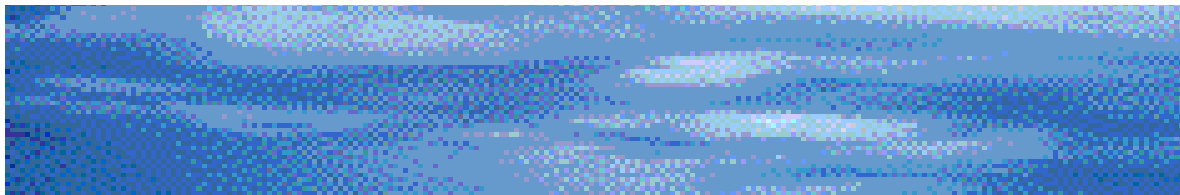


IRRIGATOR AND COMMUNITY ATTITUDES TO WATER ALLOCATION AND TRADING: A COMPARATIVE STUDY OF THE GOULBURN BROKEN AND FITZROY CATCHMENTS

TECHNICAL REPORT
Report 01/5

September 2001

John Tisdell / John Ward / Tony Grudzinski



Irrigator and Community Attitudes to Water Allocation and Trading: A Comparative Study of the Goulburn Broken and Fitzroy Catchments

**John Tisdell¹, John Ward¹,
Tony Grudzinski¹**

Technical Report 01/5
September 2001

¹Griffith University, Brisbane

Preface

As water authorities across the country implement reform they face challenges in promoting adoption. Often adoption issues are specific to their catchment, but in some cases they are universal. Where they are common, water authorities have much to gain by exploiting their combined knowledge to address them.

Knowledge of common irrigator and community attitudes to trade, for example, is extremely important in the strategic development and successful implementation of water markets. This report compares irrigator and community attitudes to water trading between the Fitzroy and Goulburn Broken catchments. It provides important insight into irrigator and community attitudes that transcend the catchment differences and highlights issues that are catchment specific.

John Tisdell
Program Leader
Sustainable Water Allocation Program

Summary

The first phase of the CRC for Catchment Hydrology Project 3.2 is to gather information on the nature of water markets and to provide input into water policy development to enhance water trading. This document reports the findings of comparative study of attitudes and opinions on water reform, allocation and trading between irrigators and community members in the Goulburn Broken and Fitzroy catchments. While these catchments have quite different climate, hydrology, farming practices and social characteristics, water managers in both catchments have to meet national water reform policy objectives. This analysis provides insights to general opinion and expectation of and blockages to water reform in two of the largest catchments in the eastern states of Australia.

The study found that overall respondents in the Fitzroy and Goulburn Broken catchments are supportive of water reform, but that the community at large has been poorly informed in the reform process. Within the reform agenda opinions and attitudes were sought on issues of water pricing, the definition of water rights and the notion of trading such rights. Overall, there is indifference among respondents to full cost pricing. The mean and distribution of responses, however, differs significantly between catchments, with Fitzroy respondents less supportive of full cost pricing than Goulburn Broken respondents.

The results of the survey suggest that there is overall agreement that the nexus between land and water should be broken and water rights be traded as chattels separate to land. Issues in the definition of the water right itself include the status of water for the environment, the rights to on-farm runoff, and the rights to sleeper and dozer licences. Overall, setting aside water for the environment prior to allocating it for their use is supported, and is stronger among Fitzroy respondents than Goulburn Broken respondents. Respondents from both catchments reject licensing on-farm runoff and are indifferent to the notion of extinguishing sleeper and dozer licences.

Changes to the definition of rights to water include issues of security and certainty of supply. The results suggest that irrigators overall believe that water entitlements will be more secure and have higher reliability following

the reform process. Comparing catchment respondents, Goulburn Broken irrigators are statistically more supportive of the notion that the water reform process will lead to more secure and reliable water supply than Fitzroy irrigators are.

The reform objectives of maximising the income generated from available water supplies, ensuring an equitable and fair distribution of water, meeting environmental flow requirements and accounting for local economic and social impacts are likely to either be in conflict or not achievable simultaneously. Maximising the return from water, measured in terms of aggregate farm income, is the most commonly used measure of Council of Australian Governments (COAG) water reform success. Prioritising this objective appears to be at odds with the opinions of catchment communities. The results of this study suggest that the catchment communities consider social justice objectives more important than maximising aggregate farm income. In the Fitzroy catchment (see catchment report) the irrigators, who have self-interest in maximising farm income, ranked social justice and environmental objectives statistically higher than maximising farm income.

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. Overall, there is strong support for free trade within and between sectors. This includes trade between irrigators, local towns and communities and local shires, but not with individuals or companies who do not intend to use the water. Respondents in the Fitzroy catchment are generally less supportive of trade, be it between irrigators or between irrigators and towns for non-domestic use, than Goulburn Broken respondents, but more supportive of allowing local council to buy water for recreational use.

Overall there is agreement that in the future water would become a chattel and be traded, but rejection of the notion that a farm's water entitlement would no longer be an inherent asset in farming. This suggests that the current emphasis on the temporary, rather than the permanent, water market will continue. Irrigators overall discriminate between high security and general security water and expect to pay more for high security water in the future - Goulburn Broken irrigators being more supportive of the notion than Fitzroy irrigators.

This price differential suggests that there may in fact be a split market for different security levels in the future.

Goulburn Broken and Fitzroy irrigators see a surplus of water, as opposed to the opportunity value of water, as the main reason why others sell water in the permanent market. This result questions, beyond redistributing surplus water, whether the permanent market is yet to result in real structural change in the crop mix of individual farmers. Furthermore, if the water offered for sale has not been used for some years the entitlement to that water may have been deemed ‘sleeper’. Re-activation of sleeper licences could jeopardise the security of supply of all water users.

There is overall agreement that trade will become significant in the future and have a significant influence on agriculture and improve farm income. There is overall agreement that trade is likely to be limited, occur within a region, impact on the water supply of farmers in other regions, significantly impact on the environmental health of rivers and be dominated by a few large players.

Preface	i
Summary	iii
List of Tables	vii
1. Introduction	1
2. Survey Design	3
3. Method of Sampling	5
4. Statistical Analysis and Interpretation	7
5. Analysis of Survey Responses	11
6. Attitudes to COAG Reform	13
6.1 Water Pricing	13
6.2 Definition of Rights and Security and Certainty of Supply	14
6.3 Security and Certainty of Supply	15
6.4 Community Involvement in COAG Reforms	16
6.5 Trade-off of Water Reform Objectives	17
6.6 Environmental Water Requirements	18
6.7 Social Justice and Equity Objectives	18
7. Market Structure, Conduct and Performance	21
7.1 Transaction Costs	28
7.2 Permanent Trading	29
7.3 Blockages and Impediments to Trade	30
8. Social Impacts of Water Trading	31
9. Future Performance Expectations of Water Markets	33
10. Demographics of Respondents	35
11. Conclusion	37
Appendix A	39

List of Tables

Table 1.	Overall agreement with the need for water reform	13
Table 2.	Full cost pricing of water	13
Table 3.	Definition of rights	14
Table 4.	Definition of rights: irrigator opinions	15
Table 5.	Security and reliability of rights following COAG reforms: irrigator opinions	15
Table 6.	Community involvement in the water reform process	16
Table 7.	Analysis of key COAG reform objectives	17
Table 8.	Trade-offs between extractive and environmental uses of water	18
Table 9.	Social justice and equity objectives for water trading	19
Table 10.	Rights to trade	21
Table 11.	Rights to trade: irrigator opinions	22
Table 12.	The nature of water entitlements in water markets: irrigator opinions	23
Table 13.	Perceptions of market concentration: irrigator opinions	23
Table 14.	The role of the water authority in regulating water markets	24
Table 15.	Remedies to infrastructure isolation resulting of trade	25
Table 16.	Disclosure of market information in public register: irrigator opinions	25
Table 17.	Perceptions of temporary trading: irrigator opinions	26
Table 18.	Reasons for buying water in the future: irrigator opinions	26
Table 19.	Reasons for selling water in the future: irrigator opinions	27
Table 20.	Expected conduct of irrigators in water trading	27
Table 21.	Level of transaction costs: irrigator opinions	28
Table 22.	Time to complete trade: irrigator opinions	28
Table 23.	Perceptions of permanent trading: buying	29
Table 24.	Perceptions of permanent trading: selling	29
Table 25.	Perceived reasons why others do not trade: irrigator opinions	30
Table 26.	Social capital impacts of water trading	31
Table 27.	Opinions on future performance of water markets	33
Table 28.	Age distribution of respondents	35

1. Introduction

The COAG water reform agenda introduced a raft of institutional changes to water management in Australia. To gain insights into irrigator and community opinions and attitudes to the reforms a survey of irrigator and community members in the Goulburn Broken and Fitzroy catchments has been conducted. This report is part of a three-volume report on the findings of the survey. Volumes 1 and 2 report on the specifics of the survey instruments, sampling design and the findings within the Goulburn Broken and Fitzroy catchments. This volume reports on the similarities and differences in attitudes to water reform, allocation and trade between the catchments.

2. Survey Design

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

Currently temporary trading occurs within the Goulburn Broken and Fitzroy catchments. In total there are 12,402 individual water users within the 21 irrigation and diversion areas that make up the Goulburn Broken catchment. A proportional stratified random sample of 1,000 water users is drawn from the Goulburn Broken catchment irrigation and diversion areas. A total population survey of regulated irrigators in the Fitzroy Basin was conducted due to the relatively small number (388) of irrigators. A stratified random sample of 1,000 community members from each catchment was drawn from the 1996 electoral roles. In designing the sampling-frame sub-catchments were used as stratum for irrigators and towns as sub-stratum for the community.

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; 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 (catchments) 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 from the Goulburn Broken catchment is significantly different to that from the Fitzroy catchment.

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 ^{a**}	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 ^{b*}	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 Goulburn Broken irrigators and Fitzroy irrigators 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 Goulburn Broken irrigators is statistically different to the mean of Fitzroy irrigators 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
Total		100	100
Mean Rank		3	3

Example 3 Interpreting significant differences

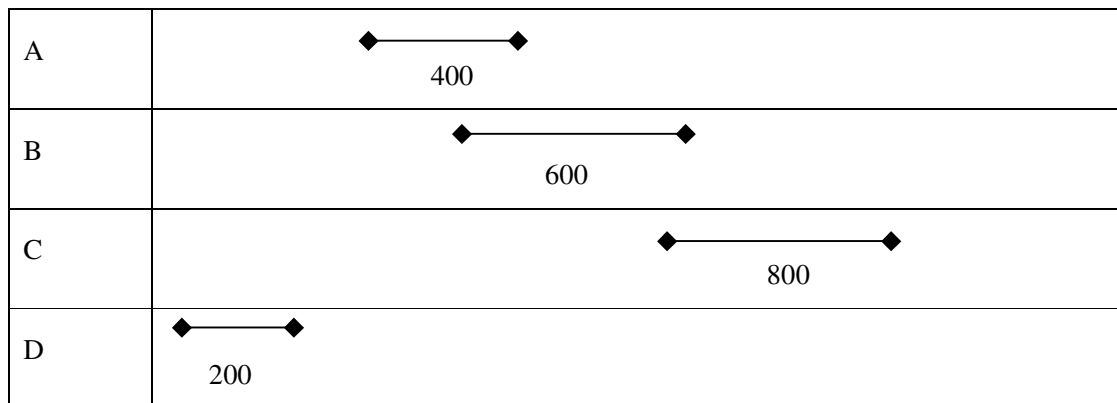
Region	Average Water Allocation (ML)
A	400 ^a
B	600 ^{ab}
C	800 ^b
D	200

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 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



5. Analysis of Survey Responses

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 Goulburn Broken catchment as they currently exist and expectations of future performance measures.

6. Attitudes to COAG Reform

The first section of the survey dealt with COAG reforms, specifically, with issues of water pricing, the definition of water rights and the notion of trading such rights. Effective adoption of these changes requires acceptance by water users and the community at large. Table 1 reports on the level of agreement with the need for water reform. There is overall support for the need for water reform, with 83.0% and 81.6% of Goulburn Broken and Fitzroy catchment respondents respectively agreeing 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 2 presents the Goulburn Broken and Fitzroy catchment respondent support for full cost pricing of water. Overall, there is indifference to full cost pricing. The mean and distribution of responses from catchments differ significantly with Fitzroy respondents less supportive of full cost pricing than Goulburn Broken respondents.

Table 1 Overall agreement with the need for water reform

	Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage
Yes	369	83.1	235	81.6
No	75	16.9	53	18.4
Total	444	100	288	100

$\chi^2=0.276$, $p<0.05$

Table 2 Full cost pricing of water

	Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage
Strongly support	32	7.4	33	11.2
Accept	129	29.7	64	21.8
Indifferent	69	15.9	45	15.3
Reject	127	29.3	90	30.6
Completely reject	57	13.1	62	21.1
Total	434	100	294	100
Mean Rank	3.02		3.29	

¹MW-U=56044.0, $p<0.01$; KS-Z=1.205, $p>0.05$ - 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. The primary step in establishing a functional water market is to break the long-standing nexus between land and water rights. A principle aim of the reform process is to change the nature of water rights from one inextricably tied to the land to more of a independent and distinct chattel. Table 3 reports the opinions of catchment respondents on the definition of water rights and the trade of such rights. The results of the survey suggest that there is overall agreement that the nexus between land and water should be broken and water rights be traded as chattels separate to land.

Issues in the definition of the water right itself include the status of water for the environment, the rights to on-farm runoff, and the rights to sleeper and dozer licences. Overall, setting aside water for the environment prior to allocating it for their use is supported, and is stronger among Fitzroy respondents than Goulburn Broken respondents. Respondents from both catchments reject licensing on-farm runoff and are indifferent to the notion of extinguishing sleeper and dozer licences.

Table 4 outlines irrigator opinions on the rights to trade. Irrigators across the two catchments studied reject the notion of licensing off-farm runoff and extinguishing sleeper licences. Fitzroy irrigators feel stronger than Goulburn Broken irrigators do on the issue of licensing farm runoff, and are more supportive of setting aside water for the environment prior to extractive use.

Table 3 Definition of rights

	Overall	Mean Rank Response †		MW-U ‡	KS-Z ‡
	Mean Rank †	Goulburn Broken	Fitzroy		
Water entitlements should be allowed to be separated from land and be traded.	2.71 ^{a**}	2.68	2.76	66649.5	0.520
On farm runoff should be licenced.	3.72 ^{**}	3.67	3.80	60856.0	1.275
Water for the environment should be set aside prior to allocating water to farmers.	2.62 ^{a**}	2.74	2.44	59692.0 ^{**}	1.629 ^{**}
Licences that have not been used for five years should be extinguished.	3.02	3.08	2.92	64078.5	1.195

† 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 Security and Certainty of Supply

Along with the definition of rights are issues of security and certainty of supply. Table 5 presents opinions on the security and reliability of rights following the water reform process. The results suggest that irrigators overall believe that water entitlements will be more secure and have higher reliability following the reform

process. Comparing catchment respondents, Goulburn Broken irrigators are statistically more supportive of the notion that the water reform process will lead to more secure and reliable water supply than Fitzroy irrigators are.

Table 4 Definition of rights: irrigator opinions

	Overall	Mean Rank Response †		MW-U ‡	KS-Z ‡
	Mean Rank †	Goulburn Broken	Fitzroy		
Water entitlements should be allowed to be separated from land and be traded.	2.54 ^{a**}	2.60	2.43	17915.0	1.037
On farm runoff should be licenced.	3.90 ^{b**}	3.65	4.33	12441.0**	2.761**
Water for the environment should be set aside prior to allocating water to farmers.	2.77 ^{a**}	2.91	2.53	15936.0**	1.565*
Licences that have not been used for five years should be extinguished.	3.41 ^{b**}	3.43	3.36	18804.5	0.652

† 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 Security and reliability of rights following COAG reforms: irrigator opinions

	Overall	Mean Rank Response †		MW-U ‡	KS-Z ‡
	Mean Rank †	Goulburn Broken	Fitzroy		
Water entitlements will be more secure following the reforms.	2.61 ^{a**}	2.50	2.80	14703.0*	1.073
Water entitlements will have higher reliability of supply following the water reforms.	2.68 ^{a**}	2.51	2.99	13071.5**	1.851**

† 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

6.4 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 6 summarises respondents' attitudes to the community's involvement and acceptance of COAG reforms. 2.8% and 11.3% of respondents across the two catchments felt they had been actively involved and embraced COAG reforms or well informed and accepting respectively. 21.0% felt they had been involved but largely ignored, and 45.6% felt poorly informed but accepting of the changes. 19.2% felt poorly informed and unhappy. Comparing across the catchments, 46.2% and 44.8% of the Goulburn Broken and Fitzroy respondents respectively felt that the community had been poorly informed but accepting of the changes. 3.5% and 1.7% respectively felt that the community had been actively informed and embraced it.

The stimulant for COAG water reform was a recognised mis-allocation of water resources in Australia. The cornerstone of the financial reward system employed by the federal government, to encourage states to adopt the reform guidelines, is based on the states demonstrating that they have established institutional structures to achieve the COAG reform objectives. Whether the state water authorities effectively engage the community or not, will not impact on their federal recognition and associated reward. Success or failure of the COAG reforms in achieving actual change, however, is highly dependent on community acceptance, especially by irrigators and communities in irrigation areas. The results of this study suggest that irrigators and the catchment communities feel disempowered, and further irrigator and community involvement in decision making is necessary if they are going to actively embrace COAG reforms.

Table 6 Community involvement in the water reform process

	Response Percentages		
	Overall	Goulburn Broken	Fitzroy
Actively involved and embraced it	2.8	3.5	1.7
Well informed and accepting	11.3	13.2	8.6
Involved but largely ignored	21.0	21.0	21.0
Poorly informed but accepting	45.6	46.2	44.8
Poorly informed and unhappy	19.2	16.3	23.8
Total	100	100	100

Note: percentage units. Full frequency tables appear in individual catchment reports.

MW-U=55449.5, $p < 0.000$; KS-Z=0.989, $p > 0.05$. (See Section 4 for explanation of MW-U and KS-Z)

6.5 Trade-off of Water Reform Objectives

The reform objectives of maximising the income generated from available water supplies, ensuring an equitable and fair distribution of water, meeting environmental 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 7 presents irrigator and community ranking of 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 statistical ranked order of importance are (1) ensuring a fair and just distribution of water, (2) maximising farm income, (3) meeting environmental flow objectives, and (4) taking account of local town and community impacts. Fitzroy respondents discriminated less than Goulburn Broken respondents, ranking fairness and justice issues and natural flow requirements equally above maximising farm income and town and community impacts.

Maximising the return from water, measured in terms of aggregate farm income, is the most commonly used measure of COAG water reform success. Prioritising this objective appears to be at odds with the opinions of catchment communities. The results of this study suggest that the catchment communities consider social justice objectives more important than maximising aggregate farm income. In the Fitzroy catchment (see catchment report) the irrigators, who have self-interest in maximising farm income, ranked social justice and environmental objectives statistically higher than maximising farm income.

Table 7 Analysis of key COAG reform objectives

Issue in Water Reform	Mean Percentage		
	Overall	Goulburn Broken	Fitzroy
Maximise farm income	21.97	21.81	22.29 ^b
Distribute water in fair and just manner	32.20	31.62	33.11 ^a
Meet natural flow requirements	29.36	27.17	32.93 ^a
Impact on local towns and communities	19.59	17.71	22.84 ^b

Note: Arcsine transformation analysed using type III ANOVA and Tukey HSD tests. Overall, Goulburn Broken and Fitzroy surveys analysed separately.

Numbers sharing the same superscript letter in a column are not statistically different. See Section 4 for explanation.

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 are presented to the respondents. The scenarios are based in part on the Water Allocation Management Plans (WAMPS) developed in 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 respondents were asked to rank their preference from highest (1) to lowest (4). Table 8 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 to a level where there is reversible habitat degradation. Respondents overall and within the focus catchments ranked no reduction in entitlement with irreversible habitat degradation lowest.

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 statement developed from a variety of philosophical schools of thought. In this study, 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 statistically higher than any other in achieving just outcomes to water trading overall and within the focus catchments. Maximising the greatest happiness is ranked statistically higher than ensuring that adequate compensation is available for those who may lose as a result of trade, consideration for the welfare of those worse off and considering the specifics of each case.

Table 8 Trade-offs between extractive and environmental uses of water

Hypothetical reduction in water entitlement	Hypothetical impact on the riverine environment	Mean Rank †		
		Overall	Goulburn Broken	Fitzroy
0%	Irreversible habitat degradation	3.15	3.10	3.23
20%	Habitat degradation, reversibility unknown	2.45 ^x	2.42 ^z	2.48 ^a
30%	Reversible habitat degradation.	2.07	2.09	2.04 ^b
40%	No habitat degradation	2.35 ^x	2.42 ^z	2.24 ^{ab}

† Scale 1 'strongly agree' 5 'strongly disagree'. The Goulburn Broken and Fitzroy 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.

Numbers sharing the same superscript letter in a column are not statistically different. See Section 4 for explanation.

Table 9 Social justice and equity objectives for water trading

Philosophical standpoint	Philosophical statement	Mean Rank †		
		Overall	Goulburn Broken	Fitzroy
Utilitarianism	Water trading should benefit the greatest number of people possible	2.01	2.00	2.03
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	2.43 ^b	2.48 ^z	2.36 ^a
Kaldor/Hicks	The beneficiaries from water trade should be able to compensate those who feel they have lost because of the transaction	2.75	2.78 ^y	2.71
Kant	There should be no general rules of trade as each situation is different and should be considered on a case-by-case basis	2.57 ^b	2.66 ^{yz}	2.44 ^a

† Scale 1 'strongly agree' 5 'strongly disagree'. Analysis conducted using Friedman's non-parametric ANOVA and modified Tukey multiple comparison tests. Numbers sharing the same superscript letter in a column are not statistically different. See Section 4 for explanation.

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 irrigators empowered with good market knowledge.

The number of buyers and sellers in the market will depend in part on who is allowed to trade. Constraints on such rights may be spatial, sectoral or use related. Table 10 summarises respondents' opinions on who should have a right to trade in water. Overall, there is strong support for free trade within and between sectors. This includes trade between irrigators, local towns and communities and local shires, but not with individuals or companies who do not intend to use the water. Respondents in the Fitzroy catchment are generally less supportive of trade between actual irrigators than Goulburn Broken respondents, but more supportive of allowing farmers who wish to start a farm enterprise and local council to buy water for recreational use.

Table 10 Rights to trade

	Mean Rank †	Mean Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
Active irrigators who hold water entitlements within your region	1.88 ^{a**}	1.82	1.97	59463.5**	1.252
Active irrigators who hold water entitlements in adjoining regions	2.75 ^{a**}	2.55	3.07	47790.0**	2.775**
Farmers who wish to start an irrigation enterprise in your region	2.62 ^{a**}	2.73	2.43	55958.5**	1.560*
Farmers who have not used their entitlement in the last five years	2.69 ^{a**}	2.59	2.84	56705.0**	1.192
Local towns and communities for domestic use	2.33 ^{a**}	2.37	2.28	61689.0	0.648
Local shires to use water for recreation use, such as parks and golf courses	2.77 ^{a**}	2.87	2.63	56602.0**	1.455*
Local industries who use water	2.31 ^{a**}	2.29	2.35	62570.5	0.394
Environmental groups and agencies	2.81 ^{a**}	2.79	2.85	61074.0	0.238
Individuals and companies who do not intend to use water	3.88 ^{b**}	3.85	3.94	63210.0	0.918

† 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 11 summarises differences in irrigator attitudes to who should be allowed to trade. Overall the catchment respondents are supportive of local shires to use water for recreation use, such as parks and golf courses, and environmental groups and agencies. Irrigators in the Fitzroy are less supportive of trade between regions for irrigation and to start new irrigation enterprises than Goulburn Broken irrigators.

The nature of water rights in the future is going to influence market performance. Apart from the legislative and administrative definition of the tradeable good (or

right), there is the issue of whether irrigators perceive their water entitlement as a tradeable chattel. Table 12 summarises irrigator attitudes on this issue.

There is overall agreement that in the future water would become a chattel and be traded. Irrigators overall discriminate between high security and general security water and expect to pay more for high security water in the future - Goulburn Broken irrigators being less supportive of the notion than Fitzroy irrigators. This price differential suggests that there may in fact be a split market for different security levels in the future.

Table 11 Rights to trade: irrigator opinions

	Mean Rank †	Mean Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
Active irrigators who hold water entitlements within your region	1.59 ^{a**}	1.60	1.58	17637.0	0.243
Active irrigators who hold water entitlements in adjoining regions	2.72 ^{a**}	2.48	3.15	12090.5**	2.466**
Farmers who wish to start an irrigation enterprise in your region	2.81 ^{a**}	3.00	2.45	12550.0**	1.846**
Farmers who have not used their entitlement in the last five years	2.35 ^{a**}	2.31	2.42	16838.0	0.588
Local towns and communities for domestic use	2.49 ^{a**}	2.53	2.42	15762.5	0.749
Local shires to use water for recreation use, such as parks and golf courses	2.88	2.98	2.72	14962.5*	1.093
Local industries who use water	2.32 ^{a**}	2.31	2.35	16876.5	0.605
Environmental groups and agencies	2.93	2.85	3.08	14576.5	0.868
Individuals and companies who do not intend to use water	3.95 ^{b**}	3.87	4.10	15533.5	1.038

† 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

Another aspect to the structure of a market is the level of concentration. A concentrated market *viz.* a market dominated by a few traders, is unlikely to achieve a Pareto optimal distribution of water. In such markets, traders anticipate the actions of others and can manipulate the market price and quantity away from a competitive equilibrium in order to their advantage.

Table 13 summarises perceptions of market concentration. Irrigators were asked a series of questions on this issue in different forms throughout the survey. In considering the impact of immediate water reforms,

respondents considered it unlikely that the market will consist of a few players who may act strategically. When considering the future of water trading, however, the respondents disagreed that there will be a lot of traders and the actions of individuals will not greatly influence the market price. These results suggest that in long term planning of water market policies, consideration should be given to possibility that water markets in the future may be thin and anti-competitive behaviour regulation may be necessary.

Table 12 The nature of water entitlements in water markets: irrigator opinions

	Mean Rank †	Mean Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
Water trading will become like buying fertilizer in that a farmer will buy and sell it in on a need basis.	2.84 ^{a*}	2.81	2.90	18089.0	0.567
Farmers will pay more for high security water than for general security	2.26 ^{a**}	2.34	2.10	15552.5*	0.793
Water entitlements will no longer be an inherent asset in farming	4.16 ^{b**}	4.13	4.23	16655.0	1.005

Table 13 Perceptions of market concentration: irrigator opinions

Issue	Statement	Mean Rank †	Mean Response †		MW-U ‡	KS-Z ‡
			Goulburn Broken	Fitzroy		
Immediate water reforms	Markets will consist of only a few traders, farmers will anticipate what others may offer and buy.	3.19 ^{b**}	3.31	2.97	14295.0**	1.550*
Future of water trading	There will be a lot of traders and the actions of individuals will not greatly influence the market price.	3.17 ^{b**}	3.05	3.38	14395.0**	1.777**

† 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

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 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.

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 Table 14. 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 across the catchments 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. Support for the water authority to intervene to protect the interests of local towns and communities and when the distribution of water may be considered unfair or unjust is stronger in the Fitzroy.

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 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 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 14 The role of the water authority in regulating water markets

	Mean †	Mean Rank Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
Only when the system is not capable of supplying the water to the buyer. [^]	1.91 ^{a**}	1.85	2.04	16577.0	0.700
If there is a possible impact on other water entitlements. [^]	1.89 ^{a**}	1.91	1.87	16866.5	0.430
If the trade impacts on the economic viability of local towns and communities	1.98 ^{a**}	2.08	1.83	55107.0 ^{**}	2.015 ^{**}
If the trade impacts on the environmental river flow objectives	1.95 ^{a**}	1.99	1.89	61081.0	0.870
If the resulting distribution of water in the catchment is not considered fair and just.	1.87 ^{a**}	1.94	1.77	57008.5 ^{**}	1.063
If the conditions and price negotiated are not considered fair and just. [^]	2.60 ^{a**}	2.55	2.70	15753.0	0.580

† 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. [^] irrigators only answered these questions.

‡ 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 15 presents a breakdown of irrigator support for each option. Overall, 53.2% of irrigators support restricting trade to within the system, compared to at most 16.9% for any other option. Restricting trade to within channel systems is higher among Fitzroy irrigators than Goulburn Broken irrigators. Restricting

trade to within channel systems may be seen as anti-competitive and if adopted the case may have to be made that such restrictions are necessary.

The final determinant of market structure is the level of market knowledge. 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 16 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. Goulburn Broken irrigators are more supportive than Fitzroy irrigators of all the forms of disclosure listed.

Table 15 Remedies to infrastructure isolation resulting of trade

	Overall		Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Continue to supply	63	16.9	46	18.7	17	13.5
Impose exit fees	62	16.7	43	17.5	19	15.1
Compensate and close system	35	9.4	25	10.2	10	7.9
Restrict trade to within system	198	53.2	118	48.0	80	63.5
Other	14	3.8	14	5.7	0	0
Total	372	100	246	100	126	100

Note: $\chi^2=13.005$, $p<0.05$.

Table 16 Disclosure of market information in public register: irrigator opinions

	Mean †	Mean Rank Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
The volume of water traded	1.70 ^{a**}	1.58	1.92	14649.0**	1.265
The price at which the water traded	2.25 ^{a**}	2.08	2.56	14289.0**	1.628**
The traders entitlements and crop mix	2.49 ^{a**}	2.27	2.88	12837.0**	1.967**

† 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

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.

Table 17 gives a breakdown of perceptions of why other farmers trade. The temporary market predominately redistributes surplus water allocations to meet shortfalls in allocations and end of season waterings. 62.3% of irrigators consider water sold is surplus to needs, while 25.3% of considered the opportunity cost of selling, as opposed to using their water on their farm, as the main reason why others sell water. A statistically greater proportion of Fitzroy irrigators (85.0%) than Goulburn Broken irrigators (61.4%) consider that water sold would be surplus to needs. Also, a statistically greater proportion of Goulburn Broken irrigators (33.2%) consider that others take account of the opportunity

cost of water when considering selling than Fitzroy irrigators (14.2%). This suggests that water trading (or transfers) in the Fitzroy markets may be more immature and dependent on surplus water than water markets in the Goulburn Broken.

Table 18 and 19 outlines reasons for trade and expected conduct of farmers in water markets in the future. Asked why they may buy water in the future, irrigators considered security and acquiring water to finish a crop most important.

When asked about selling water, 76.5% of traders said that they would sell their surplus water. There is little support for any strategic planning for buying or selling water prior to planting or during the growing season. This is of concern as the market is seen as an instrument for structural change in the short term. 22.4% and 15.8% of irrigators in the Goulburn Broken and Fitzroy respectively stated they would consider changing cropping practices in order to take advantage of water markets in the future.

Table 17 Perceptions of temporary trading: irrigator opinions

		Overall	Goulburn Broken	Fitzroy
Buy	Water allocation does not meet requirement	0.6232 ^a	0.6221 ^a	0.6250 ^a
	End of season waterings	0.2537 ^b	0.2366 ^b	0.2847 ^b
Sell	Surplus water	0.6965	0.6145	0.8500
	Earn more by selling than using	0.2662 ^c	0.3321 ^c	0.1428

Numbers sharing the same superscript letter in a column are not statistically different. See Section 4 for explanation.

Table 18 Reasons for buying water in the future: irrigator opinions

Reason	Overall		Goulburn Broken		Fitzroy	
	Count	Percentage	Count	Percentage	Count	Percentage
Prior to making a cropping decision	121	21.7	61	17.9	60	27.6
To finish a crop should water become short	172	30.8	108	31.7	64	29.5
To acquire more secure water supply	154	27.6	103	30.2	51	23.5
Prior to next irrigation	27	4.8	17	5.0	10	4.6
Purchase regularly according to watering regime	84	15.1	52	15.2	32	14.7
Total	558	100	314	100	217	100

Finally, while there is an expectation that irrigators will be reluctant to trade and rely on their entitlement to meet watering requirements, irrigators agree that in the future they will follow water prices as they do crop and input prices and react accordingly. This result may be

seen to be an indication that while there is a blockage to planting based on the expectation of acquiring water from the market, there is a willingness to gain market information that will assist in developing the market.

Table 19 Reasons for selling water in the future: irrigator opinions

Reason	Overall		Goulburn Broken		Fitzroy	
	Count	Percentage	Count	Percentage	Count	Percentage
Only sell water surplus to requirements	322	76.5	204	75.6	118	78.1
Change crop to use less water	14	3.3	9	3.9	5	3.3
Run all or some of the crop dryland	24	5.7	17	7.3	7	4.6
Reduce the area planted	20	4.8	15	6.4	5	3.3
Not crop that year	20	4.8	13	4.8	7	4.6
Other	21	4.9	12	4.4	9	6.0
Total	421	100	270	100	151	100

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

Table 20 Expected conduct of irrigators in water trading

	Mean Rank †	Mean Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
Farmers will be reluctant to trade and rely on their entitlement to meet their water requirements	2.65 ^{a**}	2.70	2.55	16072.5	0.844
Farmers will follow water prices as they do crop and input prices	2.29 ^{a**}	2.25	2.37	17239.5	0.656
There will be no temporary trading, as all trades will be permanent	4.03 ^{b**}	4.04	4.01	17061.0	0.219

† 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

7.1 Transaction Costs

Transaction costs, be they monetary or the time taken to complete a trade, are often perceived as a major inhibitor to trade. Tables 21 and 22 present a summary of opinions on transaction costs incurred by traders and the time taken to complete their last trade. No trader in either catchment saw the time taken to complete the trade as inhibiting the final use of the traded water.

Traders see neither of these issues as an inhibitor to trade, with 80.7% and 82.7% of Goulburn Broken and Fitzroy traders, respectively considering the level of transaction costs to be satisfactory and 96.3% and 90.7%, respectively considering the time taken to complete a trade as reasonable or better.

Table 21 Level of transaction costs: irrigator opinions

	Overall		Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Satisfactory	152	81.3	109	80.7	43	82.7
Excessive	35	18.7	26	19.3	9	17.3
Total	187	100	135	100	52	100

Note: $\chi^2=0.094$, $p>0.05$.

Table 22 Time to complete trade: irrigator opinions

	Overall		Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Excellent	57	30.3	45	33.6	12	22.2
Reasonable	121	64.4	84	62.7	37	68.5
Unacceptable	10	5.3	5	2.7	5	9.3
Inhibited the final use of the water	0	0	0	0	0	0
Total	188	100	134	100	54	100

Note: $\chi^2= 4.053$, $p>0.05$.

7.2 Permanent Trading

Tables 23 and 24 summarise perceptions of buying and selling in the permanent water market. 64.0% of respondents perceive that most permanent water traders purchase water because their existing water entitlement does not meet current needs. Overall, 69.3% of irrigators, and 82.6% of Fitzroy irrigators in particular see a surplus of water, as opposed to the opportunity value of water, as the main reason why others sell water

in the permanent market. This result questions, beyond redistributing surplus water, whether the permanent market is yet to result in real structural change in the crop mix of individual farmers. Furthermore, if the water offered for sale has not been used for some years the entitlement to that water may have been deemed ‘sleeper’. Re-activation of sleeper licences could jeopardise the security of supply of all water users.

Table 23 Perceptions of permanent trading: buying

	Overall		Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Entitlement does not meet existing water requirements	235	64.0	159	61.4	76	63.9
Land development	65	17.7	43	17.3	22	18.5
Increased security of supply	67	18.3	46	18.5	21	17.6
Total	367	100	248	100	119	100

Note: $\chi^2 = 0.096, p > 0.05$

Table 24 Perceptions of permanent trading: selling

	Overall		Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Surplus to needs	257	69.3	162	63.3	95	82.6
More by selling than crops	66	17.8	63	24.6	3	2.6
Dryland alternative	11	3.0	10	3.9	1	0.9
Retiring	20	5.4	12	4.7	8	7.0
Other	17	4.6	9	3.5	8	7.0
Total	371	100	256	100	115	100

Note: $\chi^2 = 31.146, p < 0.01$

7.3 Blockages and Impediments to Trade

Table 25 outlines the perceived reasons why others do not trade water. 27.3% of respondents considered that farmers will be reluctant to trade and rely on their entitlement to meet watering requirements. This feeling is strong in both the focus catchments. The second highest blockage is market knowledge. 15.2% of respondents see market knowledge as an impediment to other farmers not trading. Increasing market knowledge can be addressed through extension activities. Changing attitudes to the nature of water will prove a greater challenge.

Table 25 Perceived reasons why others do not trade: irrigator opinions

Reason	Overall		Goulburn Broken		Fitzroy	
	Count	Percentage	Count	Percentage	Count	Percentage
Do not need additional water	243	37.3	157	36.6	86	38.7
They do not know enough about the market	99	15.2	66	15.4	33	14.9
They view water as an integral part of their farm and not for sale	178	27.3	124	28.9	54	24.3
They do not wish to barter with other farmers	27	4.1	15	3.5	12	5.4
They are philosophically opposed to trading	46	7.1	36	8.4	10	4.5
They find the administration costs and delays associated with trade too great	58	8.9	31	7.2	27	12.2
Total	651	100	429	100	222	100

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

8. Social Impacts of Water Trading

The community survey 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 26. Respondents across the catchment agree that water trading has impacted on the level of banking facilities available to them. Of the social indicators presented, to date there is a high level of uncertainty surrounding the impact of water trading on hospital facilities and services, small businesses, school and educational opportunities, and real estate values.

Table 26 Social capital impacts of water trading

Measure of Social Capital	Mean †	Goulburn Broken †	Fitzroy †	MW-U ‡	KS-Z ‡
School and education opportunities	2.93	2.94	2.92	10680.0	0.337
Crime and disorderly behaviour	3.04	3.08	2.99	10273.0	0.247
Closures of small businesses	3.11	3.04	3.18	10172.0	0.449
Hospital facilities and services	2.95	2.90	3.00	10245.0	0.297
Town real estate values	2.90	2.92	2.89	11128.5	0.216
Banking facilities	2.73 ^{a**}	2.69	2.78	10255.0	0.581
Expectations for the future of your community	3.01	3.01	3.03	10530.0	0.455

† 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

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. Table 27 presents a summary of their opinions on the future of water trading. There is overall agreement that trade will become significant in the future and have a significant influence on agriculture and improve farm income. However, there is overall agreement that while trade is limited and within a region, impact on the water supply of farmers in other

regions will significantly impact on the environmental health of rivers, and be dominated by a few large players. Which individually and in aggregate are forms of externalities that need to be accounted for.

Fitzroy respondents compared to Goulburn Broken respondents feel stronger that trade will be limited within a region and that the market will be dominated by a few large players. Goulburn Broken respondents feel stronger that trade will be significant and impact on agriculture, that trade will impact on the water supply of farmers in other regions and that trade will significantly impact on the environmental health of river systems.

Table 27 Opinions on future performance of water markets

	Mean Rank †	Mean Response †		MW-U ‡	KS-Z ‡
		Goulburn Broken	Fitzroy		
Be limited and within a region	2.44 ^{a**}	2.56	2.25	52100.0**	2.062**
Become a significant market and influence on irrigated agriculture	2.23 ^{a**}	2.15	2.36	57757.0**	1.154
Impact on the water supply of farmers in other regions	2.82 ^{a**}	2.69	3.01	52443.5**	1.791**
Improve overall farm income in the region	2.60 ^{a**}	2.56	2.66	62005.0	0.473
Move water out of my reach of the river or channel system	3.20 ^{b**}	3.22	3.18	61621.5	0.840
Significantly impact on the environmental health of river systems	2.73 ^{a**}	2.66	2.85	59321.0*	1.327
Significantly reduce the wellbeing of local towns and businesses in my area	3.22 ^{b**}	3.14	3.34	58139.0**	1.222
Be dominated by a few large players	2.82 ^{a**}	2.94	2.64	55885.5**	1.831**
Significantly increase salinity in your region	3.13 ^{b**}	3.09	3.18	62424.5	0.494

† 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. Demographics of Respondents

The results of the survey give a detailed picture of irrigator 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 28 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 28 Age distribution of respondents

Age	Overall		Goulburn Broken		Fitzroy	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
15-24	9	1.2	4	0.9	5	1.6
25-34	87	11.3	46	9.8	41	13.5
35-44	169	21.9	88	18.8	81	26.6
45-54	231	29.9	154	32.9	77	25.3
55-64	140	18.1	82	17.5	58	19.1
65-74	92	11.9	63	13.5	29	9.5
74 and over	44	5.7	31	6.6	13	4.3
TOTAL	772	100	468	100	304	100

Note: $\chi^2=15.579$, $p<0.05$.

11. Conclusion

This report explored the differences and similarities in opinions of irrigators and the community at large on issues of water reform in the Goulburn Broken and Fitzroy catchments. The analysis provides insights to general opinion and expectation of and blockages to water reform in two of the largest catchments in the eastern states of Australia. The report provides valuable input to decision making for water reforms in the future, to understand the blockages to trade and areas where policies can be directed to enhance water trading in the focus catchments.

APPENDIX A.

**Frequency tables arising from the
combined survey of irrigators in the
Goulburn Broken and Fitzroy Catchments**

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 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	604	75.4	82.5	82.5
no	128	16.0	17.5	100.0
Total	732	91.4	100.0	
Missing System	69	8.6		
Total	801	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	180	22.5	23.8	23.8
	accept	243	30.3	32.2	56.0
	indifferent	77	9.6	10.2	66.2
	reject	125	15.6	16.6	82.8
	completely reject	130	16.2	17.2	100.0
	Total	755	94.3	100.0	
Missing	System	46	5.7		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	59	7.4	8.0	8.0
	accept	100	12.5	13.5	21.5
	indifferent	98	12.2	13.2	34.7
	reject	213	26.6	28.7	63.4
	completely reject	271	33.8	36.6	100.0
	Total	741	92.5	100.0	
Missing	System	60	7.5		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	172	21.5	22.9	22.9
	accept	263	32.8	35.0	57.8
	indifferent	87	10.9	11.6	69.4
	reject	142	17.7	18.9	88.3
	completely reject	88	11.0	11.7	100.0
	Total	752	93.9	100.0	
Missing	System	49	6.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	85	10.6	11.7	11.7
	accept	193	24.1	26.5	38.2
	indifferent	114	14.2	15.7	53.8
	reject	217	27.1	29.8	83.7
	completely reject	119	14.9	16.3	100.0
	Total	728	90.9	100.0	
Missing	System	73	9.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	124	15.5	16.3	16.3
	accept	192	24.0	25.3	41.6
	indifferent	122	15.2	16.1	57.7
	reject	188	23.5	24.8	82.5
	completely reject	133	16.6	17.5	100.0
	Total	759	94.8	100.0	
Missing	System	42	5.2		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	66	8.2	17.1	17.1
	accept	118	14.7	30.6	47.8
	indifferent	121	15.1	31.4	79.2
	reject	61	7.6	15.8	95.1
	completely reject	19	2.4	4.9	100.0
	Total	385	48.1	100.0	
Missing	System	416	51.9		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	51	6.4	13.1	13.1
	accept	129	16.1	33.2	46.4
	indifferent	122	15.2	31.4	77.8
	reject	65	8.1	16.8	94.6
	completely reject	21	2.6	5.4	100.0
	Total	388	48.4	100.0	
Missing	System	413	51.6		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly support	254	31.7	33.5	33.5
	accept	343	42.8	45.3	78.8
	indifferent	87	10.9	11.5	90.2
	reject	46	5.7	6.1	96.3
	completely reject	28	3.5	3.7	100.0
	Total	758	94.6	100.0	
Missing	System	43	5.4		
Total		801	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	154	19.2	20.6	20.6
	accept	305	38.1	40.7	61.3
	indifferent	145	18.1	19.4	80.6
	reject	103	12.9	13.8	94.4
	completely reject	42	5.2	5.6	100.0
	Total	749	93.5	100.0	
Missing	System	52	6.5		
Total		801	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	94	11.7	13.0	13.0
	accept	240	30.0	33.1	46.1
	indifferent	193	24.1	26.6	72.7
	reject	146	18.2	20.1	92.8
	completely reject	52	6.5	7.2	100.0
	Total	725	90.5	100.0	
Missing	System	76	9.5		
Total		801	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	174	21.7	23.0	23.0
	accept	262	32.7	34.6	57.5
	indifferent	96	12.0	12.7	70.2
	reject	166	20.7	21.9	92.1
	completely reject	60	7.5	7.9	100.0
	Total	758	94.6	100.0	
Missing	System	43	5.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	actively involed and embraced it	20	2.5	2.8	2.8
	well informed and accepting	82	10.2	11.3	14.1
	involved but largely ignored	152	19.0	21.0	35.1
	poorly informed but accepting	330	41.2	45.6	80.8
	poorly informed and unhappy	139	17.4	19.2	100.0
	Total	723	90.3	100.0	
Missing	System	78	9.7		
Total		801	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 (%)	s.e
Maximise farm income only, given available supplies	21.97	18.33
Distribute water entitlements in a fair and just manner	32.20	18.27
Meet the requirements of natural river flow	29.36	19.72
Account for the impact of trading on local towns and communities	19.59	13.29

5. Part of the COAG reform was 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	90	11.2	15.1	15.1
no	506	63.2	84.9	100.0
Total	596	74.4	100.0	
Missing System	205	25.6		
Total	801	100.0		

Your Views on Temporary Water Trading

1. What is the most important reason why other farmers temporarily buy water?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Not meet crop requirements	253	31.6	62.3	62.3
They need water to meet end of season	103	12.9	25.4	87.7
other	50	6.2	12.3	100.0
Total	406	50.7	100.0	
Missing System	395	49.3		
Total	801	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	280	35.0	69.7	69.7
	Sell because they could make more by selling	107	13.4	26.6	96.3
	other	15	1.9	3.7	100.0
	Total	402	50.2	100.0	
Missing	System	399	49.8		
Total		801	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	243	30.3	60.0	60.0
	no	162	20.2	40.0	100.0
	Total	405	50.6	100.0	
Missing	System	396	49.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	99	12.4	24.4	24.4
	no	306	38.2	75.6	100.0
	Total	405	50.6	100.0	
Missing	System	396	49.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	178	22.2	44.0	44.0
	no	227	28.3	56.0	100.0
	Total	405	50.6	100.0	
Missing	System	396	49.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	27	3.4	6.7	6.7
	no	378	47.2	93.3	100.0
	Total	405	50.6	100.0	
Missing	System	396	49.4		
Total		801	100.0		

- **They are philosophically opposed to trading.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	46	5.7	11.4	11.4
	no	359	44.8	88.6	100.0
	Total	405	50.6	100.0	
Missing	System	396	49.4		
Total		801	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	58	7.2	14.3	14.3
	no	347	43.3	85.7	100.0
	Total	405	50.6	100.0	
Missing	System	396	49.4		
Total		801	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	253	31.6	64.2	64.2
no	141	17.6	35.8	100.0
Total	394	49.2	100.0	
Missing System	407	50.8		
Total	801	100.0		

5. If you were 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	121	15.1	30.8	30.8
no	272	34.0	69.2	100.0
Total	393	49.1	100.0	
Missing System	408	50.9		
Total	801	100.0		

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

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	172	21.5	43.8	43.8
no	221	27.6	56.2	100.0
Total	393	49.1	100.0	
Missing System	408	50.9		
Total	801	100.0		

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

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	154	19.2	39.2	39.2
no	239	29.8	60.8	100.0
Total	393	49.1	100.0	
Missing System	408	50.9		
Total	801	100.0		

- **Prior to the next irrigation.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	27	3.4	6.9	6.9
	no	366	45.7	93.1	100.0
	Total	393	49.1	100.0	
Missing	System	408	50.9		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	84	10.5	21.4	21.4
	no	309	38.6	78.6	100.0
	Total	393	49.1	100.0	
Missing	System	408	50.9		
Total		801	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	322	40.2	82.4	82.4
	no	69	8.6	17.6	100.0
	Total	391	48.8	100.0	
Missing	System	410	51.2		
Total		801	100.0		

- **Change crops to use less water.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	14	1.7	3.6	3.6
	no	377	47.1	96.4	100.0
	Total	391	48.8	100.0	
Missing	System	410	51.2		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	24	3.0	6.1	6.1
	no	367	45.8	93.9	100.0
	Total	391	48.8	100.0	
Missing	System	410	51.2		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	20	2.5	5.1	5.1
	no	371	46.3	94.9	100.0
	Total	391	48.8	100.0	
Missing	System	410	51.2		
Total		801	100.0		

- **Not crop that year.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	20	2.5	5.1	5.1
	no	371	46.3	94.9	100.0
	Total	391	48.8	100.0	
Missing	System	410	51.2		
Total		801	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	286	35.7	38.3	38.3
agree	350	43.7	46.9	85.3
uncertain	52	6.5	7.0	92.2
disagree	31	3.9	4.2	96.4
strongly disagree	27	3.4	3.6	100.0
Total	746	93.1	100.0	
Missing System	55	6.9		
Total	801	100.0		

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

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	112	14.0	15.4	15.4
agree	256	32.0	35.2	50.5
uncertain	147	18.4	20.2	70.7
disagree	126	15.7	17.3	88.0
strongly disagree	87	10.9	12.0	100.0
Total	728	90.9	100.0	
Missing System	73	9.1		
Total	801	100.0		

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

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid strongly agree	118	14.7	16.1	16.1
agree	304	38.0	41.5	57.6
uncertain	134	16.7	18.3	75.9
disagree	96	12.0	13.1	88.9
strongly disagree	81	10.1	11.1	100.0
Total	733	91.5	100.0	
Missing System	68	8.5		
Total	801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	134	16.7	18.3	18.3
	agree	263	32.8	35.8	54.1
	uncertain	121	15.1	16.5	70.6
	disagree	128	16.0	17.4	88.0
	strongly disagree	88	11.0	12.0	100.0
	Total	734	91.6	100.0	
Missing	System	67	8.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	157	19.6	21.3	21.3
	agree	348	43.4	47.2	68.5
	uncertain	109	13.6	14.8	83.3
	disagree	75	9.4	10.2	93.5
	strongly disagree	48	6.0	6.5	100.0
	Total	737	92.0	100.0	
Missing	System	64	8.0		
Total		801	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	84	10.5	11.5	11.5
	agree	296	37.0	40.5	52.0
	uncertain	133	16.6	18.2	70.2
	disagree	137	17.1	18.7	88.9
	strongly disagree	81	10.1	11.1	100.0
	Total	731	91.3	100.0	
Missing	System	70	8.7		
Total		801	100.0		

- **Local industries who use water**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	115	14.4	15.6	15.6
	agree	413	51.6	56.2	71.8
	uncertain	108	13.5	14.7	86.5
	disagree	59	7.4	8.0	94.6
	strongly disagree	40	5.0	5.4	100.0
	Total	735	91.8	100.0	
Missing	System	66	8.2		
Total		801	100.0		

- **Environmental groups and agencies**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	91	11.4	12.6	12.6
	agree	256	32.0	35.4	48.0
	uncertain	164	20.5	22.7	70.7
	disagree	121	15.1	16.7	87.4
	strongly disagree	91	11.4	12.6	100.0
	Total	723	90.3	100.0	
Missing	System	78	9.7		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	37	4.6	5.1	5.1
	agree	102	12.7	14.0	19.0
	uncertain	101	12.6	13.8	32.8
	disagree	161	20.1	22.0	54.9
	strongly disagree	330	41.2	45.1	100.0
	Total	731	91.3	100.0	
Missing	System	70	8.7		
Total		801	100.0		

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

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	195	24.3	47.4	47.4
no	216	27.0	52.6	100.0
Total	411	51.3	100.0	
Missing System	390	48.7		
Total	801	100.0		

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

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Not meet crop requirements	83	10.4	43.5	43.5
water to finish crop	18	2.2	9.4	52.9
water surplus to needs	69	8.6	36.1	89.0
more by selling	15	1.9	7.9	96.9
overused entitlement	6	.7	3.1	100.0
Total	191	23.8	100.0	
Missing System	610	76.2		
Total	801	100.0		

9(b) Did the actions of other water traders affect how you traded?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid yes	57	7.1	30.0	30.0
no	133	16.6	70.0	100.0
Total	190	23.7	100.0	
Missing System	611	76.3		
Total	801	100.0		

9(c) What costs did you incur establishing your last transaction?

Cost	Mean (\$)	s.e.
Broker fees	19.81	61.67
Exchange fees	24.72	39.78
Water Authority fees	98.47	225.07
Other	88.76	712.45

9(d) Do you consider the costs associated with the transaction:-

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	satisfactory	152	19.0	81.3	81.3
	excessive	35	4.4	18.7	100.0
	Total	187	23.3	100.0	
Missing	System	614	76.7		
Total		801	100.0		

9(e) How long was it from the start of negotiating a trade to the final approval for the supply of water?

8.06 days

9(f) The time taken to complete a trade was:-

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	excellent	57	7.1	30.3	30.3
	reasonable	121	15.1	64.4	94.7
	unacceptable	10	1.2	5.3	100.0
	Total	188	23.5	100.0	
Missing	System	613	76.5		
Total		801	100.0		

Your Views on Permanent Water Trading**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	235	29.3	64.0	64.0
	want to develop more land	65	8.1	17.7	81.7
	greater security of supply	67	8.4	18.3	100.0
	Total	367	45.8	100.0	
Missing	System	434	54.2		
Total		801	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	257	32.1	69.3	69.3
	more by sell than crops	66	8.2	17.8	87.1
	dryland farm alternative	11	1.4	3.0	90.0
	retiring	20	2.5	5.4	95.4
	other	17	2.1	4.6	100.0
	Total	371	46.3	100.0	
Missing	System	430	53.7		
Total		801	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	56	7.0	13.9	13.9
	agree	144	18.0	35.6	49.5
	uncertain	64	8.0	15.8	65.3
	disagree	87	10.9	21.5	86.9
	strongly disagree	53	6.6	13.1	100.0
	Total	404	50.4	100.0	
Missing	System	397	49.6		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	8	1.0	2.0	2.0
	agree	17	2.1	4.3	6.3
	uncertain	54	6.7	13.5	19.8
	disagree	144	18.0	36.0	55.8
	strongly disagree	177	22.1	44.3	100.0
	Total	400	49.9	100.0	
Missing	System	401	50.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	47	5.9	11.9	11.9
	agree	152	19.0	38.5	50.4
	uncertain	101	12.6	25.6	75.9
	disagree	82	10.2	20.8	96.7
	strongly disagree	13	1.6	3.3	100.0
	Total	395	49.3	100.0	
Missing	System	406	50.7		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	49	6.1	12.3	12.3
	agree	243	30.3	61.2	73.6
	uncertain	55	6.9	13.9	87.4
	disagree	40	5.0	10.1	97.5
	strongly disagree	10	1.2	2.5	100.0
	Total	397	49.6	100.0	
Missing	System	404	50.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	5	.6	1.3	1.3
	agree	16	2.0	4.1	5.3
	uncertain	62	7.7	15.8	21.1
	disagree	188	23.5	47.8	69.0
	strongly disagree	122	15.2	31.0	100.0
	Total	393	49.1	100.0	
Missing	System	408	50.9		
Total		801	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	11	1.4	2.8	2.8
	agree	86	10.7	21.9	24.7
	uncertain	150	18.7	38.2	62.8
	disagree	109	13.6	27.7	90.6
	strongly disagree	37	4.6	9.4	100.0
	Total	393	49.1	100.0	
Missing	System	408	50.9		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	68	8.5	17.3	17.3
	agree	213	26.6	54.2	71.5
	uncertain	65	8.1	16.5	88.0
	disagree	37	4.6	9.4	97.5
	strongly disagree	10	1.2	2.5	100.0
	Total	393	49.1	100.0	
Missing	System	408	50.9		
Total		801	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	15	1.9	3.8	3.8
	agree	85	10.6	21.7	25.5
	uncertain	146	18.2	37.2	62.8
	disagree	112	14.0	28.6	91.3
	strongly disagree	34	4.2	8.7	100.0
	Total	392	48.9	100.0	
Missing	System	409	51.1		
Total		801	100.0		

Trade in Water in Your Region in Ten Years Time Will:

- **Be limited and within a region.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	118	14.7	16.2	16.2
	agree	320	40.0	44.0	60.2
	uncertain	163	20.3	22.4	82.6
	disagree	107	13.4	14.7	97.3
	strongly disagree	20	2.5	2.7	100.0
	Total	728	90.9	100.0	
Missing	System	73	9.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	135	16.9	18.3	18.3
	agree	387	48.3	52.5	70.8
	uncertain	142	17.7	19.3	90.1
	disagree	53	6.6	7.2	97.3
	strongly disagree	20	2.5	2.7	100.0
	Total	737	92.0	100.0	
Missing	System	64	8.0		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	70	8.7	9.6	9.6
	agree	239	29.8	32.9	42.6
	uncertain	208	26.0	28.7	71.2
	disagree	172	21.5	23.7	94.9
	strongly disagree	37	4.6	5.1	100.0
	Total	726	90.6	100.0	
Missing	System	75	9.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	32	4.0	8.6	8.6
	agree	94	11.7	25.1	33.7
	uncertain	148	18.5	39.6	73.3
	disagree	78	9.7	20.9	94.1
	strongly disagree	22	2.7	5.9	100.0
	Total	374	46.7	100.0	
Missing	System	427	53.3		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	77	9.6	10.5	10.5
	agree	294	36.7	39.9	50.4
	uncertain	243	30.3	33.0	83.4
	disagree	91	11.4	12.4	95.8
	strongly disagree	31	3.9	4.2	100.0
	Total	736	91.9	100.0	
Missing	System	65	8.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	52	6.5	7.1	7.1
	agree	100	12.5	13.7	20.9
	uncertain	287	35.8	39.4	60.3
	disagree	227	28.3	31.2	91.5
	strongly disagree	62	7.7	8.5	100.0
	Total	728	90.9	100.0	
Missing	System	73	9.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	140	17.5	19.0	19.0
	agree	188	23.5	25.5	44.5
	uncertain	181	22.6	24.6	69.1
	disagree	184	23.0	25.0	94.0
	strongly disagree	44	5.5	6.0	100.0
	Total	737	92.0	100.0	
Missing	System	64	8.0		
Total		801	100.0		

- **Significantly reduce the wellbeing of local towns and businesses in my area.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	64	8.0	8.7	8.7
	agree	126	15.7	17.1	25.7
	uncertain	203	25.3	27.5	53.2
	disagree	278	34.7	37.6	90.8
	strongly disagree	68	8.5	9.2	100.0
	Total	739	92.3	100.0	
Missing	System	62	7.7		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	135	16.9	18.3	18.3
	agree	178	22.2	24.2	42.5
	uncertain	182	22.7	24.7	67.2
	disagree	167	20.8	22.7	89.8
	strongly disagree	75	9.4	10.2	100.0
	Total	737	92.0	100.0	
Missing	System	64	8.0		
Total		801	100.0		

- **Significantly increase salinity in your region.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	92	11.5	12.5	12.5
	agree	106	13.2	14.4	26.9
	uncertain	232	29.0	31.6	58.5
	disagree	227	28.3	30.9	89.4
	strongly disagree	78	9.7	10.6	100.0
	Total	735	91.8	100.0	
Missing	System	66	8.2		
Total		801	100.0		

- 3. 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	strongly agree	135	16.9	18.3	18.3
	agree	178	22.2	24.2	42.5
	uncertain	182	22.7	24.7	67.2
	disagree	167	20.8	22.7	89.8
	strongly disagree	75	9.4	10.2	100.0
	Total	737	92.0	100.0	
Missing	System	64	8.0		
Total		801	100.0		

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

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	148	18.5	37.8	37.8
	agree	186	23.2	47.4	85.2
	uncertain	15	1.9	3.8	89.0
	disagree	30	3.7	7.7	96.7
	strongly disagree	13	1.6	3.3	100.0
	Total	392	48.9	100.0	
Missing	System	409	51.1		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	114	14.2	29.2	29.2
	agree	224	28.0	57.4	86.7
	uncertain	34	4.2	8.7	95.4
	disagree	15	1.9	3.8	99.2
	strongly disagree	3	.4	.8	100.0
	Total	390	48.7	100.0	
Missing	System	411	51.3		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	226	28.2	30.5	30.5
	agree	365	45.6	49.3	79.9
	uncertain	98	12.2	13.2	93.1
	disagree	38	4.7	5.1	98.2
	strongly disagree	13	1.6	1.8	100.0
	Total	740	92.4	100.0	
Missing	System	61	7.6		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	261	32.6	35.2	35.2
	agree	322	40.2	43.4	78.6
	uncertain	103	12.9	13.9	92.5
	disagree	46	5.7	6.2	98.7
	strongly disagree	10	1.2	1.3	100.0
	Total	742	92.6	100.0	
Missing	System	59	7.4		
Total		801	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	252	31.5	34.3	34.3
	agree	362	45.2	49.3	83.7
	uncertain	87	10.9	11.9	95.5
	disagree	26	3.2	3.5	99.0
	strongly disagree	7	.9	1.0	100.0
	Total	734	91.6	100.0	
Missing	System	67	8.4		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	54	6.7	14.1	14.1
	agree	159	19.9	41.4	55.5
	uncertain	73	9.1	19.0	74.5
	disagree	82	10.2	21.4	95.8
	strongly disagree	16	2.0	4.2	100.0
	Total	384	47.9	100.0	
Missing	System	417	52.1		
Total		801	100.0		

- 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	175	21.8	44.3	44.3
	agree	189	23.6	47.8	92.2
	uncertain	13	1.6	3.3	95.4
	disagree	10	1.2	2.5	98.0
	strongly disagree	8	1.0	2.0	100.0
	Total	395	49.3	100.0	
Missing	System	406	50.7		
Total		801	100.0		

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	115	14.4	29.3	29.3
	agree	167	20.8	42.5	71.8
	uncertain	31	3.9	7.9	79.6
	disagree	59	7.4	15.0	94.7
	strongly disagree	21	2.6	5.3	100.0
	Total	393	49.1	100.0	
Missing	System	408	50.9		
Total		801	100.0		

- **The traders entitlements and crop mix.**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	88	11.0	22.6	22.6
	agree	136	17.0	35.0	57.6
	uncertain	74	9.2	19.0	76.6
	disagree	68	8.5	17.5	94.1
	strongly disagree	23	2.9	5.9	100.0
	Total	389	48.6	100.0	
Missing	System	412	51.4		
Total		801	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	3.15
20%	Habitat degradation, reversibility unknown	2.45
30%	Reversible habitat degradation	2.07
40%	No habitat degradation	2.35

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	222	27.7	29.5	29.5
	disagree	114	14.2	15.1	44.6
	do not know	99	12.4	13.1	57.8
	agree	203	25.3	27.0	84.7
	strongly agree	115	14.4	15.3	100.0
	Total	753	94.0	100.0	
Missing	System	48	6.0		
Total		801	100.0		

Information about Yourself

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	169	21.1	43.9	43.9
	no	216	27.0	56.1	100.0
	Total	385	48.1	100.0	
Missing	System	416	51.9		
Total		801	100.0		

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

Mean 454.87 ML. s.e. 1516.94

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

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	198	24.7	50.6	50.6
	no	193	24.1	49.4	100.0
	Total	391	48.8	100.0	
Missing	System	410	51.2		
Total		801	100.0		

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

36.08%

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

52.04%

3. What age group does the farm manager belong to?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	15-24	9	1.1	1.2	1.2
	25-34	87	10.9	11.3	12.4
	35-44	169	21.1	21.9	34.3
	45-54	231	28.8	29.9	64.2
	55-64	140	17.5	18.1	82.4
	65-74	92	11.5	11.9	94.3
	75 and over	44	5.5	5.7	100.0
	Total	772	96.4	100.0	
Missing	System	29	3.6		
Total		801	100.0		