Water Policy in New Zealand and Australia: We're not playing for tiddlywinks

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Abstract
The allocation of water resources between competing demands from agriculture, industry, energy, the environment and urban uses is an increasingly contentious issue in New Zealand. As a result there is a growing interest in the design of policies for better allocating water and policies for promoting the efficient use of water.

For many decades governments in Australia have sought to develop and implement policies to promote the optimal allocation and efficient use of water. A wide variety of policies including regulatory, voluntary and market based approaches have been tried and significant modifications and improvement have been made to these policies over time.

The experience in Australia has been that the transfer of water between agricultural uses occurs much more slowly than was originally expected. One reason for this is the importance of the reliability of water supply as a key contextual determinant of the feasibility and viability of different agricultural uses of water. While water supplies in NZ may be more reliable than in Australia, reliability can and does change as a result of changes in the rules governing the allocation of water.

The experience in Australia with regards to promoting efficient use of water in agriculture is that farmers consider a wide range of needs and contextual factors when making decisions about adopting practices to improve water use efficiency (Armstrong 2004; Kaine & Bewsell 2002a; Burrows *et al.* 2002). Such decisions involve balancing a complex combination of human, production, environmental, economic and financial components of the farm business (Makeham & Malcolm 1993).

Experience in Australia also shows that when they do act, farmers modify the practices or technology to ensure they meet the key needs of their farm business (Armstrong 2002; Kaine & Bewsell 2000a, 2000b, 2001, 2002b). Hence, when regulatory or forced change occurs farmers respond in a wide range of ways – many of which are unpredictable to the policy maker and at least some of which are not consistent with the intention of the regulation. These are deliberate and sensible reactions on the part of farmers given their farm contexts.

Consequently, government in NZ needs a sophisticated understanding of farming systems and farm contexts if they are to experience fewer surprises and more successes with their initiatives in water policy.
Keywords: farm systems, irrigation, water policy

Introduction

The allocation of water resources between competing demands from agriculture, industry, energy, the environment and urban uses is an increasingly contentious issue in NZ. To borrow from the current captain of the All Blacks – "we're not playing for tiddlywinks here!" As a result there is an increasing interest in NZ on the design of policies for better allocating water and policies for promoting the efficient use of water (DPM&C 2003). There have been suggestions, for example, that the introduction of market mechanisms would encourage the allocation of water towards its highest value use and promote the adoption of water saving technologies (Robb *et al.* 2001).

For many decades governments in Australia have sought to develop and implement policies to promote the optimal allocation and efficient use of water. A wide variety of policies including regulatory, voluntary and market based approaches have been tried and significant modifications and improvement have been made to these policies over time.

In this paper we draw on the Australian experience using the State of Victoria as a case study, to highlight some key points that need to be considered by the government and community in forming their expectations about how effective water policy can be.

We open our paper by describing some of the key differences between irrigation systems in Victoria and NZ. We then describe the Victorian experience with regard to transfers in water between agricultural uses. We then move on to describe our experiences in using policy initiatives to increase the efficiency of water use. Lastly, we draw some lessons from our experiences for government and communities in NZ.

Irrigation systems in Australia and New Zealand

There are some key differences between Australia and NZ that should be borne in mind when considering the lessons that might be learnt from the Victorian experience.

First, the majority of irrigation using surface water in Victoria occurs in regulated irrigation schemes involving

the collection of water in large scale storages constructed with public money. The storages are located in the headwaters of catchments but the land irrigated from these dams may be many kilometres downstream and it may take days or weeks for water to travel from the storage to the most distant irrigators. As a consequence irrigators supplied by these regulated systems often have to order water some days in advance of when they plan to start irrigating.

Originally surface water entitlements in Victoria were issued for a nominal fee and were unrestricted in terms of the use to which water could be put, provided landholders could demonstrate 'beneficial use' of the water. Entitlements were initially defined as a fixed volume of water per acre but policy changes have led to these entitlements being converted to a fixed volume of water. In addition, permanent allocations have been made to the environment to ensure annual flows in the river systems meet the ecological requirements.

This contrasts with the situation in NZ. Here irrigated agriculture using surface water has developed largely in the form of private diversions from river systems. Entitlements to water were based on a first come, first served basis with no fixed limit on new entitlements provided no pre-existing user was disadvantaged. Eventually, limits on the volume of water that can be extracted from rivers have been instituted to protect other water users and the environment.

Entitlements to groundwater in Victoria were originally based on a first come, first served basis with no fixed limit on new entitlements. Consequently, over time groundwater resources in Victoria were at risk of becoming severely depleted, especially where surface water irrigators turned to groundwater to augment unreliable surface water supplies. Groundwater management plans have now been developed and implemented to manage this risk. New entitlements to groundwater in NZ are limited by the provision that no pre-existing user be disadvantaged.

The Australian climate is characterised by extremes. This translates into highly variable and unpredictable surface water run-off in most catchments south of the tropics. The consequence in Victoria can be substantial year-to-year variations in the volume of water held in headwater storages. To accommodate this variation, water authorities supply a varying proportion of the irrigators' water entitlement. The proportion varies each year depending on the volume of water held in the storage. This proportion is termed an 'annual allocation' and may vary from zero to 100% or more of entitlement.

The dryness and unpredictability of the Australian climate has meant that, in contrast to NZ, dairying mostly occurs on irrigated farms. In the fifties and sixties the size of Australian dairy farms was constrained by milking shed technology. With the advent of herringbone and rotary milking systems in the seventies the size of farms was limited by the area that a farmer could irrigate. This changed with the advent of laser grading. Now, again, farm size is mostly constrained by the technical and economic constraints of milking shed technology. Hence, the growing interest in once-a-day milking and automatic milking systems and the intensive use of feed supplements to boost milk production per cow.

Encouraging change in water use

The past thirty years have seen some revolutionary changes in water policy in Victoria. Initially, the ownership of irrigation entitlements was separated from the ownership of land. This was followed by the introduction of transferable water permits and the emergence of markets in irrigation water.

Economists prophesied that one of the key benefits of permitting transferability and fostering a market in irrigation entitlements would be that water would move from 'low' value uses to 'high' value uses (Pigram 1991). The economists were, to be fair, not too precise about how quickly such movements would occur. In the Victorian context they certainly contributed to creating expectations that water would be transferred away from uses such as border check irrigated dairy and mixed sheep and crop farming and into uses such as horticultural, vegetable and grape production. These expectations have not been fulfilled for a number of very sensible reasons.

First, despite deregulation and competition from NZ and elsewhere dairying has remained a profitable industry. In the absence of a dramatic switch in the preferences of dairy farmers to grow fruit trees, they have not been particularly keen to sell their water allocations and move out of dairying. Despite the fact that the price of irrigation water on the transfer market may at times be greater than the marginal revenue to be had from milking, dairy farmers have been reluctant to permanently dispose of entitlement.

Second, although mixed sheep and crop farming is not as profitable as dairying, mixed farmers have had the flexibility to be opportunistic in their trading and have tended to trade their water on a temporary basis when allocations are high, their product prices are low or water prices are high (Doyle & Johnson 2004). They appear reluctant to completely dispose of their water entitlement through a permanent trade.

Third, high value industries such as vegetables, horticulture and viticulture require substantially smaller volumes of water per hectare than industries such as dairying and mixed farming. This effect is exacerbated by the fact that, for a variety of reasons, new greenfield horticultural and viticultural developments employ low volume micro-irrigation techniques (Kaine & Bewsell

2002c).Also, there are limits to the market opportunities for these high value industries and hence limits to the extent to which they can expand. Consequently, their capacity to attract water from other agricultural uses is limited.

Fourth, industries differ in their sensitivity to annual variations in water supply. Some industries such as vegetables and fruit production require a highly secure supply of irrigation water (Kaine & Bewsell 2000; Bewsell & Kaine 2002). Other industries such as dairying can remain viable in the presence of more variable water supplies. Dairy farmers have sufficient flexibility in their production systems to accommodate variations in the supply of water. For example, by purchasing in feed, drying off some of their herd or drying off their entire herd and leasing their entitlement to others (Armstrong 2004).

An important implication of the foregoing is that, in the absence of a dramatic and severe decline in the profitability of dairying, the major factor governing the rate at which permanent transfers in water occurs between industries is the rate at which farmers exit the dairy industry.

Promoting efficient water use

Promoting efficient use of water has been a high priority for governments in Victoria and Australia for some decades. Governments have invested in identifying, developing and promoting new farming technologies and practices that maximise the efficient use of water in industries such as dairying, horticulture, viticulture. Significant improvements in efficiency have already occurred (Brown & Rendell 2000; Keeble & Johnson 2002) and farmers' knowledge of the options available to them is extensive. Given the 'easy' efficiency gains have already been captured, a broad range of policy approaches are being used to drive further efficiency improvements. Unfortunately, without a good understanding of the complexities inherent in farming, governments can be quite disappointed in farmers' lack of interest in, or misuse of, the 'best management practices' that have been designed for them. The following examples are instructive.

A key feature on dairy farms in recent years has been the incorporation of reuse dams into the design of border check irrigation systems. Reuse dams are intended to act as a safety net in the event a bay is over-watered. Excess water is trapped and drained into the dam where it is stored for later use. The reuse dam is intended to prevent the uncontrolled release of water off-farm and consequently, reuse dams should be empty when irrigation commences. In some irrigated districts, subsidies were offered for the construction of reuse dams to encourage their installation.

However, where irrigation supply is unreliable, dairy farmers rapidly realised that reuse dams could be used to exert greater control over the timing of irrigations. By having water stored in their reuse dams between irrigations farmers could time their irrigations more precisely. Clearly, this means commencing irrigations with the reuse dam full of water rather than empty. Hence, farmers deliberately manage reuse dams in precisely the opposite way to the way they were intended to be managed (Armstrong 2002; Kaine & Bewsell 2000b, 2001, 2002b).

Another example highlights the integration of the farms needs with external regulatory requirements that, in this case, limit the volume of water applied in irrigations. In northern Victoria, irrigators are restricted in their application of water per hectare of land developed for irrigation in order limit accessions to groundwater. In areas with light soils, pastures require more water per hectare over an irrigation season than is allowed under the restriction. In response to the restriction farmers have expanded their developed area in order to increase the total volume of water they can access. They then sow the proportion of their developed area that can be irrigated at the higher rate. .

Recently, government has begun subsidising the installation of automatic irrigation systems to save water. The idea is that the use of automatic irrigation systems reduces the risk that farmers will mistakenly or inadvertently over-water. The difficulty with this policy initiative is that farmers install automatic irrigation to save time not to save water. The farmers that are applying for and receiving these subsidies are those that, for example, are forced to irrigate at night or because of their property layout are forced to irrigate for an extensive period. Consequently, farmers are installing automatic systems in those paddocks that are the most difficult to irrigate in terms of time allocation and labour use (Kaine & Bewsell 2000, 2001, 2002b). Without additional conditions being attached to the subsidies for automatic irrigation it would be a matter of chance as to whether these paddocks also happen to be those with soils that are most sensitive to over-watering.

A wide range of options exist for improving water use efficiency on dairy farms from technological innovations such as irrigation infrastructure and management options such as irrigation scheduling through to production changes such as pasture improvements. Analysis of these options by Armstrong (2004) indicated that farmers were more likely to adopt options that simultaneously increased profitability, labour efficiency and water use efficiency than options that focussed solely on water use efficiency.

Discussion

We believe there are two crucial lessons that can be

learnt from the Australian experience. The first, and perhaps most important, is that the transfer of water between agricultural uses seems to be occurring more slowly than we originally anticipated. A mistake we made lay in overlooking the importance of the reliability of water supply as a determinant of the feasibility of an irrigation enterprise. The predictions of economists largely ignored the role importance of the variability in the supply of water and the costs associated with managing that variability at the level of an agricultural enterprise. As a rough rule-of-thumb, higher value uses of water also require more secure supplies of water. Contrast dairying with fruit and vegetable production for example. Hence, the more variable and unpredictable the supply of water is, the greater the likelihood that high value uses will be uneconomic. In other words, the costs of insuring against supply risk by purchasing sufficient entitlements to guarantee supply becomes too high.

In the Australian context variations in climatic conditions are a key factor driving variations in the supply of irrigation water. However, annual variations in the supply of irrigation water are a product of both the climate and the entitlement and allocation rules. Consequently, a key issue for government and the community in NZ in contemplating changes to the rules governing water allocation is to consider the way in which a change in rules will alter the long term reliability of supply, given the climate and hydrology of a catchment.

Relatedly, the permanent transfer of water between dairying and other agricultural industries in Australia will depend heavily on the rate at which farmers retire and exit the dairy industry. The dairy industry clearly has the managerial flexibility to cope with severe shortfalls in the supply of water (Armstrong 2004). In the absence of a dramatic and severe decline in the profitability of dairying due to declines in product prices, increases in energy or supplementary feed costs, there seems to be little incentive for dairy farmers to sell their water entitlements. On the evidence to date, the price of water would need to increase dramatically to become sufficiently attractive to prompt the exit of farmers from dairying.

The second lesson we can draw from the Australian experience is that farmers are adept at maximising use variety. The marketing literature has long recognised that consumers experiment with products and develop ways of using products that were never intended by the designers and manufacturers of the product (Shi & Venkatesh 2004). Researchers in this area seek to identify and understand the conditions that encourage consumers to develop a variety of uses for a product. They have found that variety in the use of a product is greatest when (Shi & Venkatesh 2004):

- The product is important to consumers
- consumers have considerable experience in the use of a product
- consumers use other complementary products
- there is intense communication between consumers about the product

If we treat best practice and regulations as 'products', then the examples we reported earlier of farmers' responses to these 'products' can be interpreted as successful efforts to generate a variety of uses for these products.

Our point is that farmers creatively respond to efforts to influence their behaviour in just the same ways that we do as consumers and members of the community. Water management is a critical component of farm management on irrigated dairy farms in Australia. Consequently, any technologies, practices and regulations that influence irrigation management are by definition important to farmers. They have considerable expertise in irrigation management and the use of complementary technologies and practices. Dairy farmers are also likely to communicate frequently with each other on irrigation management if they feel the need to respond to government initiatives! All in all, the conditions seem ripe for the creative development of unintended uses for best practices and unanticipated responses to regulation and the like.

Our view then is that the response of farmers to government initiatives such as best practice recommendations are, on the whole, considered and deliberate whether their response is to use, misuse or completely ignore the recommendations. Proposals for changing farm practices are usually conceived in relation to a particular policy outcome such as reduced use of water or greater efficiency of water use. There is a tendency to assume that farmers are just as interested in pursuing this outcome as we are. Yet farmers must consider the implications of a change in practice for their farming system as a whole. This means they must consider the feasibility of the practice in the context of their technology mix, their resource base, their skills and their families' needs. Often, pursuing objectives like saving water or increasing the efficiency of water use are not even sensible given this broader perspective.

The implications we draw from this are first, that a sound knowledge of the farming systems that we are seeking to influence through policy initiatives is required if we are to minimise surprises and disappointments. Second, because we cannot eliminate surprise, we must be prepared to take an adaptive approach to water policy.

Conclusion

The experience in Australia with water policy has been that the transfer of water between agricultural uses occurs

more slowly than we originally expected. One reason for this is that we overlooked the importance of the reliability of water supply as a determinant of the feasibility and viability of different agricultural uses of water. While water supplies in NZ may be more reliable than in Australia, at least for the present, reliability can change as a result of changes in the rules governing the allocation of water.

The experience in Australia with regards to promoting efficient use of water in agriculture is that farmers are adept at discovering ways of using best management practices in ways that we do not anticipate. They are also extremely creative in finding methods of responding to regulatory change in ways that are not always consistent with the intention of the regulation. These are deliberate and sensible reactions given their context. Consequently, government in NZ needs to develop a sound and sophisticated understanding of farming systems if they are to experience fewer surprises, fewer disappointments and more successes with their initiatives in water policy.

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