Report 01/1**

October 2001

**John Tisdell / John Ward / Tony Grudzinski**



# **Irrigator and Community Attitudes to Water Allocation and Trading in the Murrumbidgee Catchment**

**John Tisdell<sup>1</sup>, John Ward<sup>1</sup>, Tony Grudzinski<sup>1</sup>**

Technical Report 01/1  
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<sup>1</sup>Griffith University

## **Preface**

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The importance of efficient water allocations between productive, domestic and environmental uses cannot be overstated, particularly in the Australian context - the driest continent. This report addresses the much-overlooked side of policy development and implementation, namely: the social factors that both hinder and support the change. This report makes an important contribution to our understanding of how people are actually responding to the new conditions following the implementation of COAG reforms in the Murrumbidgee catchment. With several years since the introduction of tradeable water entitlements, this report provides a timely and insightful check on people's perceptions, understandings and acceptance of the new environment. It indicates a level of progress toward general acceptance, while also indicating a level of confusion and misunderstanding about how water markets should work.

John Tisdell  
Program Leader  
Sustainable Water Allocation Program



## Executive Summary

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This report presents the results of a National Program for Irrigation Research and Development (a Land and Water Australia Program) funded research project (Project GRU25) aimed at developing an understanding of irrigator and community attitudes to water allocation and trading. This document reports the findings of a survey of irrigators and community members in the Murrumbidgee catchment. The questionnaire elicited attitudes of irrigators and community members to the Council of Australian Governments (COAG) reforms, to temporary and permanent water trading, to the impact and future of water trading, to the role of the water authority in regulating the market, and to environmental issues.

The survey found that there is general agreement among the irrigators and community members that water reform is necessary, that rights to water should be separated from rights to land, and such rights should be traded independently. While irrigator respondents believe that sleeper and dozer licences should not be extinguished, the community at large feel they should. Irrigators also disagree with setting water aside for environmental use, while the community at large agrees with the notion. Irrigators are uncertain whether the reform process will lead to more secure water entitlements or higher reliability of supply. There is concern among irrigators that water markets have been established without well-defined property rights, and this has led to a lack of confidence in the water authority. Involvement in the reform process has been seen as very poor, with only 2.5% and 1.8% of irrigators and community members respectively feeling actively involved. 46.3% of irrigators stated they have been impacted by the CAP, while 7.6% of the community believe their business has been impacted. In prioritizing COAG reform objectives, ensuring a fair and just distribution of water is overall perceived as more important than maximising farm income, meeting natural flow requirements, or accounting for local town and community requirements.

The findings of the survey suggest that rules of trade and the allocation of water should be such that they promote the greatest happiness of the greatest number. From an institutional perspective, the definition of property rights, number of buyers and sellers, the conditions of and constraint on entry and exit to the market, and market knowledge are important determinants of a water markets performance in achieving the COAG reform objectives.

The number of buyers and sellers in part is determined by who has a right to trade. There is general agreement that the rights to trade should be open to irrigators (including sleeper licences that have not been used for over five years), local towns and communities for domestic use, and local industries who use water. There is support for restricting trade within channel systems when necessary to maintain infrastructure, when transactions impact on other water users, environmental flow objectives, and the economic viability of local towns and communities. There is similar widespread support for restricting trade when the conditions of trade or the resulting distribution of water is deemed unjust, and where a company enters the market solely as a speculator.

In theory, the role of the temporary market is to realize the opportunity cost of water on a season-by-season basis, and allow for surplus water and within season tradeoffs to be made. Provided the requirements underpinning market theory are achieved - including well-defined property rights<sup>1</sup>, a large number of buyers and sellers, sufficient market knowledge, and no third party impacts - temporary markets may provide a mechanism for achieving a Pareto optimal distribution of the available water supply within a given water year. To this end, there appears to be strong interest in selling surplus water. However, few sellers stated that they made trade decisions on the basis of the opportunity cost of water, and few are prepared to consider changing farm practices and using the market to maximise their return from their water. Buyers tend to purchase water to meet end of season waterings and overall shortfalls in water allocations. Overall, irrigators see traders

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<sup>1</sup>See Tisdell, J., Ward, J. and Grudzinski, T. (2000) *The development of water reform in Australia*, (in press).

in the future buying water: (a) prior to making a cropping decision; (b) should water become short; or (c) to acquire more secure water supplies. Selling will continue to be dominated by the sale of surplus water. Irrigators voiced concerns about the actions and roles of the water authorities and irrigation companies and their impact on trade. The main blockages to trade,

both perceived and actual, include a lack of information from their regulator<sup>2</sup> on of how markets operate, the definition of property rights, and market information.

Finally, the respondents see water markets playing a significant role in irrigated agriculture in the future, and will lead to an increase in overall farm income.

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<sup>2</sup>Irrigators obtain their water from the Department of Land and Water Conservation from river supplies or from private water companies if they are in designated irrigation areas.

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## **Acknowledgment**

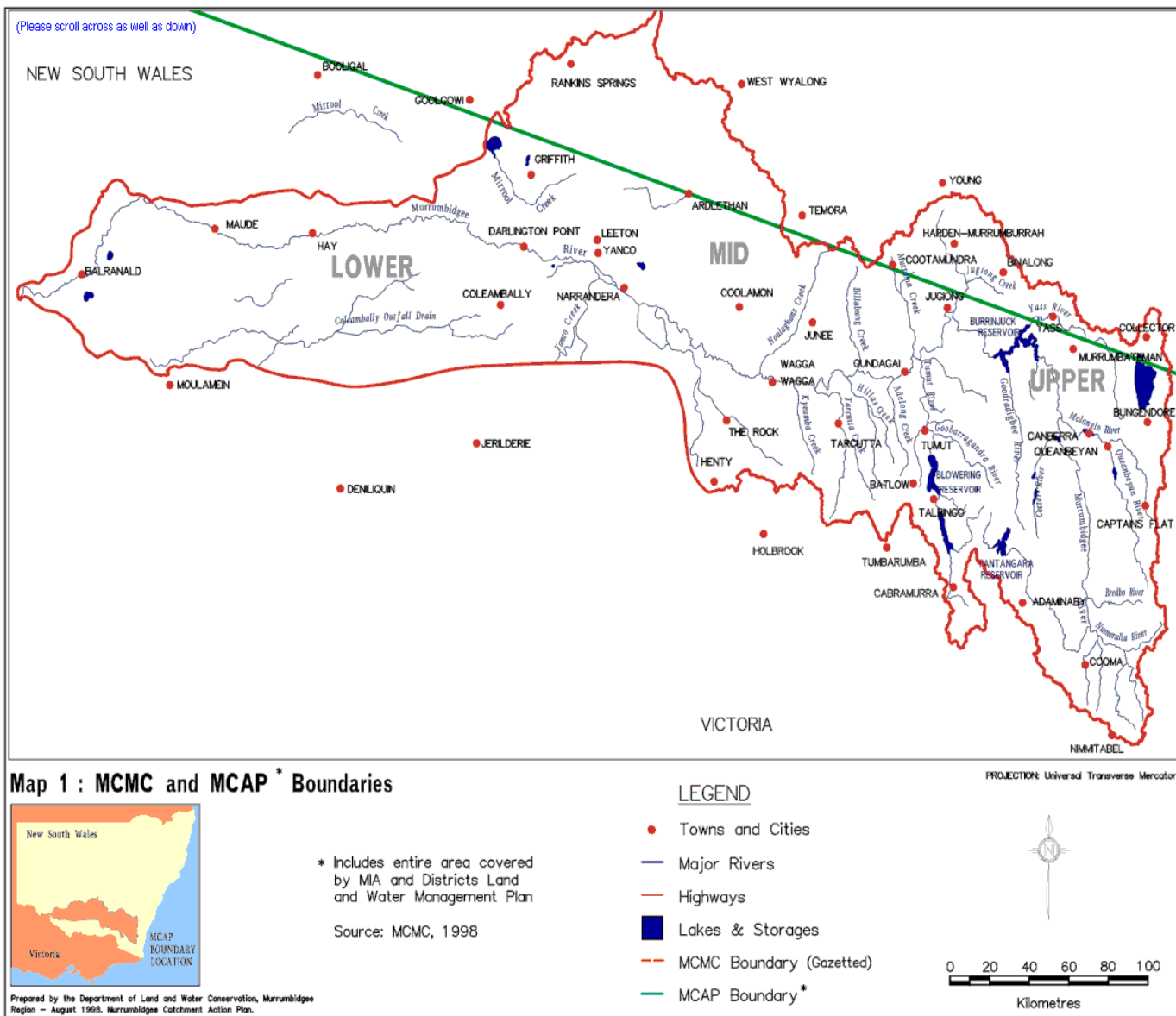
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# 1. Introduction

This document reports on the findings of a survey conducted in the Murrumbidgee catchment. The Murrumbidgee River flows for 1,600 kilometres from its headwaters in the Snowy Mountains to its junction with the Murray River (DLWC, 1999). The location of major waterways, diversions and towns within the boundaries of the Murrumbidgee catchment are illustrated in Figure 1.

The first part of the report outlines the basic structure of the survey instrument, method of sampling and statistical analysis. The second section outlines the survey findings on COAG reform and the structure, conduct and performance of water markets in the Murrumbidgee catchment.



(Source: Department of Land and Water Conservation, 2000)

Figure 1 Location of towns and major geographic features in the Murrumbidgee catchment



## **2. Survey Design**

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The survey instrument consisted of a combination of dichotomous choice, constant sum and open answer questions. The questions are grouped into seven sections each dealing with a specific aspect of water reform:

- Water reform general
- Temporary water trading
- Permanent water trading
- Impacts and future of water trading
- The role of the water authority in water markets
- Environmental concerns
- Demographic information



### **3. Method of Sampling**

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The allocation and provision of diverted surface water in the Murrumbidgee catchment is regulated and administered by various water providers. The Department of Land and Water Conservation (NSW) regulates the system and supplies water to irrigators along the main river system. Private irrigation corporations have bulk water entitlements, provided by the Department of Land and Water Conservation, to extract water and supply water to irrigators (in their capacity as corporate shareholders) within their companies. The method of water allocation, the proprietary constitution and the rules of trade differ between water management authorities and providers. To account for the differences between water managing agencies, which potentially affect the trading of water entitlements and to minimise sampling error, irrigators were stratified according to the water provider. The three largest water providers; Coleambally Irrigation Pty. Ltd., the Department of Land and Water Conservation and Murrumbidgee Irrigation Pty. Ltd. were approached to supply the names of irrigators within their jurisdiction or constituency. The Department of Land and Water Conservation provided a list of irrigators from which we selected a random sample. Murrumbidgee Irrigation

Pty. Ltd. provided a randomly sampled list of high security and general security irrigators and Coleambally Irrigation Pty. Ltd. mailed surveys to shareholder-irrigators on our behalf. The collective information provided by the managing authorities constituted the research sampling frame. A total of 1,000 questionnaires were administered to irrigators. A total of 261 valid irrigator responses, received from respondents within the boundaries of the three water managing authorities, is used in the following analyses. The number of responses from the Department of Land and Water Conservation, Murrumbidgee Irrigation Pty. Ltd. and Coleambally Irrigation Pty. Ltd. were 104, 101, and 49 respectively.

A stratified random sample has been drawn from the community of the Murrumbidgee catchment. Towns have been used as sub-stratums and community members were randomly drawn from the 1996 electoral roles. In total, a sample of 1,000 community members was drawn. The location of towns within the Murrumbidgee catchment is illustrated in Figure 1. There were 131 valid community responses. Table 1 presents the total number of individuals within each stratum, sample sizes drawn, and the number of valid responses received from each stratum.

Table 1 Community sample: Murrumbidgee catchment

<b>Town Name</b>	<b>Total Population (Sub-stratum)</b>	<b>Sample Size (n)</b>	<b>Number of Valid Responses</b>
Adaminaby	366	3	0
Ardlethan	427	4	0
Balranald	1419	13	1
Batlow	1069	10	1
Binalong	240	2	0
Bungendore	1348	12	2
Cabramurra	203	2	1
Captains Flat	418	4	0
Coleambally	647	6	0
Coolamon	1261	11	0
Cooma	7150	65	7
Cootamundra	5879	54	3
Darlington Point	881	8	2
Griffith	14209	129	13
Gundagai	2064	19	3
Hay	2869	26	2
Henty	878	8	0
Junee	3681	34	2
Leeton	6615	60	4
Murrumbateman	1087	10	3
Murrumburrah	1700	15	4
Narrandera	4678	43	8
Talbingo	297	3	0
Tarcutta	255	2	0
The Rock	859	8	2
Tumut	5915	54	13
Wagga Wagga	42848	390	55
Yanco	576	5	0
<b>Total</b>	<b>109866</b>	<b>1000</b>	<b>126</b>

#### 4. Statistical Analysis and Interpretation

Likert scales are used to determine overall levels of agreement with issue statements concerning water allocation, rights to trade and attitudes to the role of the water authority and the future of water trading. Likert scales consist of statements reflecting positions on a continuum such as strongly disagree to strongly agree. In this study standard 5-point Likert scales have been used.

Conclusions concerning overall respondent agreement or disagreement to a statement are based upon statistical differences between the mean response and indifference or uncertainty. In other words, on a 5-point scale, overall indifference or uncertainty on an issue statement would produce a mean response of three. If the mean response is found to be statistically lower than three, at standard levels of confidence (95% or 99% confidence levels), there is deemed to be overall agreement with the statement. The level of significance is symbolised in the tables of results. A single asterisk (\*) signifies significant at 95% confidence levels ( $\alpha = 0.05$ ) and a double asterisk signifies (\*\*) significant at a 99% confidence level ( $\alpha=0.01$ ). The letter *a* is used to signify that the mean is less than three and *b* to signify it is greater than three.

Using Example 1 below to demonstrate, the irrigators' mean rank response to the issue of whether active irrigators who hold water entitlements in adjoining regions is 2.48 and is statistically less than three given a 99% confidence level ( $\alpha=0.01$ ). This is signified by the letter *a* and a double asterisk on the statement's corresponding mean value. From this result it is concluded that irrigators overall agree with the statement. The mean response to local shires being given the right to trade water for recreation use is not statistically different from three, and so it is concluded that the respondents overall are indifferent or uncertain. Similarly, it is concluded that, because the mean rank of the rights of individuals and companies who do not intend to use water to trade is statistically greater than three given a 95% confidence level ( $\alpha=0.05$ ), there is overall disagreement with the notion.

The Kolmogorov-Smirnov two-sample test (KS-Z) is used to test whether populations differ in their rankings of statements, on the basis of the maximum difference in cumulative relative frequencies. In other words, it tests whether the distributions of ranking between the two populations (be they irrigators and community or traders and non-traders) differ. Hence in Example 1, referring to the issue of active irrigators who hold water entitlements in adjoining regions being allowed to trade, the KS-Z value of 1.484 is significant at a confidence level of 95%. That is, the distribution of responses of traders is significantly different to that of non-traders.

Example 1 Rights to trade

	Mean Rank	Mean Response †		MW-U	KS-Z
	Irrigator †	Trader	Non-trader		
Active irrigators who hold water entitlements in adjoining regions	2.48 <sup>a**</sup>	2.22	2.78	5647.5*	1.484*
Local shires to use water for recreation use, such as parks and golf courses	2.98	2.84	3.10	6625.5	0.934
Individuals and companies who do not intend to use water	3.87 <sup>b*</sup>	3.87	3.87	7439.5	0.215

† Scale 1 'strongly agree' 5 'strongly disagree'; \*significant at 0.05; \*\*significant at 0.01  
*a* significantly less than 3; *b* significantly greater than 3



While a significant Kolmogorov-Smirnov test is necessary to conclude rank distribution differences, it is not sufficient to conclude mean differences. The distribution of responses may differ while the means may be equal. To demonstrate, in Example 2 the frequency distributions of irrigators and the community differ significantly, yet the mean responses are equal.

In conjunction with the results of the Kolmogorov-Smirnov test, the Mann-Whitney U test (MW-U) is

used to test whether two independent samples have come from populations with the same mean. Referring to Example 1 on the issue of active irrigators who hold water entitlements in adjoining regions being allowed to trade, the mean of irrigators who have traded is statistically different to the mean of irrigators who have not traded given a 95% confidence interval ( $\alpha=0.05$ ). The single asterisk on the MW-U value corresponding to the statement signifies this.

Example 2 Water allocation issue

Rank	Position	Irrigators Frequency	Community Frequency
1	Strongly agree	50	20
2	Agree	0	20
3	Uncertain	0	20
4	Disagree	0	20
5	Strongly disagree	50	20
<b>Total</b>		<b>100</b>	<b>100</b>
<b>Mean Rank</b>		<b>3</b>	<b>3</b>

Example 3 Interpreting significant differences

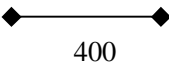
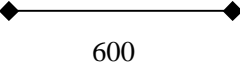
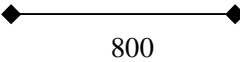

Region	Average water allocation (ML)
A	400 <sup>a</sup>
B	600 <sup>ab</sup>
C	800 <sup>b</sup>
D	200

Note: Numbers sharing the same superscript letter in a column are not statistically different.

Finally, the summary data is generated from sample data. In order to draw conclusions concerning the population with a level of confidence it is necessary to take account of the error arising from the variance in the sample means. Example 3 presents a summary of the water allocations in three regions. The averages with the same symbol are not statistically different when the sample variance is accounted for. In other words, the average water allocation of region A is not statistically different from region B, nor B from C, but the average water allocation of region A is different from region C. Region D does have an average water allocation lower than any other region.

To explain this we look at the confidence intervals for each sample mean (shown below). The range of possible population average water allocations of region A derived from the sample data overlaps region B, so the values might be the same. This is represented by the same symbol *a* in the example above. Similarly, the range of possible population average water allocations of region C derived from the sample data overlaps region B, so their values might be the same. This is represented above with symbol *b*. There is no overlap of regions A and C, hence we can state they are ‘different’. Because the range of possible values for region D does not equal any other region it has no symbol.

Confidence intervals shown diagrammatically for each sample mean in Example 3 above

A	
B	
C	
D	



## **5. Analysis of Survey Responses**

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The survey instrument elicited attitudes of irrigators and community members to COAG reforms, to temporary and permanent water trading, to the impact and future of water trading, to the role of the water authority in regulating the market, and to environmental issues. The role of the survey results and analysis is to contribute to the development of an understanding of how water markets are structured and operate in order to develop future trading rules and procedures which will promote trade in the future. To achieve this analysis of the survey responses is structured to specifically explore irrigator and community perceptions of and attitudes towards the structure and conduct of the water markets in the Murrumbidgee catchment as they currently exist and expectations of future performance measures.



## 6. Attitudes to COAG Reform

The Commonwealth of Australian Governments (COAG) introduced a raft of institutional changes to water management in Australia. The first section of the survey dealt with COAG reforms, specifically, with issues of water pricing and rights to trade. Effective adoption of these changes requires acceptance by water users and the community at large. Table 2 reports irrigator and community percentage agreement with the need for water reform. 80.9 % and 90.2 % of irrigators and community respondents respectively agree that water reform is necessary.

### 6.1 Water Pricing

As part of the reform process, water authorities need to move towards cost recovery and in the process introduce full cost pricing. Table 3 presents the irrigator and community support for full cost pricing of water. The mean and distribution of responses from irrigators and the community differ. Irrigators within the catchment overall statistically reject the notion of full cost pricing with 64.2% rejecting or strongly rejecting full cost pricing. 25.6% of irrigator respondents strongly support or accept the notion of full cost pricing. The community is more supportive with 59.4% strongly supporting or accepting the notion of full cost pricing and 27.7% rejecting or completely rejecting such a pricing policy.

Table 2 Overall agreement with the need for water reform

	Irrigators		Community	
	Frequency	Percentage	Frequency	Percentage
<b>Yes</b>	191	80.9	111	90.2
<b>No</b>	45	19.1	12	9.8
<b>Total</b>	<b>236</b>	<b>100</b>	<b>123</b>	<b>100</b>

Table 3 Full cost pricing of water

	Irrigators		Community	
	Frequency	Percentage	Frequency	Percentage
<b>Strongly support</b>	12	4.7	38	30.9
<b>Accept</b>	53	20.9	35	28.5
<b>Indifferent</b>	26	10.2	16	13.0
<b>Reject</b>	102	40.2	28	22.8
<b>Completely reject</b>	61	24.0	6	4.9
<b>Total</b>	<b>254</b>	<b>100</b>	<b>123</b>	<b>100</b>
<b>Mean Rank</b>	<b>3.58</b>		<b>2.42</b>	

MW-U= 8140.5,  $p < 0.000$ ; KS-Z=3.326,  $p < 0.00$ . (See Section 4 for explanation of MW-U and KS-Z)

## 6.2 Definition of Rights and Security and Certainty of Supply

A main element of COAG reform involves the definition and specification of water entitlements and the rights attached to those entitlements. Tables 4 and 5 report the opinions of irrigators and the community on the definition of water entitlements and the trade of such entitlements.

The primary step in establishing a functional water market is to break the long-standing nexus between land and water entitlements. A principle aim of the reform process is to change the nature of water entitlements from one inextricably tied to the land to more of an independent and distinct chattel. However, overall respondents were indifferent to breaking the nexus between land and water and allowing water entitlements to be traded as chattels separate to land. Irrigator respondents, whether they had traded water or not, agreed that nexus between land and water should be broken and water entitlements be traded as chattels separate to land while the wider community is indifferent to the notion.

Issues in the definition of the water entitlement itself include the rights to on-farm runoff, the status of water for the environment, and the rights to sleeper and dozer licences. Overall, the notion of licensing on-farm runoff is rejected by irrigators and the general community. Setting aside water for the environment prior to allocating it to farmers is supported by the community at large but rejected by irrigators. Irrigators who have traded water are less supportive of setting water aside for the environment than those who have not traded water. Finally, while there is overall indifference towards the notion of extinguishing sleeper and dozer licences, the community and irrigators attitudes are divided, with irrigators strongly rejecting the notion while the community support extinguishment.

Along with the definition of rights are issues of security and reliability. Table 6 presents opinions on the security and reliability of rights following the water reform process. The results suggest that there is a high level of uncertainty among irrigators surrounding water entitlement security and reliability following the reform process. Traders and non-traders alike hold this view. This is felt to be a result of a lack of adequate concern for property right issues during the development of water policy by the State water authority.

Table 4 Definition of rights: irrigators and community opinions

	Overall	Mean Rank Response†		MW-U‡	KS-Z‡
	Mean Rank†	Irrigator	Community		
Water entitlements should be allowed to be separated from land and be traded	2.88	2.80	3.04	13600.0	1.404*
On-farm runoff should be licensed	3.74b**	3.92	3.35	11265.0**	1.882**
Water for the environment should be set aside prior to allocating water to farmers	2.89	3.30	2.06	7958.0**	3.609**
Licences that have not been used for five years should be extinguished	3.09	3.41	2.45	9713.0**	2.826**

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
a significantly less than 3; b significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

Table 5 Rights to trade: trader and non-trader opinions

	Mean Rank†	Mean Rank Response†		MW-U‡	KS-Z‡
		Irrigators	Trader		
Water entitlements should be allowed to be separated from land and be traded	2.80a*	2.71	2.96	6849.0	0.725
On-farm runoff should be licensed	3.92b**	3.80	4.12	6615.0	0.766
Water for the environment should be set aside prior to allocating water to farmers	3.30b**	3.44	3.09	6461.5	1.442*
Licences that have not been used for five years should be extinguished	3.41b**	3.27	3.61	6702.0	1.168

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
*a* significantly less than 3; *b* significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

Table 6 Security and reliability of rights following COAG reforms: trader and non-trader opinions

	Mean Rank†	Mean Rank Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Water entitlements will be more secure following the reforms	3.07	3.07	3.05	7093.0	0.391
Water entitlements will have higher reliability of supply following the water reforms	3.12	3.21	2.98	6346.5	0.670

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
*a* significantly less than 3; *b* significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z



### 6.3 Community Involvement in COAG Reforms

A key component to ensuring adoption of COAG reforms, and especially voluntary reform mechanisms such as water trading, is empowerment and ownership of the process by irrigators and the community at large. According to the respondents, however, the community at large has been poorly informed in the reform process. Table 7 summarises respondents' attitudes to the community's involvement and acceptance of COAG reforms. 28.6% and 61.9% of the irrigators and community respectively felt that the community had been poorly informed but accepting of the changes. Of concern is that only 2.5% and 1.8% respectively felt that the community had been actively informed and embraced water reform and 37.8% of irrigators felt they have been involved but largely ignored in the reform process.

### 6.4 The Impact of the CAP

A cap on water entitlements in the Murray Darling basin was introduced in June 1995 as part of a strategy to overcome water management problems. The CAP effectively reduced water allocations throughout the catchment. Irrigators and community members were asked whether they had perceived an impact on their farm or business enterprise. Table 8 presents a summary of the results. 46.3% and 7.6% of irrigators and community members, respectively, stated that the CAP had impacted on their farm enterprise or business.

Table 7 Community involvement in the water reform process

	Irrigator		Community	
	Frequency	Percentage	Frequency	Percentage
Actively involved and embraced it	6	2.5	2	1.8
Well informed and accepting	19	7.9	9	8.0
Involved but largely ignored	91	37.8	15	13.3
Poorly informed but accepting	69	28.6	70	61.9
Poorly informed and unhappy	56	23.2	17	15.0
<b>Total</b>	<b>241</b>	<b>100</b>	<b>113</b>	<b>100</b>

Table 8 Impact of the CAP on farm enterprises

	Irrigator Farm Enterprises		Community Businesses	
	Frequency	Percentage	Frequency	Percentage
<b>Yes</b>	113	46.3	9	7.6
<b>No</b>	131	53.7	109	92.4
<b>Total</b>	<b>244</b>	<b>100</b>	<b>118</b>	<b>100</b>

The main comments by irrigator respondents concerning the impact of the CAP on their enterprise are listed in Figure 2 below. According to the respondents the CAP has forced the recognition of water as a scarce resource and more efficient use of it. The CAP has decreased production and increased farm costs resulting in decreased farm income.

The perceived impact of the CAP on irrigators depends on the size of their water entitlement. Table 9 presents the results of applying logistic regression analysis using maximum likelihood estimates to CAP impacts on irrigators.

- Decrease in their allocations (19) decreased off allocation flows (8) restricted access to water (13)
- Restricts water trading (12) lower income from abolition of permanent trade (6) and restrictions on temporary transfers (1)
- Increased the selling price of water (3)
- Decreased production (35) changes in nature of production (6) or ceased production (3)
- Decreased income (19) by an average of 15-25%
- Decreased options for further development (20) because of increased risk (4)
- Decreased security (14)
- Budgeting and planning is more difficult (8) because of late allocation announcements (3) because of unclear access rules (1)
- Increased the need to purchase water (4)
- Decreased property capital value (5)
- Decreased value of water licences (1)
- Increased costs (16); due to the need for storage facilities (6); of being environmentally friendly (6) - particularly in terms of having to cut out parts of crop rotation systems which are no longer viable
- Altered river flows (2)
- Forced improvements in water use efficiency (5)
- Advantaged river farmers (5) and those with no history of use (1)

Figure 2 Impacts of the CAP on irrigators in the Murrumbidgee catchment

Table 9 Logistic regression of CAP impacts on irrigators and community members

	Variable	$\beta$	s.e	$\chi^2$	p
<b>Irrigator</b>	Constant	1.3786	0.2367	33.9194	0.0000
	Water Entitlement	-0.0017	0.0003	24.0106	0.0000

Figure 3 graphically presents the probability function for the likelihood of perceiving a CAP impact on irrigators<sup>3</sup>. As the size of an irrigator’s water allocation increases the likelihood of being impacted by the CAP decreases from over 75% by those irrigators with water entitlements less than 160ML, to less than 12% for irrigators with water entitlements over 2000ML. The average allocation of irrigator respondent is 440ML. At that level the probability of CAP impact is 65.3%.

### 6.5 Trade-off of Water Reform Objectives

The reform objectives of maximising the income generated from available water supplies<sup>4</sup>, ensuring an equitable and fair distribution of water, meeting natural flow requirements and accounting for local economic and social impacts are likely to either be in conflict or not achievable simultaneously. The government may have to determine a hierarchy to prioritise these objectives. Table 10 presents irrigator and community ranking of

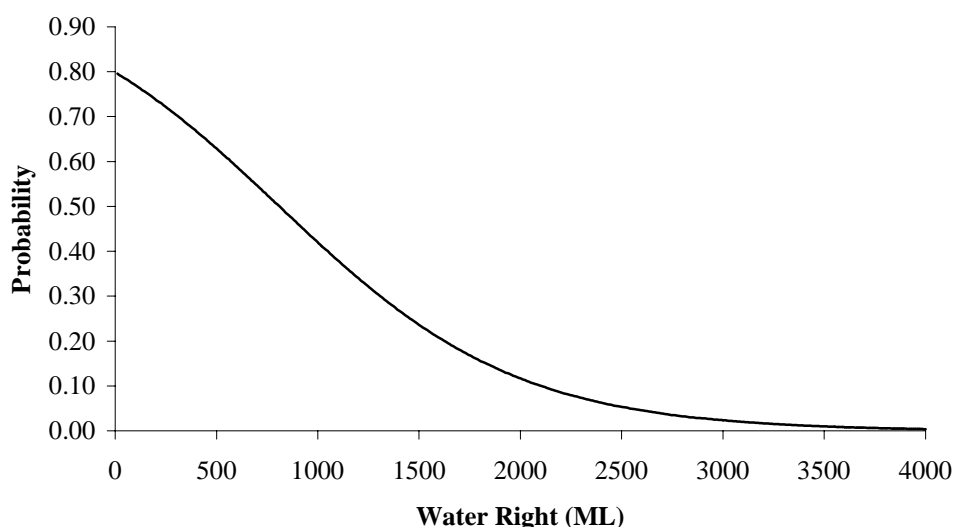


Figure 3 Probability of CAP impact by size of water allocation

Table 10 Analysis of key COAG reform objectives

Issue in Water Reform	Mean Percentage		
	Overall	Irrigator	Community
Maximise farm income	22.65 <sup>a</sup>	27.29 <sup>a</sup>	13.41
Distribute water in fair and just manner	30.39	30.82 <sup>a</sup>	29.53 <sup>a</sup>
Meet natural flow requirements	24.20 <sup>a</sup>	19.00 <sup>b</sup>	34.56 <sup>a</sup>
Impact on local towns and communities	19.05	18.84 <sup>b</sup>	19.47

Note: Acrsin transformation analysed using type III ANOVA and Tukey HSD tests. Overall, irrigator and community surveys analysed separately. Symbols represent no statistical differences.

<sup>3</sup>Models of the CAP impact on the community at large were not statistically significant.

<sup>4</sup>This has been interpreted by most commentators as maximising the return to the farmers utilising the water. It has also been interpreted in some quarters of government as maximising state treasury revenue.

COAG reform objectives. Overall, respondents ranked the need to distribute water in a fair and just manner higher than all other issues listed. The issues, in relative importance, are ensuring a fair and just distribution of water, then meeting environmental flow objectives and maximising farm income, and finally taking account of local town and community impacts. Irrigators consider ensuring a fair and just distribution of water and maximising farm income as most important, and above meeting natural flow objectives and accounting for local town and community impacts. The community ranked natural flow objectives, and ensuring a just and fair distribution of water, equal and above maximising farm income and taking account of local town and community impacts. In essence, there is general agreement on the need to consider equity and social justice issues but a divergence on the relative importance of maximising farm income.

## 6.6 Environmental Water Requirements

Addressing environmental flow requirements is likely to require a trade-off between extractive and environmental use of water. Four *hypothetical* scenarios were presented to the respondents. The scenarios are based in part on the Water Allocation Management Plan (WAMPS) for

the Fitzroy Basin and are meant to elicit irrigator and community opinions and attitudes toward foregoing water entitlements for improved environmental flows. It is not claimed that the options presented reflect actual trade-off combinations.

The irrigators were asked to rank their preference from highest (1) to lowest (4). Table 11 presents a summary of their rankings. Overall, given the options presented, there is strong support for reducing the allocation of water to extractive use to allow for improvements in the riverine environment. Irrigator respondents overall are prepared to accept a reduction in their water entitlement for an improvement in environmental flows. Irrigators ranked highest options that involved a reduction in water entitlements that provided for possible reversibility of habitat degradation. Irrigators ranked no reduction in entitlement with irreversible habitat degradation lowest. The community supports higher levels of entitlement reduction and associated improved environmental flows.

The notion that government agencies enter the market and purchase water for environmental use is not generally supported<sup>5</sup>.

Table 11 Trade-offs between extractive and environmental uses of water

Hypothetical Reduction in Water Entitlement	Hypothetical Impact on the Riverine Environment	Mean Rank †		
		Overall	Irrigators	Community
0%	Irreversible habitat degradation	3.10	3.02	3.23
20%	Habitat degradation, reversibility unknown	2.30 <sup>ab</sup>	2.11 <sup>x</sup>	2.59
30%	Reversible habitat degradation	2.09 <sup>ac</sup>	2.17 <sup>x</sup>	1.96 <sup>y</sup>
40%	No habitat degradation	2.51 <sup>bc</sup>	2.70	2.18 <sup>y</sup>

† Scale 1 'strongly agree' 5 'strongly disagree'. The irrigators and community results, while presented in the same table have been analysed separately. Analysis conducted using Friedman's non-parametric ANOVA and modified Tukey multiple comparison tests. Symbols represent no statistical differences.

<sup>5</sup>See Appendix A; Environmental Concerns, Question 2.

### 6.7 Social Justice and Equity Objectives

The stated objectives of COAG water reform are to achieve an efficient and equitable distribution of water. If the changes in policy are to be accepted and adopted by the irrigators and the community at large, they need to be empowered in the development of new policies and feel that the outcomes are fair and just. Syme *et al.* (1999) have undertaken studies of peoples' attitudes and standpoints on these issues by presenting them with water allocation statements developed from a variety of philosophical schools of thought. In this study, (see Table 12) statements concerning outcomes and procedures for water trading were developed from four philosophical schools of thought - Utilitarianism, Rawls, Kaldor/Hicks and Kant.

Countries, such as Australia, have been seen as utilitarian societies, and as such have tended to develop policies to maximise the greatest happiness of the greatest number.

In this study this standpoint is ranked more positively than any other in achieving just outcomes to water trading. In developing trading rules and procedures concern should be for the greatest happiness of the greatest number. Maximising the greatest happiness is more important than ensuring that adequate compensation is available for those who may lose as a result of trade, examining each case on its merits or consideration for the welfare of those worse off. Exploring the lower ranked standpoints further, development of the rules and procedures on a case-by-case basis is seen as equally important as concern for the welfare of those worst-off. Ensuring adequate compensation was ranked lowest overall. The community ranked the greatest happiness of the greatest number equal highest with concern for liberty and the welfare of the worst-off.

Table 12 Social justice and equity objectives for water trading

Philosophical Standpoint	Philosophical Statement	Mean Rank†		
		Overall	Irrigator	Community
Utilitarianism	Water trading should benefit the greatest number of people possible	2.20	2.34	1.90 <sup>x</sup>
Rawls theory of Social Justice	If trading rules and procedures cannot provide equal opportunity to access water for all in your region they should protect the rights of those worst-off	2.56 <sup>a</sup>	2.77 <sup>a</sup>	2.13 <sup>xy</sup>
Kaldor/Hicks	The beneficiaries from water trade should be able to compensate those who feel they have lost because of the transaction	2.87	3.15	2.27 <sup>yz</sup>
Kant	There should be no general rules of trade as each situation is different and should be considered on a case-by-case basis	2.61 <sup>a</sup>	2.66 <sup>a</sup>	2.52 <sup>z</sup>

† Scale 1 'strongly agree' 5 'strongly disagree'. Analysis conducted using Friedman's non-parametric ANOVA and modified Tukey multiple comparison tests. Symbols represent no statistical differences.

## 7. Market Structure, Conduct and Performance

From an institutional perspective, the number of buyers and sellers, the conditions of and constraint on entry and exit to the market, homogeneity of the product and market knowledge, are important determinants of a market's performance in achieving the COAG reform objectives. These aspects of market analysis can form a basis to judge market performance. Market performance, viz. achieving an efficient and equitable

distribution of the resource, is arguably a key variable in constructing public policy on water trading. To effectively achieve the efficiency objectives of COAG reforms, water markets need to be as competitive in economic terms as possible. To be competitive a market needs to have a large number of buyers and sellers, a well-defined homogeneous property right and good market knowledge. The economic basis of COAG water reforms is for the water authority to only intervene when necessary and to promote as close to a free trade environment as possible.

Table 13 Rights to trade: irrigator and community opinions

	Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Irrigators	Community		
Active irrigators who hold water entitlements within your region	1.75 <sup>a**</sup>	1.53	2.20	9409.5**	2.992**
Active irrigators who hold water entitlements in adjoining regions	2.55 <sup>a**</sup>	2.41	2.85	11688.5**	1.685**
Farmers who wish to start an irrigation enterprise in your region	2.62 <sup>a**</sup>	2.65	2.56	14531.5	0.981
Farmers who have not used their entitlement in the last five years	2.73 <sup>a**</sup>	2.49	3.20	10065.5**	2.792**
Local towns and communities for domestic use	2.25 <sup>a**</sup>	2.27	2.20	14769.0	0.349
Local shires to use water for recreation use, such as parks and golf courses	2.49 <sup>a**</sup>	2.46	2.56	13481.5	0.843
Local industries who use water	2.35 <sup>a**</sup>	2.27	2.53	12500.5*	0.952
Environmental groups and agencies	2.65 <sup>a**</sup>	2.64	2.68	14555.5	0.471
Individuals and companies who do not intend to use water	3.96 <sup>b**</sup>	3.98	3.92	13381.0	0.820

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

The number of buyers and sellers in the market will in part depend in part on who is allowed to trade. Constraints on such rights may be spatial, sectoral or use related. Table 13 summarises irrigator and community opinions on who should have a right to trade in water. Overall, there is support for trade between irrigators, local towns and communities and local shires, but not with individuals or companies who do not intend to use the water. Irrigators feel stronger about allowing trade between active irrigators, local industries who use water and by sleeper licencees than the community. The community also feels indifferent to trade in sleeper licencees.

Table 14 summarises differences between traders and non-traders opinions on the rights to trade. Spatially, there is strong support by irrigators for active irrigators

within their region to trade, and positive, but less so, support for trade with people in adjoining regions. On both these issues irrigators who traded are more supportive than those who do not trade, and the distribution of responses between these two groups differ. Irrigators are supportive of trade with local towns and communities for domestic and local industrial use as well as recreation use, such as parks and golf courses. They are also supportive of trade with environmental groups and agencies and farmers who wish to start an irrigation enterprise. There is overall agreement among irrigators that companies who do not intend to use water should not be allowed to enter the market. Excluding such companies will remove non-use speculators from the market. Further exploration of this issue is necessary to determine whether such exclusion is legal under competition and trade practices.

Table 14 Rights to trade: trader and non-trader opinions

	Irrigator Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Active irrigators who hold water entitlements within your region	1.53 <sup>a**</sup>	1.36	1.84	5606.5**	1.508*
Active irrigators who hold water entitlements in adjoining regions	2.41 <sup>a**</sup>	2.16	2.85	4858.0**	1.732**
Farmers who wish to start an irrigation enterprise in your region	2.65 <sup>a**</sup>	2.49	2.93	5438.0*	0.976
Farmers who have not used their entitlement in the last five years	2.49 <sup>a**</sup>	2.42	2.60	6321.0	0.437
Local towns and communities for domestic use	2.27 <sup>a**</sup>	2.19	2.42	6374.0	0.534
Local shires to use water for recreation use, such as parks and golf courses	2.46 <sup>a**</sup>	2.25	2.82	5020.0**	1.5220*
Local industries who use water	2.27 <sup>a**</sup>	2.15	2.48	5756.5*	0.898
Environmental groups and agencies	2.64 <sup>a**</sup>	2.55	2.80	5955.0	0.728
Individuals and companies who do not intend to use water	3.98 <sup>b**</sup>	4.02	3.93	5861.0	0.555

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01

<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3. ‡ See Section 4 for explanation of MW-U and KS-Z

The nature of water entitlements in the future is going to influence market performance. Apart from the legislative or administrative definition of the tradeable good (or right), there is the issue of whether the irrigators perceive their water entitlement as a tradeable chattel. Table 15 summarises irrigator attitudes on this issue. Irrigators are uncertain whether in the future water will become a chattel and be traded like other farm inputs such as fertiliser. Finally, the security of a right is important in determining its value and as irrigators agreed that they would be willing to pay more for high security water over general security water. This price differential suggests that there may in fact be a split market for different security levels in the future.

Another aspect to the structure of a market is the level of concentration. Market concentration involves measuring the number and relative size of traders in the market. A market dominated by a few traders is unlikely to achieve a Pareto optimal distribution of water. In such circumstances, the traders need to anticipate the actions of others. Table 16 summarises irrigator perceptions of market concentration. Irrigators were asked a series of questions on this issue in different forms throughout the survey. Respondents are undecided whether the water market will consist of a few players who may act strategically by anticipating the actions of other traders and whether the actions of individuals will greatly influence the market price.

Table 15 The nature of water entitlements in water markets: trader and non-trader opinions

	Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Water trading will become like buying fertilizer in that a farmer will buy and sell it in on a need basis	2.98	2.99	2.95	7213.0	0.584
Farmers will pay more for high security water than for general security	2.11 <sup>a**</sup>	2.06	2.20	6672.5	0.633
Water entitlements will no longer be an inherent asset in farming	4.15 <sup>b**</sup>	4.22	4.03	6533.5	0.996

† Scale 1 ‘strongly agree’ 5 ‘strongly disagree’; \* Significant at 0.05; \*\* Significant at 0.01

<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3. ‡ See Section 4 for explanation of MW-U and KS-Z

Table 16 Perceptions of market concentration: trader and non-trader opinions

	Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Markets will consist of only a few traders, farmers will anticipate what others may offer and buy	3.17	3.19	3.12	6836.0	0.375
There will be a lot of traders and the actions of individuals will not greatly influence the market price	3.08	3.05	3.12	6623.5	0.325

† Scale 1 ‘strongly agree’ 5 ‘strongly disagree’; \* Significant at 0.05; \*\* Significant at 0.01

<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3. ‡ See Section 4 for explanation of MW-U and KS-Z



Historically, the role of the water authority has been to engineer dams, weirs and channels and regulate water use according to the hydrological characteristics of the system. Maturing water economies, and associated water reform, is likely to result in a broadening role for water authorities to deal with the social, economic and hydrological dimensions of catchment management.

The water authority plays a key role in formulating the structure of a market. Irrigator and community attitudes to the role of the water authority in water markets are presented in Tables 17 and 18. There is strong support among irrigators for the water authority to intervene in trade if the system is not capable of supplying water to the buyer. There is also unilateral support among irrigators and the community for the water authority to intervene in the market when trade has the potential of impacting on third parties, the economic viability of local towns and communities, environmental flow objectives, and when the negotiated conditions of trade

or resulting distribution from trade is seen as unjust or unfair. The community feels stronger than irrigators on the economic viability of towns and communities, environmental flow objectives and ensuring a just and fair distribution of water.

Within the irrigation community, support for water authority market intervention for hydrological reasons, impacts on other water entitlements and when trade impacts on local towns and communities is equal among traders and non-traders. Traders are less supportive of intervention to meet environmental flow objectives and equity and social justice concerns than non-traders.

Implementing these findings would require a more interventionist approach than has been currently prescribed and adopted. The dominant academic stand on trade in Australia is to promote free trade and limit intervention. The commonly held standpoint on water trading is to minimise water authority and state intervention and allow the market to redistribute

Table 17 The role of the water authority in regulating water markets: irrigator and community opinions

	Overall	Mean Rank Response†		MW-U‡	KS-Z‡
	Mean†	Irrigators	Community		
If the trade impacts on the economic viability of local towns and communities	2.05 <sup>a**</sup>	2.15	1.84	12504.5**	1.235
If the trade impacts on the environmental river flow objectives	2.08 <sup>a**</sup>	2.32	1.62	9066.0**	2.824**
If the resulting distribution of water in the catchment is not considered fair and just	2.05 <sup>a**</sup>	2.23	1.72	10346.5**	2.318**

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01

*a* significantly less than 3; *b* significantly greater than 3. ‡ See Section 4 for explanation of MW-U and KS-Z

water entitlements. Academic arguments for a more interventionist approach would be based on the notion that water is a common pool resource and that such intervention is necessary to achieve a Pareto optimal outcome or some form of Pareto improvement in the distribution of water. The argument would be that markets do not naturally internalise the social costs

and benefits to regional towns and the environment, or consider the distributive consequences of trade. Markets will redistribute resources based solely on private benefits and costs. The case would have to be made that trade in water has consequences beyond that of private benefits and costs associated with trade in other goods.

Table 18 The role of the water authority in regulating water markets: trader and non-trader opinions

	Mean†	Mean Rank Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Only when the system is not capable of supplying the water to the buyer	1.80 <sup>a**</sup>	1.79	1.83	6826.0	0.254
If there is a possible impact on other water entitlements	2.08 <sup>a**</sup>	2.17	1.91	6121.5	0.856
If the trade impacts on the economic viability of local towns and communities	2.15 <sup>a**</sup>	2.18	2.08	6502.5	0.332
If the trade impacts on the environmental river flow objectives	2.32 <sup>a**</sup>	2.45	2.08	5375.0 <sup>**</sup>	1.346
If the resulting distribution of water in the catchment is not considered fair and just	2.23 <sup>a**</sup>	2.38	1.97	5048.0 <sup>**</sup>	1.210
If the conditions and price negotiated are not considered fair and just	2.79 <sup>a**</sup>	2.96	2.48	5220.5 <sup>**</sup>	1.369

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

Of specific concern to the water authority is the possibility that trade will result in infrastructure isolation if large volumes of water trade out of a channel system. The policy to deal with this issue is important in determining the definition of rights to trade by those within channel systems, and, in the process, the structure of the market. Options open to the water authority include continuing to supply to those remaining, imposing exit fees on those trading out of the system, compensating those remaining and closing the system, or restricting trade to within the system. Table 19 presents a breakdown of irrigator support for each option. 59.1% of irrigators support restricting trade to within the system, compared to at most 19.1% for any other option.

The final determinant of market structure is the level of market knowledge. Comprehensive, accessible and symmetrical market knowledge is important in maintaining competitive markets. Understanding of the interactions between market prices, quantities and the actions of other traders define market knowledge in this context. Providing a public register of trade is one way the water authority could increase market knowledge. Table 20 presents a summary of irrigators' opinions on the disclosure of market information. Irrigators overall are supportive of disclosure of the volume and price of water as well as traders' entitlements and crop mixes on a public register.

Table 19 Remedies to infrastructure isolation resulting of trade

	Frequency	Percentage
Continue to supply	41	19.1
Impose exit fees	24	11.2
Compensate and close system	23	10.7
Restrict trade to within system	127	59.1
<b>Total</b>	<b>215</b>	<b>100</b>

Table 20 Disclosure of market information in public register: trader and non-trader opinions

	Mean <sup>†</sup>	Mean Rank <sup>†</sup> Response		MW-U <sup>‡</sup>	KS-Z <sup>‡</sup>
		Trader	Non-trader		
The volume of water traded	1.90a**	2.67	1.70	5692.0**	1.582*
The price at which the water traded	2.58 a**	2.00	2.31	5692.0*	1.132
The traders entitlements and crop mix	2.58 a**	2.73	2.33	5553.0*	0.997

<sup>†</sup> Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
a significantly less than 3; b significantly greater than 3

<sup>‡</sup> See Section 4 for explanation of MW-U and KS-Z

Sources of information are listed in Figure 4 below. The main sources include the Department of Land and Water Conservation and agents and brokers. Coleambolly and Murrumbidgee Irrigation are also major providers to their irrigators. General media, such as newspapers play a minor role.

The structure of a market is by no means the sole determinant of how a market will perform. Another key determinant is how the traders conduct themselves, in other words, the behaviour of sellers and buyers in the market. How they act will also be determined by perceived, as well as the actual actions of other traders.

- Agent/broker (26)
- Dept. land and water resources (26)
- MIA Council of Horticultural Association (22)
- Coleambolly Irrigation (17)
- Murrumbidgee Irrigation (15)
- Newspaper (6)
- Friends (5)
- Newsletters (4)
- Internet (4)
- Local authority (3)
- Local distributor (2)
- Central office (1)
- State rivers and water supply (1)
- RCL (1)
- Private trader (1)
- Real estate agent (1)
- CALM (1)
- Water assessment commission (1)

Figure 4 Sources of water market information

Table 21 gives a breakdown of perceptions of why other farmers trade and compares the results with stated reasons for trade. The temporary market predominately redistributes surplus water allocations<sup>6</sup> to meet shortfalls in allocations and end of season waterings. 94.5% of water sold is surplus to needs, while only 5.5% of sellers considered the opportunity cost of selling as opposed to using their water on their farm. 78.6% bought water because their existing entitlement did not meet their needs and 21.4% bought water to meet their end of season watering needs. 20.4% considered the actions of other traders influenced how they traded<sup>7</sup>.

Overall, the proportion of irrigators who believe others buy water because their water allocation does not meet requirements is not consistent with actual stated reasons for trade. This is largely due to the perceptions of those who do not trade. The overall and trader perceptions concerning buying water to meet end of season waterings are accurate, but not by those who do not trade. Selling water that is surplus to needs or because more can be earned by selling than using the water on-farm is correctly perceived overall by both traders and non-traders.

Tables 22 and 23 outline the reasons for trade and expected conduct of farmers in water markets in the future. When traders are asked why they may buy water in the future, 35.1% stated they would buy water if it became short, while 30.1% would decide to buy water prior to making a cropping decision. When asked about selling water in the future, 75.7% of traders indicated that they would sell their surplus water. 17% indicated that they would consider changing farm practices in order to trade water.

While overall irrigators are uncertain whether farmers will be reluctant to trade and rely on their entitlement to meet their water requirements, non-traders believe it is unlikely. There is general agreement among irrigators that farmers will follow water prices as they do crop and input prices. Finally, irrigators see a continued place for temporary markets to meet within season distribution issues.

Table 21 Perceptions of temporary trading: trader and non-trader opinions

		<b>Overall %</b>	<b>Traders %</b>	<b>Non-traders %</b>	<b>Actual %</b>
<b>Buy</b>	Water allocation does not meet requirements	62.55	63.82	60.67	78.57
	End of season waterings	28.39	29.61	25.84	21.43
<b>Sell</b>	Surplus water	68.85	71.71	64.44	94.50
	Earn more by selling than using	19.26	16.45	23.33	5.50

<sup>6</sup>Trade in surplus water -water in excess of needs is likely to be inconsistent with the objectives of the CAP to have total extraction equivalent to 1993/94 levels. If water is allocated on the basis of expected activation levels trade in inactive water entitlements will distort long-term allocations. This issue is yet to be fully addressed by the State water authority.

Table 22 Reasons for trading water in the future

Buy/Sell	Reason	Count	Percentage of responses
<b>Buy</b>	Prior to making a cropping decision	100	30.1
	To finish a crop should water become short	117	35.2
	To acquire more secure water supply	65	19.6
	Prior to next irrigation	11	3.3
	Purchase regularly according to watering regime	39	11.7
	<b>Total</b>	<b>332</b>	<b>100</b>
<b>Sell</b>	Only sell water surplus to requirements	199	75.7
	Change crop to use less water	13	4.9
	Run all or some of the crop dryland	8	3.0
	Reduce the area planted	13	4.9
	Not crop that year	11	4.2
	Other	19	7.2
	<b>Total</b>	<b>263</b>	<b>100</b>

Note: Respondents could give more than one answer; the results are therefore presented in a multiple response table

Table 23 Expected conduct of farmers in water trading: trader and non-trader opinions

	Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Farmers will be reluctant to trade and rely on their entitlement to meet their water requirements	2.91	3.03	2.70	5983.5*	0.806
Farmers will follow water prices as they do crop and input prices	2.34 <sup>a**</sup>	2.27	2.47	6790.5	0.649
There will be no temporary trading as all trades will be permanent	4.00 <sup>b**</sup>	4.11	3.83	5938.5**	1.169

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

### 7.1 Use of Market Information

The use of market information can substantially influence the nature and performance of the water market. The perceived and actual uses of market information reported by respondents are listed in Figure 5 below. The main use is in trade: *viz.* determining sales and purchase strategy. The information is also using for planning (general).

Finally, the irrigators expressed that they would like information on price and the rules and regulation of trade, including availability; approval process; time frames and deadlines; a register of water for sale and water demanded.



Figure 5 Use of market information

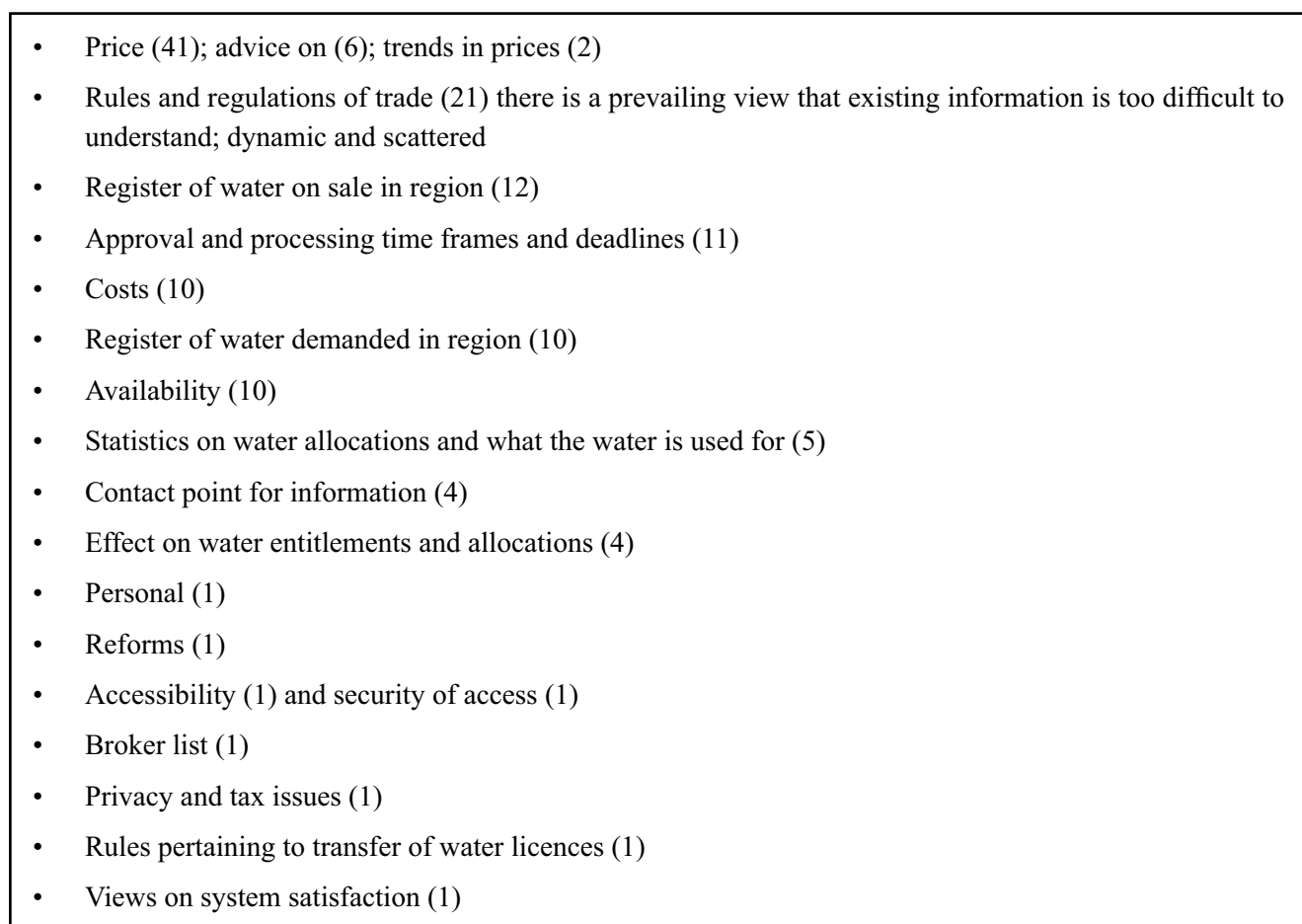


Figure 6 Market information requested

## 7.2 Transaction Costs

Transaction costs, be they the actual monetary costs in the form of fees and commissions, or the time taken to complete a trade are often perceived as a major inhibitor to trade. Tables 24 and 25 present a summary of transaction costs incurred by traders and their opinions on the time taken to complete their last trade.

Traders see neither of these issues as an inhibitor to trade, with 84.7% of traders considering the level of transaction costs to be satisfactory and 89.3% considering the time taken to complete a trade as reasonable or better.

Table 24 Level of transaction costs

<b>Mean Transaction Cost \$113.84</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Cumulative Percentage</b>
Satisfactory	122	84.7	84.7
Excessive	22	15.3	100
<b>Total</b>	<b>144</b>	<b>100</b>	

Table 25 Time to complete trade

<b>Mean Time 21.55 days</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Cumulative Percentage</b>
Excellent	34	24.3	24.3
Reasonable	91	65.0	89.3
Unacceptable	13	9.3	98.6
Inhibited the final use of the water	2	1.4	100
<b>Total</b>	<b>140</b>	<b>100</b>	



### 7.3 Permanent Trading

Table 26 summarises perceptions of buying and selling in the permanent water market. Respondent views on permanent water trading are that most traders purchased water because their existing water entitlement does not meet current needs. 71.3% of irrigator respondents believe that the reason other farmers permanently sell water is that it is surplus to needs. 25.2% believe that other farmers trade water by making some form of structural change to their farm operation. 48.0% and 33.0% perceive others buying water to meet existing water requirements or increase their irrigation enterprise respectively. 18.9% of irrigators see others buying water to increase their water security.

### 7.4 Blockages and Impediments to Trade

Table 27 outlines the perceived reasons why others do not trade water. No blockage dominated the responses. The main perceived reason why others do not trade, beyond a need basis, is that they see their own entitlement as an integral part of their farm. 23% of irrigators believe others do not trade water because they view water as an integral part of their farm and not for sale. Institutionally breaking the nexus between land and water will not lead to trade unless farmers see water entitlements as a tradeable asset.

Blockages and impediments to the trading in water entitlements, as outlined in Figure 7 below, centre on the role of the water authority and irrigation corporations, in particular their intervention in the market and variation of the rules of trade during the trading period. Water pricing and the uncertainty surrounding it is also seen as a major blockage.

Table 26 Perceptions of permanent trading

		Frequency	Percentage	Cuml. Percentage
<b>Buy</b>	Entitlement does not meet existing water requirements	109	48.0	48.0
	Land development	75	33.0	81.1
	Increased security of supply	43	18.9	100
	<b>Total</b>	<b>227</b>	<b>100</b>	
<b>Sell</b>	Surplus to needs	164	71.3	71.3
	More by selling than crops	29	12.6	83.9
	Dryland alternative	6	2.6	86.5
	Retiring	8	3.5	90.0
	Other	23	10.0	100
	<b>Total</b>	<b>230</b>	<b>100</b>	

Table 27 Perceived reasons why others do not trade: trader and non-trader opinions

Reason	All Irrigators		Traders		Non-traders	
	Count	%	Count	%	Count	%
Do not need additional water	140	35.0	97	40.9	43	26.5
They do not know enough about the market	67	16.8	34	14.3	32	19.8
They view water as an integral part of their farm and not for sale	92	23.0	47	19.8	45	27.8
They do not wish to barter with other farmers	12	3.0	5	2.1	7	4.3
They are philosophically opposed to trading	47	11.8	29	12.2	18	11.1
They find the administration costs and delays associated with trade too great	42	10.5	25	10.5	17	10.5
<b>Total</b>	<b>400</b>	<b>100</b>	<b>237</b>	<b>100</b>	<b>162</b>	<b>100</b>

Note: Respondents could give more than one answer. The results are therefore presented in a multiple response table.

- Allowing trade between regions (5) - don't allow trade (3)
- Not allowing trade between regions (3) - facilitate meetings and trade between areas (4)
- No storage (1)- no solutions
- Concern about irrigation company and water authority intervention (30) and as a possible monopoly power (6)
- Concern about DWLC changing the rules all the time in mid game (10); full cost pricing and not acting in the public interest (2); and being too influenced by the rice growers (7)
- Limited information on buyers and sellers (3) - a public register would be nice (1) but without names for privacy (1)
- Farmers traditional points of view are outdated (6) and they require community education (3)
- Lack of information (8) - supply some (6), perhaps develop a local network distribution system (2)
- Concern over loss of off allocation (5) and forfeit carryover (7) rules - these are particularly unpopular and immediate removal is suggested (5) and (7); also the addition of a secondary licence based on history of use (1)
- Government blockage (9) - improved individual accountability (1); quicker approvals process (2); and options for longer length transfers (3-5 years) (2) are suggested
- Water supply data is lacking (1)
- Insecurity (1) - 12 month sell period without endangering one's licence (1)
- Time taken for delivery (1)
- Trade restrictions (3) - remove them (3) (the original thought processes involved here blow the mind)
- 25% environmental levy (3) - across the board environmental allocations (1)
- Bulk purchases by agents and landholders (1)
- Cut-off times are too early (11)
- Water availability (4) - build more dams (2)
- Delivery losses from up to downstream (2) - account for these in allocation setting (1)
- Water prices (12) - a government subsidy (1); cutting out middlemen (2); setting price controls (2) to help the free market (2)
- Price floors set by monopoly firms (1)
- Commodity prices are too low (1)
- Other water users are a pain in the bum (1)
- Uncertainty over allocations and loss of licence (5) - security for entitlements over the long term (1); clearer guidelines for CAP and access (3)
- Ownership (1) - should stay with landholder and title (1)

Figure 7 Perceived institutional and system blockages to trade

## 8. Social Impacts of Water Trading

The community questionnaire asked whether they are aware of changes in social capital as a direct result of water trading. The indicators of social capital and a summary of their responses are presented in Table 28. Hospital facilities and services, banking facilities,

closure of small business and town real estate values are seen as being in decline while school and education opportunities, crime and disorderly behaviour and future expectation have not changed substantially as a result of water trading.

Table 28 Social capital impacts of water trading

Measure of Social Capital	Mean Response by the Community†
School and education opportunities	2.89
Crime and disorderly behaviour	3.05
Closures of small businesses	2.82*
Hospital facilities and services	2.71**
Town real estate values	2.77*
Banking facilities	2.64**
Expectations for the future of your community	2.73

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
*a* significantly less than 3; *b* significantly greater than 3



## 9. Future Performance Expectations of Water Markets

Finally, given the structure and conduct of the market, respondents are asked their opinions on the performance of the market in the future. Tables 29 and 30 present a summary of their opinions. While, there is an overall feeling that trade will be limited and within a region, it is also felt that future water markets will become a significant influence in the structure and operation of irrigated agriculture and improve overall farm income

in the region. There is a strong divergence of opinion on the impact of water trading on environmental flows. The community at large believes water trading will significantly impact on environmental flows while irrigators do not. There is an overall feeling that water trading will not significantly reduce the well-being of local towns and communities. In terms of market structure there is a feeling that a few large players will dominate the market. This feeling is stronger among non-traders and the community at large than traders. Finally, there is overall agreement that water trading will not significantly increase salinity in the region.

Table 29 Opinions on the future performance of water markets: trader and non-trader opinions

	Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Trader	Non-trader		
Be limited and within a region	2.56 <sup>a**</sup>	2.72	2.27	5460.0**	1.436*
Become a significant market and influence on irrigated agriculture	2.31 <sup>a**</sup>	2.24	2.42	6398.5	0.429
Impact on the water supply of farmers in other regions	3.03	3.11	2.89	6078.0	0.889
Reduce the announced sales to all irrigators	3.07	2.63	2.84	4995.5**	1.037
Improve overall farm income in the region	2.79 <sup>a**</sup>	3.32	3.10	5092.5**	1.945**
Move water out of my reach of the river or channel system	3.19 <sup>b**</sup>	3.39	2.97	5325.5**	1.481*
Significantly impact on the environmental health of river systems	3.23 <sup>b**</sup>	3.43	2.94	5426.0**	1.304
Significantly reduce the well-being of local towns and businesses in my area	3.33 <sup>b**</sup>	3.00	3.15	5840.0	0.996
Be dominated by a few large players	2.89	3.69	2.68	5791.0*	1.180
Significantly increase salinity in your region	3.53 <sup>b**</sup>	3.92	3.24	5276.0**	1.063

† Scale 1 ‘strongly agree’ 5 ‘strongly disagree’; \* Significant at 0.05; \*\* Significant at 0.01  
<sup>a</sup> significantly less than 3; <sup>b</sup> significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

Table 30 Opinions on future performance of water markets: irrigator and community opinions

	Mean Rank†	Mean Response†		MW-U‡	KS-Z‡
		Irrigator	Community		
Be limited and within a region	2.53 <sup>a**</sup>	2.56	2.47	14900.0	0.537
Become a significant market and influence on irrigated agriculture	2.26 <sup>a**</sup>	2.31	2.15	14125.5	0.604
Impact on the water supply of farmers in other regions	2.81 <sup>a**</sup>	3.03	2.38	9827.0 <sup>**</sup>	3.041 <sup>**</sup>
Improve overall farm income in the region	2.75 <sup>a**</sup>	2.79	2.67	14385.5	1.298
Move water out of my reach of the river or channel system	3.17 <sup>b**</sup>	3.19	3.14	14194.5	0.776
Significantly impact on the environmental health of river systems	2.83 <sup>a**</sup>	3.23	2.06	7027.0 <sup>**</sup>	3.984 <sup>**</sup>
Significantly reduce the wellbeing of local towns and businesses in my area	3.21 <sup>b**</sup>	3.33	2.97	12025.5 <sup>**</sup>	2.156 <sup>**</sup>
Be dominated by a few large players	2.80 <sup>a**</sup>	2.89	2.63	13211.5 <sup>*</sup>	1.430 <sup>*</sup>
Significantly increase salinity in your region	3.20 <sup>b**</sup>	3.53	2.57	8576.0 <sup>**</sup>	3.245 <sup>**</sup>

† Scale 1 'strongly agree' 5 'strongly disagree'; \* Significant at 0.05; \*\* Significant at 0.01  
*a* significantly less than 3; *b* significantly greater than 3

‡ See Section 4 for explanation of MW-U and KS-Z

## 10. Demographic Breakdown of Respondents and Responses

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The results of the survey give a detailed picture of irrigators and community attitudes to water allocation and trading issues. Adoption of the findings depends on the stability of the aggregate attitudes through time. An important determinant of that is the age distribution of the respondents. Overall the farming community is

ageing and there is the possibility that the views of future farmers may differ through time as farmers retire. A breakdown of the age of respondents presented in Table 31 shows 65.7% of the irrigators responding to the survey are under 54 and therefore have potentially ten or more working years on their farm. Their attitudes and opinions will therefore impact on the adoption of water reform and trading for some years to come.

Table 31 Age distribution of respondents

Age	Irrigators		Community	
	Count	Percentage	Count	Percentage
15-24	0	0	2	1.6
25-34	14	5.6	17	13.3
35-44	68	27.2	20	15.6
45-54	75	30.0	27	21.1
55-64	65	26.0	23	18.0
65-74	23	9.2	25	19.5
74 and over	5	2.0	14	10.9





## 11. Conclusion

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The survey found that there is general agreement among the irrigators and community members that water reform is necessary, that rights to water should be separated from rights to land, and such rights should be traded independently. While irrigator respondents believe that sleeper licences should not be extinguished, the community at large feel they should. Irrigators also disagree with setting water aside for environmental use, while the community at large agree with the notion. Irrigators are uncertain whether the reform process will lead to more secure water entitlements or higher reliability of supply. Involvement in the reform process has been seen as very poor. Approximately half of irrigators stated they have been impacted by the CAP, while a small number of the community believe their business has been impacted. In prioritizing COAG reform objectives, ensuring a fair and just distribution of water is overall perceived as more important than maximising farm income, meeting natural flow requirements, or accounting for local town and community requirements.

The number of buyers and sellers in part is determined by who has a right to trade. There is general agreement that the rights to trade should be open to irrigators and local towns and communities. There is support for restricting trade within channel systems when necessary to maintain infrastructure, when transactions impact on other water users, environmental flow objectives, and the economic viability of local towns and communities. There is similar widespread support for restricting trade when the conditions of trade or the resulting distribution of water is deemed unjust, and where a company enters the market solely as a speculator.

In the temporary market, the role of the temporary market is to realise the opportunity cost of water on a season-by-season basis, and allow for surplus water and within season tradeoffs to be made. There is strong interest in selling surplus water. However, few sellers stated that they made trade decisions on the basis of the opportunity cost of water, and few are prepared to consider changing farm practices and using the market to maximise their return from their water. Buyers tend to purchase water to meet end of season waterings

and overall shortfalls in water allocations. Overall, irrigators see traders in the future buying water: (a) prior to making a cropping decision; (b) should water become short; or (c) to acquire more secure water supplies. Selling will continue to be dominated by the sale of surplus water. Irrigators voiced concerns about the actions and roles of the water authorities and irrigation companies, and their impact on trade. The main blockages to trade, both perceived and actual, include a lack of information from their regulator on of how markets operate and market information.

Finally, the respondents see water markets playing a significant role in irrigated agriculture in the future, and will lead to an increase in overall farm income.



**APPENDIX A.**

**Frequency tables arising from the survey  
of irrigators in the Murrumbidgee  
catchment**

**The Impact of Water Reform in Australia**

The planning process for water policy reform for the next decade is underway. This survey provides a great opportunity for you to be part of that process. All answers are confidential and will only be used to gain an overview of opinions in the catchments. Researchers at Griffith University are conducting this survey. The University will not release information from individual surveys. The role of Universities is to provide informed and independent comment on government policy. A report on the findings of this study will be given to the water authority governing your region for consideration and released as a public document for comment.

**Your Views on Water Reform**

The COAG is promoting water reform in Australia. State Governments are currently reviewing water laws and policies. The reforms involve the definition of rights to water, water pricing and the introduction of trade in water entitlements. We are interested in how these reforms impact on you, as an irrigator and member of the rural catchment community, and your family, friends and community.

**1. Do you believe the system of water management needed to be reformed?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	191	73.2	80.9	80.9
	no	45	17.2	19.1	100.0
	Total	236	90.4	100.0	
Missing	System	25	9.6		
Total		261	100.0		

Note: 'Missing System' signifies non-response to question

**2. This question lists a number of statements concerning water reform.**

- **Water entitlements should be allowed to be separated from land and be traded**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	71	27.2	28.1	28.1
	accept	73	28.0	28.9	56.9
	indifferent	10	3.8	4.0	60.9
	reject	34	13.0	13.4	74.3
	completely reject	65	24.9	25.7	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

- **On-farm runoff should be licensed**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	17	6.5	6.7	6.7
	accept	27	10.3	10.6	17.3
	indifferent	24	9.2	9.4	26.7
	reject	78	29.9	30.6	57.3
	completely reject	109	41.8	42.7	100.0
	Total	255	97.7	100.0	
Missing	System	6	2.3		
Total		261	100.0		

- **Water for the environment be set aside prior to allocating water to farmers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	27	10.3	10.7	10.7
	accept	63	24.1	25.0	35.7
	indifferent	31	11.9	12.3	48.0
	reject	70	26.8	27.8	75.8
	completely reject	61	23.4	24.2	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		

- **Water users should be charged the full cost of water supply**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	12	4.6	4.7	4.7
	accept	53	20.3	20.9	25.6
	indifferent	26	10.0	10.2	35.8
	reject	102	39.1	40.2	76.0
	completely reject	61	23.4	24.0	100.0
	Total	254	97.3	100.0	
Missing	System	7	2.7		
Total		261	100.0		

- **Licences which have not been used for five years should be extinguished**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	32	12.3	12.6	12.6
	accept	43	16.5	16.9	29.5
	indifferent	40	15.3	15.7	45.3
	reject	68	26.1	26.8	72.0
	completely reject	71	27.2	28.0	100.0
	Total	254	97.3	100.0	
Missing	System	7	2.7		
Total		261	100.0		

- **Water entitlements will be more secure following the reforms**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly support	25	9.6	10.2	10.2
accept	59	22.6	24.1	34.3
indifferent	58	22.2	23.7	58.0
reject	68	26.1	27.8	85.7
completely reject	35	13.4	14.3	100.0
Total	245	93.9	100.0	
Missing System	16	6.1		
Total	261	100.0		

- **Water entitlements will have higher reliability of supply following the water reforms**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly support	31	11.9	12.6	12.6
accept	56	21.5	22.8	35.4
indifferent	59	22.6	24.0	59.3
reject	66	25.3	26.8	86.2
completely reject	34	13.0	13.8	100.0
Total	246	94.3	100.0	
Missing System	15	5.7		
Total	261	100.0		



- **Water trading should benefit the greatest number of people possible**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	61	23.4	24.8	24.8
	accept	106	40.6	43.1	67.9
	indifferent	34	13.0	13.8	81.7
	reject	24	9.2	9.8	91.5
	completely reject	21	8.0	8.5	100.0
	Total	246	94.3	100.0	
Missing	System	15	5.7		
Total		261	100.0		

- **If trading rules and procedures cannot provide equal opportunity to access water for all in your region, they should protect the rights of those worst-off**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	40	15.3	15.8	15.8
	accept	78	29.9	30.8	46.6
	indifferent	62	23.8	24.5	71.1
	reject	47	18.0	18.6	89.7
	completely reject	26	10.0	10.3	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

- **The beneficiaries from water trade should be able to compensate those who feel they have lost because of the transaction**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	48	18.4	18.9	18.9
	accept	86	33.0	33.9	52.8
	indifferent	43	16.5	16.9	69.7
	reject	59	22.6	23.2	92.9
	completely reject	18	6.9	7.1	100.0
	Total	254	97.3	100.0	
Missing	System	7	2.7		
Total		261	100.0		

- **There should be no general rules of trade as each situation is different and should be considered on a case-by-case basis**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	29	11.1	11.6	11.6
	accept	51	19.5	20.5	32.1
	indifferent	58	22.2	23.3	55.4
	reject	75	28.7	30.1	85.5
	completely reject	36	13.8	14.5	100.0
	Total	249	95.4	100.0	
Missing	System	12	4.6		
Total		261	100.0		

**3. Overall, during the water reform process the community at large has been:**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	actively involved and embraced it	6	2.3	2.5	2.5
	well informed and accepting	19	7.3	7.9	10.4
	involved but largely ignored	91	34.9	37.8	48.1
	poorly informed but accepting	69	26.4	28.6	76.8
	poorly informed and unhappy	56	21.5	23.2	100.0
	Total	241	92.3	100.0	
Missing	System	20	7.7		
Total		261	100.0		

**4. Below are four aspects of water reform. Please allocate 100 points among these aspects to reflect the relative importance you attach to each of them. The more points a statement receives, the more important that statement is to you. If you think the statement is not at all important, give it zero points. If one statement is twice as important as some other statement, it should receive twice as many points.**

**The reforms should:**

	Average (%)	Std. Dev.
Maximise farm income only, given available supplies	27.29	21.79
Distribute water entitlements in a fair and just manner	30.82	19.59
Meet the requirements of natural river flow	19.00	15.99
Account for the impact of trading on local towns and communities	18.84	15.51

**5. Part of the COAG reform is the CAP on water entitlements in 1993/94. Has the CAP impacted on your farm or business?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	113	43.3	46.3	46.3
	no	131	50.2	53.7	100.0
	Total	244	93.5	100.0	
Missing	System	17	6.5		
Total		261	100.0		

<b>Your Views on Temporary Water Trading</b>
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**1. What is the most important reason why other farmers temporarily buy water?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not meet crop requirements	152	58.2	62.6	62.6
	They need water to meet end of season	69	26.4	28.4	90.9
	other	22	8.4	9.1	100.0
	Total	243	93.1	100.0	
Missing	System	18	6.9		
Total		261	100.0		

**2. What is the most important reason why other farmers temporarily sell water?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	They have surplus water	168	64.4	68.9	68.9
	Sell because they could make more by selling	47	18.0	19.3	88.1
	other	29	11.1	11.9	100.0
	Total	244	93.5	100.0	
Missing	System	17	6.5		
Total		261	100.0		

**3. What do you see are the main reasons other farmers do not temporarily trade water?**

- **They do not need additional water, or have surplus to sell**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	140	53.6	54.5	54.5
	no	117	44.8	45.5	100.0
	Total	257	98.5	100.0	
Missing	System	4	1.5		
Total		261	100.0		

- **They do not know enough about the market**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	67	25.7	26.1	26.1
	no	190	72.8	73.9	100.0
	Total	257	98.5	100.0	
Missing	System	4	1.5		
Total		261	100.0		

- **They view water as an integral part of their farm and not for sale**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	92	35.2	35.8	35.8
	no	165	63.2	64.2	100.0
	Total	257	98.5	100.0	
Missing	System	4	1.5		
Total		261	100.0		

- **They do not wish to barter with other farmers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	12	4.6	4.7	4.7
	no	246	94.3	95.3	100.0
	Total	258	98.9	100.0	
Missing	System	3	1.1		
Total		261	100.0		

- **They are philosophically opposed to trading**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	47	18.0	18.3	18.3
no	210	80.5	81.7	100.0
Total	257	98.5	100.0	
Missing System	4	1.5		
Total	261	100.0		

- **They find the administration costs and delays associated with gaining approval for trade too great**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	42	16.1	16.3	16.3
no	215	82.4	83.7	100.0
Total	257	98.5	100.0	
Missing System	4	1.5		
Total	261	100.0		

**4. Have you been able to gain good information on how temporary water markets operate?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	143	54.8	58.6	58.6
no	101	38.7	41.4	100.0
Total	244	93.5	100.0	
Missing System	17	6.5		
Total	261	100.0		

**5. If you are to temporarily buy water in the future would you look to the water market:**

- **Prior to making your cropping decision for the season**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	100	38.3	39.7	39.7
	no	152	58.2	60.3	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		

- **To finish a crop should water become short**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	117	44.8	46.4	46.4
	no	135	51.7	53.6	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		

- **To acquire more secure water supplies for the season**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	65	24.9	25.8	25.8
	no	187	71.6	74.2	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		

- **Prior to the next irrigation**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	199	76.2	78.7	78.7
	no	54	20.7	21.3	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

- **To purchase water regularly according to your watering regime**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	11	4.2	4.4	4.4
	no	241	92.3	95.6	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		

**6. If you planned to sell water temporarily prior to planting, would you:**

- **Only sell water surplus to requirements**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	39	14.9	15.5	15.5
	no	213	81.6	84.5	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		



- **Change crops to use less water**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	13	5.0	5.1	5.1
no	240	92.0	94.9	100.0
Total	253	96.9	100.0	
Missing System	8	3.1		
Total	261	100.0		

- **Run all or some of the crop as a dryland enterprise**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	8	3.1	3.2	3.2
no	245	93.9	96.8	100.0
Total	253	96.9	100.0	
Missing System	8	3.1		
Total	261	100.0		

- **Reduce the area planted and leave some land fallow**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	13	5.0	5.1	5.1
no	241	92.3	94.9	100.0
Total	254	97.3	100.0	
Missing System	7	2.7		
Total	261	100.0		

- **Not crop that year**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	11	4.2	4.3	4.3
	no	242	92.7	95.7	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

- **Other**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	19	7.3	7.5	7.5
	no	234	89.7	92.5	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

## 7. Who should be allowed to trade in the temporary water market?

- **Active irrigators who hold water entitlements within you region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	147	56.3	58.3	58.3
	agree	92	35.2	36.5	94.8
	uncertain	3	1.1	1.2	96.0
	disagree	4	1.5	1.6	97.6
	strongly disagree	6	2.3	2.4	100.0
	Total	252	96.6	100.0	
Missing	System	9	3.4		
Total		261	100.0		

- **Active irrigators who hold water entitlements in adjoining regions**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	61	23.4	25.5	25.5
	agree	66	25.3	27.6	53.1
	uncertain	37	14.2	15.5	68.6
	disagree	46	17.6	19.2	87.9
	strongly disagree	29	11.1	12.1	100.0
	Total	239	91.6	100.0	
Missing	System	22	8.4		
Total		261	100.0		

- **Farmers who wish to start an irrigation enterprise in your region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	80	30.7	32.8	32.8
	agree	63	24.1	25.8	58.6
	uncertain	43	16.5	17.6	76.2
	disagree	38	14.6	15.6	91.8
	strongly disagree	20	7.7	8.2	100.0
	Total	244	93.5	100.0	
Missing	System	17	6.5		
Total		261	100.0		

- **Farmers who have not used their entitlement in the last five years**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	68	26.1	28.0	28.0
	agree	77	29.5	31.7	59.7
	uncertain	38	14.6	15.6	75.3
	disagree	32	12.3	13.2	88.5
	strongly disagree	28	10.7	11.5	100.0
	Total	243	93.1	100.0	
Missing	System	18	6.9		
Total		261	100.0		

- **Local towns and communities for domestic use**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	65	24.9	26.3	26.3
	agree	112	42.9	45.3	71.7
	uncertain	22	8.4	8.9	80.6
	disagree	34	13.0	13.8	94.3
	strongly disagree	14	5.4	5.7	100.0
	Total	247	94.6	100.0	
Missing	System	14	5.4		
Total		261	100.0		

- **Local shires to use water for recreation use, such as parks and golf courses**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	52	19.9	21.7	21.7
	agree	101	38.7	42.1	63.8
	uncertain	29	11.1	12.1	75.8
	disagree	41	15.7	17.1	92.9
	strongly disagree	17	6.5	7.1	100.0
	Total	240	92.0	100.0	
Missing	System	21	8.0		
Total		261	100.0		

- **Local industries who use water**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	58	22.2	24.0	24.0
	agree	112	42.9	46.3	70.2
	uncertain	33	12.6	13.6	83.9
	disagree	27	10.3	11.2	95.0
	strongly disagree	12	4.6	5.0	100.0
	Total	242	92.7	100.0	
Missing	System	19	7.3		
Total		261	100.0		

- **Environmental groups and agencies**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	53	20.3	22.0	22.0
	agree	79	30.3	32.8	54.8
	uncertain	43	16.5	17.8	72.6
	disagree	34	13.0	14.1	86.7
	strongly disagree	32	12.3	13.3	100.0
	Total	241	92.3	100.0	
Missing	System	20	7.7		
Total		261	100.0		

- **Individuals and companies who do not intend to use water**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	21	8.0	9.0	9.0
	agree	20	7.7	8.5	17.5
	uncertain	26	10.0	11.1	28.6
	disagree	42	16.1	17.9	46.6
	strongly disagree	125	47.9	53.4	100.0
	Total	234	89.7	100.0	
Missing	System	27	10.3		
Total		261	100.0		

- **Other**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	4	1.5	20.0	20.0
	accept	1	.4	5.0	25.0
	indifferent	5	1.9	25.0	50.0
	reject	3	1.1	15.0	65.0
	completely reject	7	2.7	35.0	100.0
	Total	20	7.7	100.0	
Missing	System	241	92.3		
Total		261	100.0		

**10. Have you traded water in the temporary water trading market in the last three years?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	159	60.9	61.4
	no	100	38.3	100.0
	Total	259	99.2	100.0
Missing	System	2	.8	
Total		261	100.0	

**10(a) What is the main reason you traded water?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not meet crop requirements	33	12.6	21.7
	water to finish crop	9	3.4	27.6
	water surplus to needs	103	39.5	95.4
	more by selling	6	2.3	99.3
	overused entitlement	1	.4	100.0
	Total	152	58.2	100.0
Missing	System	109	41.8	
Total		261	100.0	

**10(e) Did the actions of other water traders affect how you traded?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	30	11.5	20.4
	no	117	44.8	100.0
	Total	147	56.3	100.0
Missing	System	114	43.7	
Total		261	100.0	

**10(f) What costs did you incur establishing your last transaction?**

Cost	Mean (\$)	Std. Dev.
Exchange fees	79.06	78.60
Legal fees	75.00	0.00
Consultants	0.00	0.00
Water Authority fees	0.00	0.00
Other	116.87	175.10

**10(g) Do you consider the costs associated with the transaction:-**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid satisfactory	122	46.7	84.7	84.7
excessive	22	8.4	15.3	100.0
Total	144	55.2	100.0	
Missing System	117	44.8		
Total	261	100.0		

**10(h) How long is it from the start of negotiating a trade to the final approval for the supply of water?**

21.55 days

**10(i) The time taken to complete a trade was:-**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid excellent	34	13.0	24.3	24.3
reasonable	91	34.9	65.0	89.3
unacceptable	13	5.0	9.3	98.6
inhibited the final use of water	2	.8	1.4	100.0
Total	140	53.6	100.0	
Missing System	121	46.4		
Total	261	100.0		

<b>Your Views on Permanent Water Trading</b>
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**1. What is the most important reason why other farmers buy water entitlements?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	does not meet water requirements	109	41.8	48.0	48.0
	want to develop more land	75	28.7	33.0	81.1
	greater security of supply	43	16.5	18.9	100.0
	Total	227	87.0	100.0	
Missing	System	34	13.0		
Total		261	100.0		

**2. What is the most important reason why other farmers sell water entitlements?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	surplus to needs	164	62.8	71.3	71.3
	more by sell than crops	29	11.1	12.6	83.9
	dryland farm alternative	6	2.3	2.6	86.5
	retiring	8	3.1	3.5	90.0
	other	23	8.8	10.0	100.0
	Total	230	88.1	100.0	
Missing	System	31	11.9		
Total		261	100.0		



### Your Views on the Impact and Future of Water Trading

To plan for the future it is important to look forward and best guess the future. Your expectations are an important input into policy development for the next decade.

- **Water trading will become like buying fertiliser in that a farmer will buy and sell it in on a need basis**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	27	10.3	10.8	10.8
	agree	87	33.3	34.7	45.4
	uncertain	40	15.3	15.9	61.4
	disagree	59	22.6	23.5	84.9
	strongly disagree	38	14.6	15.1	100.0
	Total	251	96.2	100.0	
Missing	System	10	3.8		
Total		261	100.0		

- **Water entitlements will no longer be an inherent asset in farming**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	9	3.4	3.6	3.6
	agree	15	5.7	5.9	9.5
	uncertain	23	8.8	9.1	18.6
	disagree	89	34.1	35.2	53.8
	strongly disagree	117	44.8	46.2	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

- **Farmers will be reluctant to trade and rely on their entitlement to meet their water requirements**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	25	9.6	10.1	10.1
	agree	74	28.4	29.8	39.9
	uncertain	66	25.3	26.6	66.5
	disagree	65	24.9	26.2	92.7
	strongly disagree	18	6.9	7.3	100.0
	Total	248	95.0	100.0	
Missing	System	13	5.0		
Total		261	100.0		

- **Farmers will follow water prices as they do crop and input prices**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	34	13.0	13.5	13.5
	agree	148	56.7	59.0	72.5
	uncertain	30	11.5	12.0	84.5
	disagree	28	10.7	11.2	95.6
	strongly disagree	11	4.2	4.4	100.0
	Total	251	96.2	100.0	
Missing	System	10	3.8		
Total		261	100.0		

- **There will be no temporary trading as all trades will be permanent**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	7	2.7	2.8	2.8
	agree	11	4.2	4.4	7.2
	uncertain	41	15.7	16.3	23.5
	disagree	108	41.4	43.0	66.5
	strongly disagree	84	32.2	33.5	100.0
	Total	251	96.2	100.0	
Missing	System	10	3.8		
Total		261	100.0		

- **Markets will consist of only a few traders, farmers will anticipate what others may offer and buy**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	12	4.6	4.9	4.9
	agree	49	18.8	19.8	24.7
	uncertain	99	37.9	40.1	64.8
	disagree	60	23.0	24.3	89.1
	strongly disagree	27	10.3	10.9	100.0
	Total	247	94.6	100.0	
Missing	System	14	5.4		
Total		261	100.0		

- **Farmers will pay more for high security water entitlements than for general security**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	51	19.5	20.2	20.2
	agree	147	56.3	58.1	78.3
	uncertain	35	13.4	13.8	92.1
	disagree	15	5.7	5.9	98.0
	strongly disagree	5	1.9	2.0	100.0
	Total	253	96.9	100.0	
Missing	System	8	3.1		
Total		261	100.0		

- **There will be a lot of traders and the actions of individuals will not greatly influence the market price**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	12	4.6	4.9	4.9
	agree	60	23.0	24.5	29.4
	uncertain	81	31.0	33.1	62.4
	disagree	81	31.0	33.1	95.5
	strongly disagree	11	4.2	4.5	100.0
	Total	245	93.9	100.0	
Missing	System	16	6.1		
Total		261	100.0		

<b>Trade in Water in your Region in Ten Years Time will:</b>
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- **Be limited and within a region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	34	13.0	13.7	13.7
	agree	108	41.4	43.5	57.3
	uncertain	53	20.3	21.4	78.6
	disagree	40	15.3	16.1	94.8
	strongly disagree	13	5.0	5.2	100.0
	Total	248	95.0	100.0	
Missing	System	13	5.0		
Total		261	100.0		

- **Become a significant market and influence on irrigated agriculture**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	35	13.4	14.2	14.2
	agree	135	51.7	54.7	68.8
	uncertain	50	19.2	20.2	89.1
	disagree	20	7.7	8.1	97.2
	strongly disagree	7	2.7	2.8	100.0
	Total	247	94.6	100.0	
Missing	System	14	5.4		
Total		261	100.0		

- **Impact on the water supply of farmers in other regions**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	15	5.7	6.0	6.0
	agree	59	22.6	23.8	29.8
	uncertain	86	33.0	34.7	64.5
	disagree	79	30.3	31.9	96.4
	strongly disagree	9	3.4	3.6	100.0
	Total	248	95.0	100.0	
Missing	System	13	5.0		
Total		261	100.0		

- **Reduce the announced sales to all irrigators**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	10	3.8	4.3	4.3
	agree	49	18.8	20.9	25.2
	uncertain	106	40.6	45.3	70.5
	disagree	53	20.3	22.6	93.2
	strongly disagree	16	6.1	6.8	100.0
	Total	234	89.7	100.0	
Missing	System	27	10.3		
Total		261	100.0		

- **Improve overall farm income in the region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	28	10.7	11.4	11.4
	agree	80	30.7	32.7	44.1
	uncertain	70	26.8	28.6	72.7
	disagree	49	18.8	20.0	92.7
	strongly disagree	18	6.9	7.3	100.0
	Total	245	93.9	100.0	
Missing	System	16	6.1		
Total		261	100.0		

- **Move water out of my reach of the river or channel system**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	14	5.4	5.7	5.7
	agree	38	14.6	15.6	21.3
	uncertain	93	35.6	38.1	59.4
	disagree	85	32.6	34.8	94.3
	strongly disagree	14	5.4	5.7	100.0
	Total	244	93.5	100.0	
Missing	System	17	6.5		
Total		261	100.0		

- **Significantly impact on the environmental health of river systems**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	19	7.3	7.8	7.8
	agree	49	18.8	20.0	27.8
	uncertain	58	22.2	23.7	51.4
	disagree	94	36.0	38.4	89.8
	strongly disagree	25	9.6	10.2	100.0
	Total	245	93.9	100.0	
Missing	System	16	6.1		
Total		261	100.0		

- **Significantly reduce the well-being of local towns and businesses in my area**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	33	12.6	13.5	13.5
agree	70	26.8	28.6	42.0
uncertain	55	21.1	22.4	64.5
disagree	66	25.3	26.9	91.4
strongly disagree	21	8.0	8.6	100.0
Total	245	93.9	100.0	
Missing System	16	6.1		
Total	261	100.0		

- **Be dominated by a few large players**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	10	3.8	4.2	4.2
agree	32	12.3	13.3	17.5
uncertain	59	22.6	24.6	42.1
disagree	100	38.3	41.7	83.8
strongly disagree	39	14.9	16.3	100.0
Total	240	92.0	100.0	
Missing System	21	8.0		
Total	261	100.0		

- **Significantly increase salinity in your region**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	19	7.3	7.8	7.8
agree	41	15.7	16.8	24.6
uncertain	50	19.2	20.5	45.1
disagree	109	41.8	44.7	89.8
strongly disagree	25	9.6	10.2	100.0
Total	244	93.5	100.0	
Missing System	17	6.5		
Total	261	100.0		

- 1. There is concern that if permanent trade results in water moving out of an irrigation area it may not be financially viable to supply water to the remaining irrigators. If this happens, the water authority should:**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	continue to supply	41	15.7	19.1	19.1
	exit fees	24	9.2	11.2	30.2
	compensate and close	23	8.8	10.7	40.9
	restrict trade	127	48.7	59.1	100.0
	Total	215	82.4	100.0	
Missing	System	46	17.6		
Total		261	100.0		



<b>Your Views on the Role of the Water Authority in Water Markets</b>
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**1. Under what circumstances should be water authority be able to reject an application for trade?**

- **Only when the system is not capable of supplying the water to the buyer**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	99	37.9	40.4	40.4
	agree	118	45.2	48.2	88.6
	uncertain	10	3.8	4.1	92.7
	disagree	13	5.0	5.3	98.0
	strongly disagree	5	1.9	2.0	100.0
	Total	245	93.9	100.0	
Missing	System	16	6.1		
Total		261	100.0		

- **If there is a possible impact on other water entitlements**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	65	24.9	26.3	26.3
	agree	131	50.2	53.0	79.4
	uncertain	26	10.0	10.5	89.9
	disagree	17	6.5	6.9	96.8
	strongly disagree	8	3.1	3.2	100.0
	Total	247	94.6	100.0	
Missing	System	14	5.4		
Total		261	100.0		

- **If the trade impacts on the economic viability of local towns and communities**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	67	25.7	27.2	27.2
	agree	113	43.3	45.9	73.2
	uncertain	34	13.0	13.8	87.0
	disagree	26	10.0	10.6	97.6
	strongly disagree	6	2.3	2.4	100.0
	Total	246	94.3	100.0	
Missing	System	15	5.7		
Total		261	100.0		

- **If the trade impact on the environmental river flow objectives**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	55	21.1	22.5	22.5
	agree	104	39.8	42.6	65.2
	uncertain	45	17.2	18.4	83.6
	disagree	32	12.3	13.1	96.7
	strongly disagree	8	3.1	3.3	100.0
	Total	244	93.5	100.0	
Missing	System	17	6.5		
Total		261	100.0		

- **If the resulting distribution of water in the catchment is not considered fair and just**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	51	19.5	21.2	21.2
	agree	121	46.4	50.2	71.4
	uncertain	38	14.6	15.8	87.1
	disagree	25	9.6	10.4	97.5
	strongly disagree	6	2.3	2.5	100.0
	Total	241	92.3	100.0	
Missing	System	20	7.7		
Total		261	100.0		

- **If the conditions and price negotiated are not considered fair and just**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	35	13.4	14.5	14.5
	agree	85	32.6	35.1	49.6
	uncertain	45	17.2	18.6	68.2
	disagree	51	19.5	21.1	89.3
	strongly disagree	26	10.0	10.7	100.0
	Total	242	92.7	100.0	
Missing	System	19	7.3		
Total		261	100.0		

- **Other**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	2	.8	18.2	18.2
	accept	3	1.1	27.3	45.5
	indifferent	4	1.5	36.4	81.8
	completely reject	2	.8	18.2	100.0
	Total	11	4.2	100.0	
Missing	System	250	95.8		
Total		261	100.0		

**2. To provide aggregate information to the market through a public register, traders should have to disclose to the water authority:-**

- **The volume of water traded**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	90	34.5	36.6	36.6
	agree	125	47.9	50.8	87.4
	uncertain	8	3.1	3.3	90.7
	disagree	11	4.2	4.5	95.1
	strongly disagree	12	4.6	4.9	100.0
	Total	246	94.3	100.0	
Missing	System	15	5.7		
Total		261	100.0		

- **The price at which the water traded**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	61	23.4	25.0	25.0
	agree	83	31.8	34.0	59.0
	uncertain	21	8.0	8.6	67.6
	disagree	56	21.5	23.0	90.6
	strongly disagree	23	8.8	9.4	100.0
	Total	244	93.5	100.0	
Missing	System	17	6.5		
Total		261	100.0		

- **The traders entitlements and crop mix**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	50	19.2	20.6	20.6
	agree	84	32.2	34.6	55.1
	uncertain	48	18.4	19.8	74.9
	disagree	39	14.9	16.0	90.9
	strongly disagree	22	8.4	9.1	100.0
	Total	243	93.1	100.0	
Missing	System	18	6.9		
Total		261	100.0		

• **Other**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	5	1.9	26.3	26.3
	accept	4	1.5	21.1	47.4
	indifferent	5	1.9	26.3	73.7
	reject	2	.8	10.5	84.2
	completely reject	3	1.1	15.8	100.0
Total		19	7.3	100.0	
Missing	System	242	92.7		
Total		261	100.0		

**Environmental Concerns**

- A number of options have been raised to make water available for environmental flows. Please consider the following *hypothetical* policy options and associated consequences for restoring environmental flows. Rank them from highest (1) to lowest (4) in order of your preference.**

Hypothetical reduction in water entitlement	Hypothetical impact on the Riverine environment	Mean Rank
0%	Irreversible habitat degradation	3.02
20%	Habitat degradation, reversibility unknown	2.11
30%	Reversible habitat degradation	2.17
40%	No habitat degradation	2.70

**2. A government agency should enter the market and use taxpayers money to buy water for the environment.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	56	21.5	22.0	22.0
	disagree	21	8.0	8.2	30.2
	do not know	16	6.1	6.3	36.5
	agree	68	26.1	26.7	63.1
	strongly agree	94	36.0	36.9	100.0
	Total	255	97.7	100.0	
Missing	System	6	2.3		
Total		261	100.0		

**Information about Yourself**

• **Do you have on-farm water storage?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	60	23.0	24.4	24.4
	no	186	71.3	75.6	100.0
	Total	246	94.3	100.0	
Missing	System	15	5.7		
Total		261	100.0		

• **If yes, what is the size of your ring tank?**

Mean 119.15 ML. 1121.39 Std. Dev.

- **Do you generate most of your income from irrigated crops?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	136	52.1	53.3	53.3
	no	119	45.6	46.7	100.0
	Total	255	97.7	100.0	
Missing	System	6	2.3		
Total		261	100.0		

- **What proportion of your income is derived from dryland farming?**

14.33%

- **What proportion of your income is derived from off-farm sources?**

12.95%

## 2. What age group does the farm manager belong to?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-34	14	5.4	5.6	5.6
	35-44	68	26.1	27.2	32.8
	45-54	75	28.7	30.0	62.8
	55-64	65	24.9	26.0	88.8
	65-74	23	8.8	9.2	98.0
	75 and over	5	1.9	2.0	100.0
	Total		250	95.8	100.0
Missing	System	11	4.2		
Total		261	100.0		

**APPENDIX B.**

**Frequency tables arising from the survey  
of community members of the  
Murrumbidgee catchment**



**The Impact of Water Reform in Australia**

The planning process for water policy reform for the next decade is underway. This survey provides a great opportunity for you to be part of that process. All answers are confidential and will only be used to gain an overview of opinions in the catchments. Researchers at Griffith University are conducting this survey. The University will not release information from individual surveys. The role of Universities is to provide informed and independent comment on government policy. A report on the findings of this study will be given to the water authority governing your region for consideration and released as a public document for comment.

**Your Views on Water Reform**

The Council of Australian Governments (COAG) is promoting water reform in Australia. State governments are currently reviewing water laws and policies. The reforms involve the definition of rights to water, water pricing and the introduction of trade in water entitlements. We are interested in how these reforms impact on you, as a member of a rural catchment community, your family and friends.

**1. Do you believe the system of water management needed to be reformed?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid    yes	111	84.7	90.2	90.2
no	12	9.2	9.8	100.0
Total	123	93.9	100.0	
Missing   System	8	6.1		
Total	131	100.0		

Note: 'Missing System' signifies non-response to question

**2. Overall, during the water reform process the community at large has been:**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	actively involved and embraced it	2	1.5	1.8	1.8
	well informed and accepting	9	6.9	8.0	9.7
	involved but largely ignored	15	11.5	13.3	23.0
	poorly informed but accepting	70	53.4	61.9	85.0
	poorly informed and unhappy	17	13.0	15.0	100.0
	Total	113	86.3	100.0	
Missing	System	18	13.7		
Total		131	100.0		

**3. This question lists a number of statements concerning water reform. Please tick the box that best describes your opinion on the following statements.**

- **Water entitlements should be allowed to be separated from land and be traded**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	15	11.5	12.5	12.5
	accept	35	26.7	29.2	41.7
	indifferent	18	13.7	15.0	56.7
	reject	34	26.0	28.3	85.0
	completely reject	18	13.7	15.0	100.0
	Total	120	91.6	100.0	
Missing	System	11	8.4		
Total		131	100.0		

- **On-farm runoff should be licenced**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	9	6.9	7.5	7.5
	accept	30	22.9	25.0	32.5
	indifferent	18	13.7	15.0	47.5
	reject	36	27.5	30.0	77.5
	completely reject	27	20.6	22.5	100.0
	Total	120	91.6	100.0	
Missing	System	11	8.4		
Total		131	100.0		

- **Water for the environment should be set aside prior to allocating water to farmers**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	51	38.9	40.8	40.8
	accept	43	32.8	34.4	75.2
	indifferent	12	9.2	9.6	84.8
	reject	11	8.4	8.8	93.6
	completely reject	8	6.1	6.4	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

- **Water users should be charged the full cost of water supply**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	38	29.0	30.9	30.9
	accept	35	26.7	28.5	59.3
	indifferent	16	12.2	13.0	72.4
	reject	28	21.4	22.8	95.1
	completely reject	6	4.6	4.9	100.0
	Total	123	93.9	100.0	
Missing	System	8	6.1		
Total		131	100.0		

- **Licences which have not been used for five years should be extinguished**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	32	24.4	25.8	25.8
	accept	43	32.8	34.7	60.5
	indifferent	19	14.5	15.3	75.8
	reject	21	16.0	16.9	92.7
	completely reject	9	6.9	7.3	100.0
	Total	124	94.7	100.0	
Missing	System	7	5.3		
Total		131	100.0		

- **Water trading should benefit the greatest number of people possible**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	49	37.4	39.8	39.8
	accept	49	37.4	39.8	79.7
	indifferent	15	11.5	12.2	91.9
	reject	8	6.1	6.5	98.4
	completely reject	2	1.5	1.6	100.0
	Total	123	93.9	100.0	
Missing	System	8	6.1		
Total		131	100.0		

- **If trading rules and procedures cannot provide equal opportunity to access water for all in your region they should protect the rights of those worst-off**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	39	29.8	31.2	31.2
	accept	47	35.9	37.6	68.8
	indifferent	25	19.1	20.0	88.8
	reject	12	9.2	9.6	98.4
	completely reject	2	1.5	1.6	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

- **The beneficiaries from water trade should be able to compensate those who feel they have lost because of the transaction**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly support	29	22.1	24.6	24.6
accept	45	34.4	38.1	62.7
indifferent	29	22.1	24.6	87.3
reject	13	9.9	11.0	98.3
completely reject	2	1.5	1.7	100.0
Total	118	90.1	100.0	
Missing System	13	9.9		
Total	131	100.0		

- **There should be no general rules of trade as each situation is different and should be considered on a case-by-case basis**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly support	23	17.6	19.0	19.0
accept	52	39.7	43.0	62.0
indifferent	15	11.5	12.4	74.4
reject	22	16.8	18.2	92.6
completely reject	9	6.9	7.4	100.0
Total	121	92.4	100.0	
Missing System	10	7.6		
Total	131	100.0		

4. **Below are four aspects of water reform. Please allocate 100 points among these aspects to reflect the relative importance you attach to each of them. The more points a statement receives, the more important that statement is to you. If you think the statement is not at all important give it zero points. If one statement is twice as important as some other statement, it should receive twice as many points. The reforms should:**

	Mean
Maximise farm income only, given available water supplies	13.41
Distribute water entitlements in a fair and just manner	29.53
Meet the requirements of natural river flow	34.56
Account for the impact of trading on local towns and communities	19.47

**5. Part of the COAG reform is the CAP on water entitlements in 1993/94. Has the CAP impacted on your business or job?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	9	6.9	7.6	7.6
	no	109	83.2	92.4	100.0
	Total	118	90.1	100.0	
Missing	System	13	9.9		
Total		131	100.0		

**6. Who should be allowed to trade in water?**

- **Active irrigators who hold water entitlements within your region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	32	24.4	25.6	25.6
	agree	57	43.5	45.6	71.2
	uncertain	19	14.5	15.2	86.4
	disagree	13	9.9	10.4	96.8
	strongly disagree	4	3.1	3.2	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

- **Active irrigators who hold water entitlements in adjoining regions**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	17	13.0	14.0	14.0
	agree	37	28.2	30.6	44.6
	uncertain	26	19.8	21.5	66.1
	disagree	29	22.1	24.0	90.1
	strongly disagree	12	9.2	9.9	100.0
	Total	121	92.4	100.0	
Missing	System	10	7.6		
Total		131	100.0		

- **Farmers who wish to start an irrigation enterprise in your region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	18	13.7	14.6	14.6
	agree	52	39.7	42.3	56.9
	uncertain	26	19.8	21.1	78.0
	disagree	20	15.3	16.3	94.3
	strongly disagree	7	5.3	5.7	100.0
	Total	123	93.9	100.0	
Missing	System	8	6.1		
Total		131	100.0		

- **Farmers who have not used their entitlement in the last five years**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	12	9.2	9.8	9.8
	agree	23	17.6	18.9	28.7
	uncertain	28	21.4	23.0	51.6
	disagree	46	35.1	37.7	89.3
	strongly disagree	13	9.9	10.7	100.0
	Total	122	93.1	100.0	
Missing	System	9	6.9		
Total		131	100.0		

- **Local towns and communities for domestic use**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	34	26.0	27.9	27.9
	agree	52	39.7	42.6	70.5
	uncertain	17	13.0	13.9	84.4
	disagree	16	12.2	13.1	97.5
	strongly disagree	3	2.3	2.5	100.0
	Total	122	93.1	100.0	
Missing	System	9	6.9		
Total		131	100.0		

- **Local shires to use water for recreation use, such as parks and golf courses**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	15	11.5	12.3	12.3
	agree	55	42.0	45.1	57.4
	uncertain	25	19.1	20.5	77.9
	disagree	23	17.6	18.9	96.7
	strongly disagree	4	3.1	3.3	100.0
	Total	122	93.1	100.0	
Missing	System	9	6.9		
Total		131	100.0		

- **Local industries who use water**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	16	12.2	13.3	13.3
	agree	59	45.0	49.2	62.5
	uncertain	17	13.0	14.2	76.7
	disagree	22	16.8	18.3	95.0
	strongly disagree	6	4.6	5.0	100.0
	Total	120	91.6	100.0	
Missing	System	11	8.4		
Total		131	100.0		

- **Environmental groups and agencies**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	21	16.0	16.8	16.8
	agree	43	32.8	34.4	51.2
	uncertain	27	20.6	21.6	72.8
	disagree	23	17.6	18.4	91.2
	strongly disagree	11	8.4	8.8	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		



- **Individuals and companies who do not intend to use water**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	6	4.6	4.9	4.9
	agree	15	11.5	12.3	17.2
	uncertain	16	12.2	13.1	30.3
	disagree	31	23.7	25.4	55.7
	strongly disagree	54	41.2	44.3	100.0
	Total	122	93.1	100.0	
Missing	System	9	6.9		
Total		131	100.0		

**Your Views on the Impact and Future of Water Trading**

**To plan for the future it is important to look forward and best guess the future. Your expectations are an important input into policy development for the next decade:**

**1. Trade in water in your region in ten years time will:**

- **Limited and within a region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	17	13.0	13.8	13.8
	agree	52	39.7	42.3	56.1
	uncertain	35	26.7	28.5	84.6
	disagree	17	13.0	13.8	98.4
	strongly disagree	2	1.5	1.6	100.0
	Total	123	93.9	100.0	
Missing	System	8	6.1		
Total		131	100.0		

- **Become a significant market and influence on irrigated agriculture**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	26	19.8	20.8	20.8
	agree	64	48.9	51.2	72.0
	uncertain	28	21.4	22.4	94.4
	disagree	4	3.1	3.2	97.6
	strongly disagree	3	2.3	2.4	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

- **Impact on the water supply of farmers in other regions**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	22	16.8	17.6	17.6
	agree	57	43.5	45.6	63.2
	uncertain	27	20.6	21.6	84.8
	disagree	15	11.5	12.0	96.8
	strongly disagree	4	3.1	3.2	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

- **Improve overall farm income in the region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	12	9.2	9.8	9.8
	agree	37	28.2	30.1	39.8
	uncertain	58	44.3	47.2	87.0
	disagree	11	8.4	8.9	95.9
	strongly disagree	5	3.8	4.1	100.0
	Total	123	93.9	100.0	
Missing	System	8	6.1		
Total		131	100.0		

• **Move water out of my reach of the river or channel system**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	9	6.9	7.4	7.4
	agree	17	13.0	13.9	21.3
	uncertain	57	43.5	46.7	68.0
	disagree	26	19.8	21.3	89.3
	strongly disagree	13	9.9	10.7	100.0
	Total	122	93.1	100.0	
Missing	System	9	6.9		
Total		131	100.0		

• **Significantly impact on the environmental health of river systems**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	45	34.4	35.7	35.7
	agree	45	34.4	35.7	71.4
	uncertain	24	18.3	19.0	90.5
	disagree	8	6.1	6.3	96.8
	strongly disagree	4	3.1	3.2	100.0
	Total	126	96.2	100.0	
Missing	System	5	3.8		
Total		131	100.0		

• **Significantly reduce the well-being of local towns and businesses in my area**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	11	8.4	8.8	8.8
	agree	25	19.1	20.0	28.8
	uncertain	50	38.2	40.0	68.8
	disagree	35	26.7	28.0	96.8
	strongly disagree	4	3.1	3.2	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

- **Be dominated by a few large players**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	36	27.5	29.3	29.3
	agree	27	20.6	22.0	51.2
	uncertain	22	16.8	17.9	69.1
	disagree	23	17.6	18.7	87.8
	strongly disagree	15	11.5	12.2	100.0
	Total	123	93.9	100.0	
Missing	System	8	6.1		
Total		131	100.0		

- **Significantly increase salinity in your region**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	32	24.4	25.4	25.4
	agree	30	22.9	23.8	49.2
	uncertain	36	27.5	28.6	77.8
	disagree	16	12.2	12.7	90.5
	strongly disagree	12	9.2	9.5	100.0
	Total	126	96.2	100.0	
Missing	System	5	3.8		
Total		131	100.0		

2. Have you been aware of any changes in the following that you believe are a result of trading water into or out of your region?

• **School and education opportunities**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	10	7.6	9.3	9.3
	No Change	94	71.8	87.0	96.3
	Increase	4	3.1	3.7	100.0
	Total	108	82.4	100.0	
Missing	System	23	17.6		
Total		131	100.0		

• **Crime and disorderly behaviour**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	5	3.8	4.6	4.6
	No Change	96	73.3	88.1	92.7
		1	.8	.9	93.6
	Increase	7	5.3	6.4	100.0
Total		109	83.2	100.0	
Missing	System	22	16.8		
Total		131	100.0		

• **Closures of small businesses**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	17	13.0	15.3	15.3
		1	.8	.9	16.2
	No Change	85	64.9	76.6	92.8
		1	.8	.9	93.7
Increase		7	5.3	6.3	100.0
Total		111	84.7	100.0	
Missing	System	20	15.3		
Total		131	100.0		

- **Hospital facilities and services**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	18	13.7	16.4	16.4
	No Change	90	68.7	81.8	98.2
	Increase	2	1.5	1.8	100.0
	Total	110	84.0	100.0	
Missing	System	21	16.0		
Total		131	100.0		

- **Town real estate values**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	23	17.6	20.7	20.7
	No Change	78	59.5	70.3	91.0
	Increase	10	7.6	9.0	100.0
	Total	111	84.7	100.0	
Missing	System	20	15.3		
Total		131	100.0		

- **Banking facilities**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	21	16.0	19.1	19.1
	No Change	88	67.2	80.0	99.1
	Increase	1	.8	.9	100.0
	Total	110	84.0	100.0	
Missing	System	21	16.0		
Total		131	100.0		

• **Expectations for the future of your community**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decline	26	19.8	24.5	24.5
		1	.8	.9	25.5
	No Change	67	51.1	63.2	88.7
	Increase	12	9.2	11.3	100.0
	Total	106	80.9	100.0	
Missing	System	25	19.1		
	Total	131	100.0		

**Your Views on the Role of the Water Authority  
in Water Markets**

**1. Under what circumstances should the water authority be able to reject an application for trade?**

• **If the trade impacts on the economic viability of local towns and communities**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	51	38.9	40.8	40.8
	agree	56	42.7	44.8	85.6
	uncertain	9	6.9	7.2	92.8
	disagree	5	3.8	4.0	96.8
	strongly disagree	4	3.1	3.2	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
	Total	131	100.0		

- **If the trade impacts on the environmental river flow objectives**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	67	51.1	53.6	53.6
agree	48	36.6	38.4	92.0
uncertain	5	3.8	4.0	96.0
disagree	1	.8	.8	96.8
strongly disagree	4	3.1	3.2	100.0
Total	125	95.4	100.0	
Missing System	6	4.6		
Total	131	100.0		

- **If the resulting distribution of water in the catchment is not considered fair and just**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	58	44.3	46.8	46.8
agree	49	37.4	39.5	86.3
uncertain	13	9.9	10.5	96.8
disagree	2	1.5	1.6	98.4
strongly disagree	2	1.5	1.6	100.0
Total	124	94.7	100.0	
Missing System	7	5.3		
Total	131	100.0		

### Environmental Concerns

1. **A number of options have been raised to make water available for environmental flows. Please consider the following *hypothetical* policy options and associated consequences for restoring environmental flows. Rank them from highest (1) to lowest (4) in order of your preference.**

Hypothetical Reduction in Water Entitlement	Hypothetical Impact on the Riverine Environment	Mean Rank
0%	Irreversible habitat degradation	3.23
20%	Habitat degradation, reversibility unknown	3.23
30%	Reversible habitat degradation	2.59
40%	No habitat degradation	1.96



**2. A government agency should enter the market and use taxpayers money to buy water for the environment**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	29	22.1	23.2	23.2
	disagree	25	19.1	20.0	43.2
	do not know	20	15.3	16.0	59.2
	agree	32	24.4	25.6	84.8
	strongly agree	19	14.5	15.2	100.0
	Total	125	95.4	100.0	
Missing	System	6	4.6		
Total		131	100.0		

**Information About Yourself**

**1. What age group do you belong to? Please place a cross in the appropriate box**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-24	2	1.5	1.6	1.6
	25-34	17	13.0	13.3	14.8
	35-44	20	15.3	15.6	30.5
	45-54	27	20.6	21.1	51.6
	55-64	23	17.6	18.0	69.5
	65-74	25	19.1	19.5	89.1
	75 and over	14	10.7	10.9	100.0
	Total	128	97.7	100.0	
Missing	System	3	2.3		
Total		131	100.0		

- **If you would like a copy of the study results please tick the YES box in the following form.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	85	64.9	78.0	78.0
	no	24	18.3	22.0	100.0
	Total	109	83.2	100.0	
Missing	System	22	16.8		
Total		131	100.0		