

# “EXPLORING NON-PROFIT MAXIMISING INFLUENCES ON IRRIGATOR’S BEHAVIOUR”.

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## ABSTRACT

Undertaking water reforms that are acceptable to irrigators relies in part on encouraging effective communication between them and policymakers. It has been argued that past efforts have not been satisfactory as policy makers have treated irrigators in the aggregate. They have not recognised that failing to understand the range of unique influences determining irrigators’ behaviour when responding to new policy initiatives can potentially result in suboptimal policy outcomes.

The research for this paper was conducted with the irrigators of the Namoi Valley who, in an effort to achieve environmental sustainability of their water resource, are facing varying, and for some, severe reductions in their water entitlements. By using qualitative interviews and multivariate analyses of quantitative survey data the relationship between values other than profit-maximisation and irrigators’ behaviour is explored.

The aim of this research is to allow policy makers to better understand and communicate with irrigators by using more complementary and more meaningful approaches to policy design and implementation. As a result the management actions of irrigators are likely to be more aligned with policy expectations and thereby minimize conflicts between users, compromised outcomes and undesired social and community impacts.

## INTRODUCTION

With the world’s population expected to increase from over 6 billion currently (United Nations Population Division 2007) to over 9 billion in the year 2050, and allowing for a rising demand for calories from a more affluent population, along with the reduction or elimination of malnutrition, worldwide food production will need to almost double. As irrigation currently accounts for more than 1/3rd of the world’s food production, it must be expected that irrigation has to continue to play a pivotal role in meeting the increasing demand for food. The ability to continue to increase water supply for increased food production is made uncertain by a number of factors: (i) increased urban, recreational and environmental demands; (ii) political opposition to new major water infrastructure; and (iii) increased marginal cost of new supply. With little opportunity to increase the supply of water it is clear that more production will be needed from each unit of water used for irrigation. This will require a shift from supply to demand management and an increase in water use efficiency and productivity.

To bring about the necessary production and efficiency improvements it will be essential to have effective communication between policy-makers and irrigators. Policy-makers have been criticized for treating irrigators in aggregate, assuming that their responses to new policy initiatives are profit-maximising, rather than recognising that a range of influences other than a sole emphasis on profit-maximising also determine their behaviour. Greater efforts need to be made in understanding how irrigators make decisions and what influence values other than profit-maximisation might have on those decisions. This improved understanding of the motivations of irrigators can then lead to better design of water reform policies. This could result in instruments that are more readily adopted; avoiding unwanted and undesirable socio-economic effects.

This paper is based on interviews and surveys with groundwater irrigators in the Namoi Valley who since the introduction of the Water Sharing Plans (WSP) have faced reductions to their water entitlements, in some cases up to 94%. These drastic reductions are aimed at achieving a

sustainable level of water use. This research is designed to identify the factors that influence irrigators' decision-making in response to the introduction of new policies or new innovations and management practices. It also aims to group irrigators depending on how such factors influence their decision-making so that new policies and programs can be designed to better target the individual goals of each of these groups, resulting in more predictable policy outcomes and a higher adoption rate of new innovations and management practices.

## **METHODOLOGY**

The research methods were chosen so that the initial understandings which developed from the literature review would be built on through every subsequent stage of the project. The initial exploratory nature and loose theories of the first stages, eventually gives way to more clearly defined theories of the last stage.

Schutt (2006, p. 14) suggests that exploratory research "seeks to find out how people get along in the setting under question, what meanings they give to their actions, and what issues concern them. The goal is to learn 'What is going on here?'...". Armstrong (1971) suggests that exploratory research is used when little a priori knowledge exists and that the polar extreme is 'theory based' research where much use is made of a priori knowledge. In the context of this research project the initial mail-out survey has much in common with exploratory research, the following personal interviews less so, while the final telephone interviews have more in common with 'theory-based' research, or explanatory research. This is research that Schutt (2006, p. 15) suggests "seeks to identify causes and effects of social phenomena and predict how one phenomena will change or vary in response to variation in some other phenomenon". Exploratory research was initially used for this project because not much was known about the influences on irrigators' behaviour in the Namoi Valley, or the problems that they faced.

The mail-out survey of groundwater licence holders gathered the initial demographic and property specific information that allowed a better understanding of the type of irrigators active in the area. The survey also used open-ended questions to allow respondents' concerns to emerge unhindered by the rigid constraints of researchers' predefined categories, and also to uncover areas of interest and relationships between issues not previously considered. The mail-out survey served the additional purpose of identifying potential candidates for the personal interviews and telephone survey which were to follow. Quantitative analysis of the mail-out survey was conducted using descriptive statistics; qualitative analysis was done by using a simple cut and sort technique.

The subsequent personal interviews allowed further exploration of the areas of research interest identified from the mail-out survey. The twenty interviews were recorded on a digital recorder and then selectively transcribed according to their usefulness in adding to the developing theory. Due to the small number of interviews, once they were transcribed, they were simply coded directly to the transcript without the use of qualitative data analysis software. This stage allowed the provisional theory to be refined.

The results from the previous stages of the research provided the background information for the design of a quantitative telephone survey instrument to test the refined theory. The telephone survey was administered to 121 groundwater licence holders. The survey instrument was developed to gather information from respondents about their: 1) business, property and personal characteristics; 2) ratings on the value statements regarding family, land water, community, lifestyle as well as profit; and 3) management response to the WSP.

Using the value statements of the survey, factor analysis was chosen to reveal the underlying value constructs among irrigators by summarizing and reducing the data. This was done by combining a small set of variables in such a way that they are able to explain what was common to the larger set of variables in a more concise fashion. Cross-tabulation and significance tests were then used to examine how irrigators rating highly or lowly on the three value-constructs differed with respect to property and personal characteristics as well as in their management responses.

Cluster analysis – which was also conducted using the responses to the value statements from the phone survey – is designed to group individuals with similar value orientations so that they form

homogenous groups. It is simply a procedure used for searching for patterns in the data in the form of clusters. Again cross-tabulation and significance tests were used to test whether the different cluster groups had different property and personal characteristics or management responses. Using the crosstabulation results the cluster groups were able to be formed into a typology of irrigators illustrating that the influences of values can lead to differing farm management actions and intentions.

## RESULTS & DISCUSSION

Irrigators' motivations are not solely profit maximization (Bjornlund 2002; Kuehne & Bjornlund 2006a). Irrigators make decisions in order to maximise their benefit or utility, motivated by "interwoven economic, environmental, social, and cultural goals and values" (Walter 1997, p. 66). Although these decisions may seem irrational from a profit maximizing perspective, from the individual irrigators' perspective, their decisions might well be entirely rational (Vanclay & Lawrence 1994).

The 151 responses to the mail-out survey from the 659 posted suggested that even though the respondents had serious concerns about the consultation process used to develop and implement the WSP (Kuehne & Bjornlund 2006b) they accepted that water reform was needed. Their overriding concerns were associated with the fairness of the consultation process that was used to develop the WSP. It appeared that they were under a misapprehension that they were to have had a greater involvement in the decision making; and that they were to play a larger role in the development of the plans than they were subsequently allowed to (Kuehne & Bjornlund 2006b). The mail-out survey also showed that respondents planned to take a diverse range of actions in response to the WSP.

The results from the personal interviews (Kuehne & Bjornlund 2006a) reinforced the previously expressed concerns regarding the consultation process but also indicated that a simple typology of irrigators could be developed by classifying them according to their profit orientation (see table:1). The interviews showed that two groups could be described. One group, the *Custodians*, seemed to think of their land differently to the other. They: valued the length of time that they had been farmers; appeared to be more traditional irrigators; appeared more reluctant to change; had strongly developed community affiliations; and were less obviously motivated by the pursuit of profit. The other group, the *Investors*, appeared to view everything in terms of profit. They viewed their land and water primarily as a resource to generate an income, and had a lesser emotional attachment to it.

Table 1: Initial typology

Classification variables	Investors	Custodian
Goals / Motivation	Focus on return on investment.	Replicate the farm, with children all owning farms.
Family objectives	Not focused or dependent on family.	Family-centric.
Business objectives	Money needs to "work".	Committed to farming as an occupation and way of life.
Business history	Recent entrants & may be new to agriculture and the community.	Family based, possibly multi-generational business.
Attitudes to debt	Recognition that large debts can be necessary to ensure business growth.	Prefer to avoid exposure to large business debts.
Attitudes to water	Resource to be bought and sold.	A right and a responsibility. Not likely to be sold.
Attitude to land	Resource that is tradable. Farms will be bought and	Desire to leave the land in better condition for future

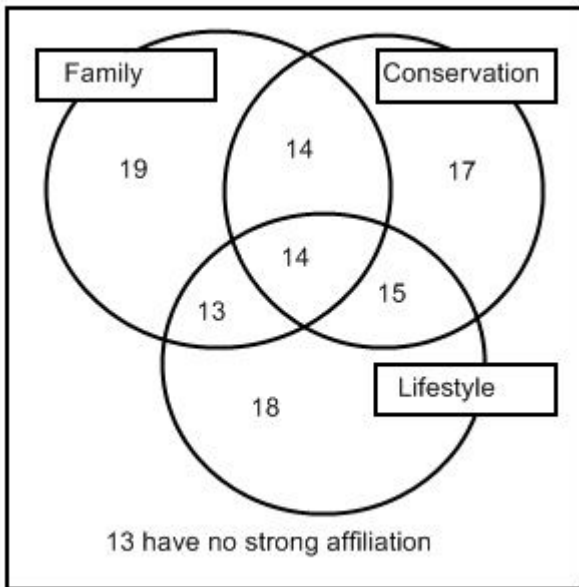
	sold.	generations.
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(Kuehne & Bjornlund 2008)

The telephone survey was the final part of the data gathering process and built on all the proceeding parts of the research. It was the part of the research where the exploratory theory of the mail-out survey and the personal interviews were synthesized into a refined theory and tested. The survey was firstly analysed using factor analysis to explore the nature of the values held by irrigators, and then followed by cluster analysis which explored the groupings of irrigators holding similar values.

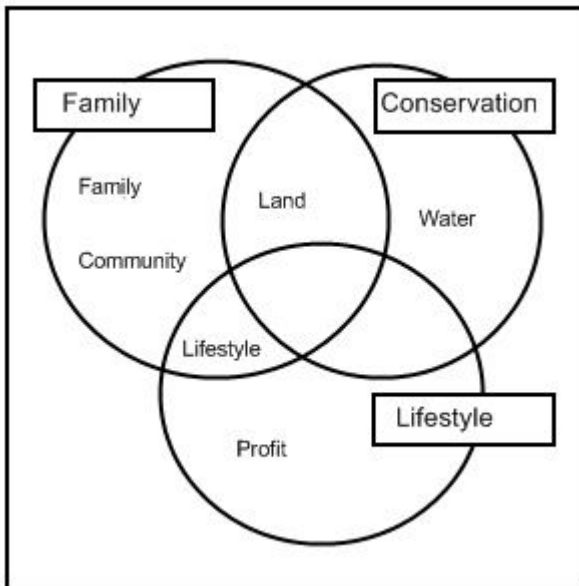
Factor analysis revealed three value constructs existing among irrigators; which we labelled *Family Conservation* and *Lifestyle*. By analysing how irrigators aligned themselves with each value construct it was possible to illustrate to what extent these value constructs overlapped and influenced each other (fig.1). This analysis was endorsed by the literature which suggested that the relationship between values and behavior is complex and that the combined attitudes and values held by a person are good predictors of their behaviour (Willock et al. 1999a).

Figure: 1 Number and distribution of respondents for highest 50% of factor scores for each factor



(Kuehne et al. 2008b)

Figure 2: Dominant values for each value construct

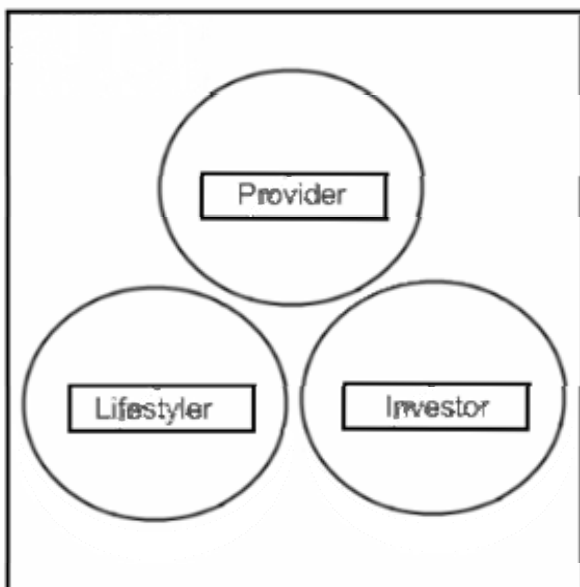


(Kuehne et al. 2008b)

When considering whether people with these value constructs would participate in water markets it was found that irrigators rating highly on the *Family* value construct are not primarily motivated by profit and are therefore reluctant sellers of water. Those rating highly on the *Lifestyle* value construct also contain reluctant sellers of water but for different reasons, the sale of their water would reduce their level of profit and their lifestyle. Those rating highly on the *Conservation* value construct are less motivated by profit and more by considering whether the sale of water would be the right thing to do. This examination of irrigators value constructs showed that there was a marked difference between the management intentions of irrigators and that this was related to the value constructs that they held (Kuehne et al. 2008b).

Cluster analysis was performed on the value statements of the telephone survey. Three plausible clusters emerged: *Providers*; who are focused on family and family succession, *Lifestylers*; who are focused on the lifestyle benefits of farming, and the profit oriented, *Investors*. Unlike the overlapping value constructs of factor analysis the cluster analysis forms distinct groups, see fig. 3 (Kuehne et al. 2008a).

Figure 3: Cluster groups



The research found that because each of these groups expected the use of their water to achieve different goals for them, each of them had differing likelihoods of becoming involved in the sale of their water. For example the *Provider*, because they were motivated by family succession, were the least likely to sell their water. They saw it as a resource that was essential for the growth of their business for the ultimate benefit of their family. The *Lifestyler*, because they were not expecting to have family succession, and did not have the need to grow the business to the same extent as the *Provider*, were a little more likely to consider selling their water. The *Investor* with a much greater emphasis on profit maximisation for its own sake (rather than generating a profit to achieve family goals like the *Provider*) is the more likely group to consider sale of water. However, this was only if the sale of the water was financially attractive (Kuehne et al. 2008a).

## CONCLUSIONS

Influences on irrigators' decision making behaviour are complex, not easily understood, and difficult to study in their entirety. Further work is still required on developing a more complete understanding of the individual components of these decision drivers. Combining research such as this with the research of others will eventually contribute to a richer understanding of the interrelationships between irrigators' individual non-profit decision drivers.

What we have found is that *Investors*, *Lifestylers* and *Providers* each vary in the extent to which they would consider selling their water. This was determined by how much the sale of their water would contribute to advancing their goals, which differed for each group. *Investors* are the most likely sellers as their goals are satisfied by financial gain. *Lifestylers* are less likely to sell as their water is useful for them in continuing their goal of staying involved in agriculture until they retire. The *Providers* are the least likely to sell their water as they intend to use it to grow their business for the benefit of their family successors.

To encourage greater participation of the two reluctant groups in water markets government policies and programs could be implemented taking their varying goals into account. To gain the participation of the *Lifestyler*, ecosystem stewardship payments, which allow the landholder to remain on their property and carry out paid environmental management activities while the water is used for purposes other than irrigated agriculture, may be appropriate. The *Provider*, because their water is used for developing the business for family purposes will be more reluctant to surrender it. However this could happen if it were possible in some way to satisfy the *Providers* desires in providing viable farming careers for their successors. By providing a better understanding of the range of influences on irrigators' decision making – and why the influences exist – this research should result in a less troublesome relationship between government and industry. This is important as the need for water and other environmental reforms, at the same time as increases in agricultural production, will be a constant for years to come.

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