

The influence of irrigators' attitudes and objectives on their decision making

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Abstract:

Water markets were expected to minimise the socio-economic impact of reducing irrigators' water entitlements in Australia's Namoi Valley by providing a mechanism for reallocating water from inactive license holders to active irrigators. But survey responses show that this is an unlikely scenario as it appears as though there may be a number of influences acting on inactive license holders that are stronger than the desire for economic gain from participating in water markets. This research constructs a typology that aims to provide an explanatory framework for understanding what those influences might be. A better understanding of farmers' attitudes and objectives; and of the motivations for their behaviour, is likely to lead to better policy design and more successful policy implementation. The implication for policy makers is that reducing irrigators entitlement based on their past usage, rather than equal reductions for all, will cause less disruption within the affected communities as this method places minimum reliance on the market as a reallocation mechanism.

KEYWORDS Water reform; farmers values; farmers typologies; ideal types; Namoi Valley; Australia

INTRODUCTION

Many water resources throughout the world are now over allocated. There is an increasing demand from human consumption as well as sanitation, industry and recreation. At the same time environmental awareness is increasing and more water will need to stay in the rivers and aquifers for sustainability and environmental purposes. In most places increasing supply of water is no longer an option; consequently, satisfying new demand will require water to be transferred from agricultural users. Such export of water out of rural areas can have significant economic impact on the exporting communities. The degree of impact will depend on farmers' management responses. If remaining water entitlements are used by the most efficient water users, and highest value producers, then the socio-economic impact will be less profound. It is therefore important to understand how farmers are going to respond to reduced access to water.

The study area for this research, the Namoi Valley in New South Wales (NSW) from 1961 onwards, developed quickly as an irrigation region due to the availability of regulated water from the newly constructed Keepit Dam. However, when Keepit Dam ran dry in drought years, irrigators sought out the more reliable groundwater supplies as alternative sources of water. Today about one third of the nearly 120,000 hectares of irri-

gated land is irrigated using groundwater (Kuehne and Bjornlund, 2006b). The average irrigation farm has 892 cultivated hectares with 206 hectares of that being irrigated. Furrow irrigated cotton is grown on 80% of the irrigated land with a variety of other crops also being grown, depending on seasonal conditions and market outlooks (Powell *et al.*, 2003).

The Namoi Valley has become the most intensively developed groundwater using region in NSW (CSIRO, 2007). It is also over-allocated to such an extent that if all groundwater licence holders fully utilised their licences, and used the 471 gigalitres of water that they were legally entitled to over the course of a year, the amount used would be more than double the annual sustainable yield of 208 GL. In an average year, over the whole valley, groundwater extractions of 174 GL are a little below the sustainable yield, but this has risen to an unsustainable level of 326 GL in drought years (NGMC, 2001). To remove the potential for unsustainable over extraction, a process of developing water-sharing plans (WSP), has been finalized, and implemented from November 2006. In order to reduce water use to sustainable levels these plans introduce cuts to water entitlements of different magnitudes for the thirteen hydrogeologically distinct groundwater zones of the region. The mean cut to groundwater entitlements is 52% but some license holders will have no cuts while those in the worst affected zone will have their entitlements reduced by 94%.

The main objective of this research is to explore the influence of irrigators' attitudes and objectives on their decision making. Groundwater licence holders because they need to respond in some way to reductions in water entitlements provide an ideal group for this purpose. The next section of the paper will outline the development of the WSP, this will be followed by a discussion of the relevant literature. The third section will describe the research design which will be followed by an analysis of the results.

Development of the Water Sharing Plans

The development of the WSPs needs to be seen in the context of an emerging national water policy framework developed by the Council of Australian Governments (CoAG, 1994, 2004). This framework required that water entitlements be unbundled from property rights to land, and that water should be able to be freely traded. It also recognised the environment as a legitimate water user and required the states to give specific water entitlements to the environment, and to return all water sources to sustainable levels of use.

The response of the New South Wales State Government to the CoAG reform process was the development of the WSP. For a discussion of the development process of these plans see Kuehne and Bjornlund (2006a, b). The WSP set the rules for sharing of water between the environment and other uses such as irrigated agriculture

and urban areas for a ten-year period. To return the catchments to sustainable levels, in most instances, some reductions had to be made to existing water entitlements. An important part of the development of the WSP was therefore to define the method of entitlement reduction. The two options considered were History of Extraction (HOE) which is a measure of past usage or Across-the-Board (ATB). HOE weights the reductions according to past usage and favours the active users while ATB requires an equal reduction of usage among all licence holders irrespective of past use. Furthermore, ATB favours the inactive or low users however is in line with the recommendation of the Independent Audit Group (MDBC, 1996). Irrigators with a high history of use argued that HOE maintained economic activity within the community, reduced the effect of stranded assets; a situation where their investment in infrastructure becomes worthless without water, and avoided a period of uncertainty and restructuring while active irrigators rearranged their water access to ensure continued production. Irrigators with a low history of use argued that because they had been frugal and responsible with water use HOE would unfairly disadvantage them. "Inactive" users expressed concern that cuts based on HOE would have unfairly affected their property values. Licence holders overall did not favour HOE although irrigators with a high history of use did; however, early statements made by government agencies created an expectation that the government would choose HOE (Nancarrow *et al.*, 1998). The government initially chose ATB in August 2001, although the intention to change to HOE was announced in June of 2004. Irrigators were still confused and uncertain about the method of reduction, until HOE was legislated in December 2005 (Kuehne and Bjornlund, 2006a) and finally adopted with the implementation of the WSP in November 2006.

LITERATURE REVIEW

The recognition that farmers are influenced by more than just economic forces is not new. Ashby (1926) states "if the desire for profit or the greatest possible material gain for the least possible effort is not the only or the chief motive actuating farmers it is desirable to enquire what other impulses may be". Gasson (1973) renewed interest in more recent times, by describing an ordering process where farmers choose between the instrumental, intrinsic, and social goals; later adding personal goals to the choices (Gasson and Errington, 1993). Instrumental goals relate to maximising income while intrinsic goals might be the value of the work; a social goal for example could be to maintain family tradition while personal goals could be, being recognised as a good farmer. Fairweather and Keating (1994) also suggested that farmers aim to balance business and personal goals. They described three management styles which highlight the most important goal to be achieved by the farmer: dedicated producer, flexible strategist and the environmentalist. Van der Ploeg (1994) developed the idea that "farming styles", a complex set of notions, knowledge, norms and experiences that exist to inform farmers about how to carry out their activity in a particular area, has an influence on farmers' behaviour. Howden and Vanclay (2000) found that they were unable to support the idea of "farming styles" in an Australian context. They suggested that the styles didn't just emerge from the research but were influenced by the research process, so that when given the opportunity, farmers adopted the styles, using them as a type of heuristic, but that they

didn't previously exist. Willock *et al.* (1999) took farmers' attitudes, goals/objectives and behaviours and used them to construct psychometric scales of measurement. Austin *et al.* (2001) extended this, suggesting that personality and intelligence also substantially influence farmers' behaviour. Shrapnel and Davie (2001) emphasise the importance of considering farmers personality when seeking to understand their behaviour. Beedell and Rehman (1999) favoured the theory of planned behaviour, which aims to link attitudes and behaviour. Behavioural intention is suggested to be a result of a combination of beliefs about the likely outcomes, the expectations of others and the perceptions of control over the behaviour. Salamon (1995) takes an approach that is more in common with this research, using ideal types of "Yeoman" and "Entrepreneur" as a way to describe and predict farmers' behaviour. Austin (1996), however, has not found that ideal types are a very useful way of describing the influences on farmers and suggests that Salamons' dichotomous classification ignores the complexity of farmers' motives.

Interviews with irrigators in northern Victoria, (Bjornlund, 2005; Tisdell and Ward, 2003) suggest that farmers are reluctant to sell their water entitlements because they have always viewed the water as being connected to the land. This could prevent the anticipated reallocation of water and thereby worsen the economic impact of the water sharing plans as suggested by the Socio-Economic Services Unit (1999). Bjornlund (2002) identified that many irrigators preferred to retain their entitlements while selling their seasonal allocations to supplement their income from other sources in order to stay on the farm, protect the value of their property and keep their future options open.

Gasson and Errington (1993) suggest that classifying objectives makes them easier to comprehend while Thompson (2002) suggests that it may not be necessary to group farmers into categories, and finds that the simple recognition that there is heterogeneity within the body of farmers is of value. It is suggested that the classification scheme should not be used to hide the complexity; "the overwhelming and often confusing heterogeneity of agriculture" (van der Ploeg, 1994), but should be used to better understand the motives of this heterogeneous group (Darnhofer *et al.*, 2005).

The literature shows that the influences on farmers' decision making are complex. The influences examined are likely to have been chosen for reasons of the authors' interest rather than as an exhaustive attempt at explaining the factors influencing farmers' decision making. In a similar way the variety of typologies described have value by highlighting particular influences.

THE RESEARCH

Most of the study participants needed to choose whether they: sold or leased all or some of their water; bought more water, became more efficient or reduced their level of irrigated production. The aims of the survey were to identify and explore the issues associated with the reduced water entitlements and licence holders expected management responses prior to the implementation of the WSP. Using the responses to the survey, and nineteen in-depth personal interviews the next step was to investigate whether it was possible to categorise these farmers according to how they fell on a continuum ranging from *Custodian* to *Investor* (see Table I), and whether doing this was useful for predicting their behaviour.

Table I. Proposed 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 and 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 sold.	Desire to leave the land in better condition for future generations.

The survey was limited to five pages with seven qualitative (see Appendix A) and twenty three quantitative questions gathering demographic and property specific information. More questions would have provided richer data, but the lower response rate might then have produced biased results. After being trialled in a neighbouring region, the survey was sent to all 545 groundwater licence holders in the Namoi Valley in July 2005. Using elements of the Dillman method, non-respondents received two reminder postcards and a replacement survey (Dillman, 2000). Surveys were returned over a five month period and then analysed using simple frequencies and descriptive statistics.

RESULTS

The water usage and entitlement characteristics of the 130 respondents (24% of the population) were similar to the non-respondents apart from a greater representation from more active water users; a group that has more at stake from the reductions.

To better understand their management responses, using entitlement and usage data provided by the government, we classified licence holders into three groups (see Table II) according to how the WSP would impact on them: i) *Affected* - those that needed to reduce their water use, ii) *Stable* - those that did not need to reduce their water use, and iii) *Inactive*- those who had never used the water that their licence has entitled them to use. The *Affected* irrigators had larger water entitlements and used more of their entitlement over a larger irrigated area. The *Affected* group needed to reduce their water use because their zone was requiring large cuts to achieve sustainability and/or because they have been using a high percentage of their entitlement. They had a similar farmed area to the *Stable* irrigators, but have 36% more entitlement and 37% more irrigated area. They had nearly 4 times the annual water use of the *Stable* irrigators, which is one of the reasons that they are in the *Affected* group. The *Stable* irrigators expected to use similar quantities of water as they had in the past, either because they hadn't used a large proportion of their entitlement or because their zone was not suffering significant reductions. The *Inactive* license holders were licensed to use water but had never done so. Their smaller entitlements (34% of the size of the *Affected* and 53% of the *Stable* irrigators) may not have been large enough to justify investment in irrigation infrastructure or to pay the maintenance expenses on bores and pumps (see Table III).

An open-ended question was used to seek information on planned management responses to the WSP. The individual responses were self-identified by the licence holders to avoid a leading bias. They were then classified into meaningful categories (see Table IV).

Table II. Licence Holder Groups

Group	Criteria for group membership
<i>Affected</i>	Average groundwater use > Entitlement after implementation of WSP reductions
<i>Stable</i>	Average groundwater use <= Entitlement after implementation of WSP reductions
<i>Inactive</i>	Average groundwater use = 0

Table III. Description of Licence Holders

Group	Entitlement (10 ³ × m ³)	Annual Usage (10 ³ × m ³)	Farmed area (ha)	Irrigated area (ha)
<i>Affected</i>	907	551	760	234
<i>Stable</i>	591	146	762	170
<i>Inactive</i>	311	n.a.	443	n.a.
All	713	316	724	199

Note: Water usage only refers to groundwater, figures in table are mean figures for group

Table IV. Planned Actions of Licence Holders

Action	<i>Affected</i> (n = 44)	<i>Stable</i> (n = 53)	<i>Inactive</i> (n = 19)
Buy extra water	41%	13%	21%
Sell or lease out water	-	9%	10%
Sell or lease out land	-	-	10%
Reduce irrigated area or water use	23%	-	-
Change crop types to use less water	18%	-	-
Change irrigation technology	30%	19%	-
Water use efficiency improvements	36%	-	-
Infrastructure improvements	-	24%	-
Diversify away from irrigation	-	9%	-
No action	9%	26%	32%
Don't know	2%	24%	47%

Note: As more than one response is possible total percent can be more than 100

Most (41%) of the *Affected* irrigators wanted to buy more water to avoid owning stranded assets and were therefore not considering selling or leasing water. They needed to purchase their water either from *Stable* irrigators or from *Inactive* licence holders. But only 10% of *Inactive* licence holders and 9% of *Stable* irrigators considered selling or leasing their water. Some *Inactive* licence holders talked of using the water in the future, although if they hadn't already developed their irrigation licence it was not very likely that they ever would. It was more likely that they viewed it as an asset; but not as an asset to be traded separately to the farm. *Affected* irrigators were planning to become more efficient water users and were considering a range of possibilities, including changing what they grow, changing their technologies and changing the way they irrigate.

Many of them have already made substantial investments to achieve water savings, but further efficiency gains are likely to deliver less return on investment. The *Stable* irrigators, because they had not approached the limits of their licence, have not in the past needed to invest in water saving technologies; they are therefore likely to have some of the cheaper and more cost-effective options open to them, which the *Affected* irrigators have already carried out.

Stable irrigators might carry out these improvements as *Affected* irrigators start to offer to pay higher prices for water entitlements. It appears that irrigators view a hierarchy of water use efficiency improvements according to the return on investment, the total amount required and how close the fit is with the existing way of doing things.

Some of these actions are not rational in an economic sense but they might be able to be seen as rational in terms of the farmers' values, attitudes and objectives. Based on the personal interviews, the answers to the open ended questions in the survey and the literature, we propose the existence of a typology for farmers (see Table I) that might better explain and predict farmers' behaviour.

This typology involves ideal types in the sense that, although an ideal *Investor* and an ideal *Custodian* are described they are never expected to exist in reality; but farmers are likely to be located on a continuum between the two extremes. The opposing statements for each of the classification variables of this typology are the extremes of each type. The variables were developed by a synthesis of the qualitative responses to the open ended questions of the mail-out survey and the literature. The personal interviews validated the choice of variables with many interviewees mentioning them during the course of the interviews. Some of the statements, which illustrate the different approaches between *Custodians* and *Investors*, are quoted below. Differences between *Custodians* and *Investors* became quite clear when farmers discussed their attitudes towards land and water.

Caring for the land is important to the *Custodian*; one said, "*we can keep going ... and really improve the soil over the next ten years ... Another ten years and this place is going to be in really good shape. An Investor* described a contrasting approach to the land stating, "*we're using the land as one of our tools to make a dollar; no-one will deny that*". *Custodians* expect to continue farming, and ideally on the same property; one said, "*I was born here, and my father had this place so the family has been around since the late 1800's*". Another *Custodian* made his attachment to the land quite clear, stating, "*our attachment to this country is far greater than they [the government] could ever imagine ... so [we're] not about to give it up easily ... the perception is that we're a bunch of ... wealthy, large ... cotton farmers ... but most of us are just ordinary people, just trying to ... educate our kids and keep our heads above water*". An *Investor* displayed a more pragmatic approach to land, "*You've just got to get more and more land. You know irrigation is very important to us, it's king, it's king of the castle as far as we're concerned*". The *Investor* who stated "we've always been on the lookout for opportunities elsewhere", seemingly, could easily leave the farm behind.

For the *Custodian* water is more than a resource to be bought and sold. Talking about the possibility of selling water one said, "*it wouldn't enter our head. We said to the bureaucrats and the politicians ... We don't want the money. We want the water ... We're here for the long haul. I'm second generation ... our son is third. And he's put his name on a bit of land*". Some *Custodians* see the water as back up, or protection, to be used as a buffer in drier

years. "*As we lose our allocation ... if the drought hits and we've still got substantial debt or interest rates change, it's going to have a severe impact on us*". Some *Custodians* also see their water as a responsibility, "*The government has allocated you ... so many megalitres, it's your duty to make as much production as possible from each of those megalitres, I think it's your public duty, and I don't think people would argue too much about that*". Another *Custodian* shows a sense of stewardship, "*If you're being selfish you just think, I'll use it to the end of time, it does n't worry us, but it does ... the aquifer is in trouble*". But the *Investor* sees water differently; one stated, "*I said to my wife ... that's our super ... In another 15 or 20 years when I want to retire to the Gold Coast ... that water licence alone is going to be worth a hell of a lot*".

CONCLUSIONS

This research finds that some licence holders have suggested that they will be making decisions that are not profit maximising. In the instance of *Inactive* licence holders it had been expected by policy makers that they would sell their water entitlements to those that need them such as the *Affected* group. They have, however, indicated that they do not intend to do this. Selling the water may achieve an economic objective, but it appears to be in conflict with their culture and tradition (Bjornlund, 2004). These findings suggest that any decision by policy makers not to base entitlement reductions on history of use might have had serious consequences for the community. If the *Inactive* licence holders and the *Stable* irrigators did not sell to the *Affected* irrigators, as expected by the policy makers (Marsden Jacob Associates, 1999; NGMC, 2001), then significant reductions in agricultural production within the region would have been the result. However, the findings that farmers are not solely influenced by economic motivations could indicate to policy makers intending to implement similar cuts that the best approach might be to first cancel unused licences and reduce partly used licenses, so that existing active irrigators can continue to produce and generate economic activity and jobs in their communities. If the policy makers are reluctant to do this for reasons of equity then it might be more appropriate to address this through compensation or structural adjustment. The advantage of this approach would be that the adjustment within the community would take place in a more stable manner and thereby the impact within the community would be minimized.

This research has constructed a typology that provides an explanatory framework for understanding the influence of attitudes and objectives – other than solely economic – on farmers' decision making. The next stages of the research will focus on developing the constructed typology and then testing its usefulness for predicting behaviour and thereby providing early indications of the economic impact when undertaking similar reforms. An increased understanding of farmer s' objectives and the motivations for their behaviours is likely to lead to better policy design and more successful policy implementation.

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APPENDIX A: Qualitative Survey Questions

1. Depending on your business position, and the severity and the timing of the cuts (if any) to your entitlements, the implementation of the WSP could be an opportunity that you can take advantage of, or a threat that you need to counter. For example you might be considering buying or selling land or water. What are the most important actions that you are planning to take in response to the WSP changes?
2. What sources of information have been the most useful for you when you were thinking about the above actions?
3. When you were considering the above actions, what would have made your decision easier to make?
4. If you were in charge of implementing the WSP, what would you have done differently?
5. Thinking of the country as a whole, if you were given the responsibility of returning Australia's water use to a sustainable level what actions would you take?
6. Most people say that when farmers make large one-off decisions (like the sale or purchase of a farm) they are mostly influenced by the financial implications of their decisions. What other important factors do you think might have an influence on farmers' decision making in these instances?
7. Are you able to summarise what the WSP means to you? (This can also be how it affects your farm, your family, or your community).