Journal of Hydrology 550 (2017) 253–267

Contents lists available at ScienceDirect

Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

Research papers

Economic, social and resource management factors influencing groundwater trade: Evidence from Victoria, Australia

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ARTICLE INFO

Article history:
Received 16 September 2016
Received in revised form 29 March 2017
Accepted 28 April 2017
Available online 4 May 2017
This manuscript was handled by Geoff Syme, Editor-in-Chief, with the assistance of Heather M. Smith , Associate Editor

Keywords:
Groundwater trade
Groundwater management
Groundwater economics
Groundwater sociology
Victoria (Australia)

ABSTRACT

In Victoria, Australia, most groundwater resources are now fully allocated and opportunities for new groundwater development can only occur through trading of license entitlements. Groundwater usage has rarely exceeded 50% of the available licensed volume, even in the 2008/9 drought year, and 50 to 70% of individual license holders use less than 5% of their allocation each year. However, little groundwater trading is occurring at present.

Interviews were conducted with groundwater license holders and water brokers to investigate why the Victorian groundwater trade market is underdeveloped. Responses show there is a complex mix of social, economic, institutional and technical reasons. Barriers to trade are influenced by the circumstances of each groundwater user, administrative process and resource management rules. Water brokers deal with few trades at low margins and noted unrealistic selling prices and administrative difficulties. Irrigators who have successfully traded identify that there are few participants in trading, technical appraisals are expensive and administrative requirements and fees are burdensome, especially when compared to surface water trading.

Opportunities to facilitate trade include groundwater management plan refinement and improved information provision. Simplifying transaction processes and costs, demonstrating good resource stewardship and preventing third party impacts from trade could address some concerns raised by market participants. There are, however, numerous individual circumstances that inhibit groundwater trading, so it is unlikely that policy and process changes alone could increase usage rates without greater demand for groundwater or more favourable farming economic circumstances.

1. Introduction

Groundwater resources globally are under increasing pressure due to factors such as historical unfettered development and increasing pressure for agricultural production and urban water demands (Qureshi et al.,2012; Gao et al., 2013; Palazzo and Brozovic 2014). Once surface and groundwater systems become fully exploited, variability in seasonal rainfall and climate trends can restrict supply, cause supply reliability problems, increase competition among users and cause decline in groundwater levels. In most cases, this often comes at the expense of water-dependent ecological assets (Connor and Kaczan, 2013). Further economic development is fundamentally constrained once the natural water resource limits have been reached, unless transfer of water holdings from low value use to higher value occurs.

As with many other comparable economies and countries, agriculture is the main user of groundwater in the state of Victoria, Australia. This resource is regulated through provisions in the Victorian Water Act (1989) that require implementation of resource management plans in defined aquifer supply areas. These cap total entitlement within sustainable extraction limits, and seasonal restrictions can also be applied if groundwater levels fall below agreed trigger levels. Of the available groundwater resource of just over 1000 GL/yr, agriculture users hold entitlements of nearly 800 GL/yr. (Cheng and Gill, 2015). However, the majority

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http://dx.doi.org/10.1016/j.jhydrol.2017.04.055
0022-1694/

of this water holding is not used each year, with few aquifer systems reaching over 50% use of entitlement, even in the driest years (2006–9) of the recent millennium drought (1997–2009).

Agriculture could increase production and improve its climatic resilience through better utilisation of the issued but unutilised groundwater entitlements, and new enterprises seeking groundwater licenses could be established through groundwater trade. One might expect that most groundwater license holders would seek to sell any water that they cannot use in order to maximise the return on their asset and offset the annual fees and charges leveed by RWAs[1], yet the number of groundwater trades is small, especially in comparison to surface water trading (DELWP, 2015).

Groundwater trade could also be considered as a market-based instrument which farmers can use as a mechanism to improve their self-reliance and preparedness for drought management, or assist in orderly structural adjustment (Bjornlund, 2002; Kiem, 2013). Given the caps on groundwater availability in many areas, governments keen to support regional development and impart better drought resilience also have an interest in understanding whether demand for water can be met through better utilisation of the water that has already been licensed.

This paper investigates why the groundwater trading market is underdeveloped (compared to surface water markets) and identifies opportunities to facilitate trade. It commences with a description of the development of water markets and groundwater management in Victoria, then the results of interviews designed to capture the experiences and views of license holders and brokers with respect to groundwater trading in Victoria are presented. These reveal opportunities and challenges that governments and agencies face in seeking to establish an effective groundwater trading system that will make better use of already issued and capped groundwater entitlements.

2. Background

2.1. The development of water markets

Globally, surface water trade has become well established and operates in a number of surface water systems (Gao et al., 2013; Skurray et al., 2013; Howitt, 1994). The general requirements for a competitive and efficient water market (Dinar et al., 1997; Saliba, 1987, Juchems et al. 2013) are:

1) many sellers and buyers with full knowledge of the market institutions and facing similar transaction costs;
2) participation decisions are made independent from other buyers and sellers;
3) outcomes are not affected by the decisions of other participants;
4) participants are assumed to be maximizing profits; and
5) completely specified, enforceable, and transferable property rights.

Market systems that have met these requirements will move resources from low value uses to high value uses, resulting in an economically efficient allocation of resources for both individuals and society, so long as the gains in value are large enough to offset the costs of completing the transaction. A well-designed water market requires the measurement and monitoring of water extractions and enforcement of management rules, and should consider any externalities or third party effects (Rubio and Casino, 2001; Skurray and Pannell, 2012).

[1] RWAs – Rural Water Authorities, the bodies responsible for managing Victoria's groundwater resources.

In Australia, moves toward the development of water markets began in the 1980's in response to two main factors: drought and over-allocation (Connor and Kaczan, 2013; Skurray et al., 2012). A major change occurred in 1994 when water rights based on land ownership were changed to a system based upon entitlements to a defined volume of water from a consumptive pool. This allowed water to be separated from land ownership, allowing it be traded (Connor and Kaczan, 2013; Gao et al., 2013). These developments initially applied to surface water resources, but following an investigation of groundwater management arrangements (COAG, 1994; ARMCANZ, 1996) it was concluded that 'groundwater trading could expand as it offered potential to solve difficult management issues as demand for water use increased' (Skurray et al., 2012). Since the late 1990s, most Victorian groundwater supply aquifers had limits placed on total annual extraction volume in response to declining levels and to establish the foundations for more sustainable resource use (Gill et al., 2014). With many systems fully allocated, the basis for 'cap and trade' markets was established for most of Victoria's main irrigation supply aquifers.

A key development which facilitated increased surface and groundwater trading was the 2004 National Water Initiative (NWI) which established an integrated framework of entitlement and allocation specifications, water planning and water trading (GHD et al., 2011) which Victoria's groundwater trading arrangements largely follow. This provided a clear definition of the tradeable product (water entitlements and allocations) to promote confidence in the market, as well as 15 principles to establish markets, define boundaries, assess participation and implement appropriate management. It also noted that governments need to facilitate efficient market operation where physically possible by minimising transaction costs, providing good market information, allowing a mix of products to develop, recognising the needs of the environment and protecting against third-party impacts. However, the only references to the social aspects of water trading discussed in GHD (2011) were the benefits or impacts of water trade under the ubiquitous 'triple bottom line: economic, social and environmental', providing a reason for this study to start looking at how well participants were progressing with the newly established markets.

A detailed literature review of the social aspects of groundwater governance (Mitchell et al., 2012) found that much of the research was directed at surface water markets, and landholder decisions regarding groundwater did not always mirror surface water decisions, so they concluded that it was uncertain whether groundwater trade was driven by the same factors as surface water markets. Access to both surface water and groundwater (conjunctive use) may also influence participation in both markets (Mitchell et al., 2011). The lack of literature describing the practical operation of an established groundwater trading market, such as now operates in Victoria, was another of the reasons behind this study.

2.2. Victoria's groundwater resources

Development of groundwater for irrigation purposes grew steadily from the 1960s, with sharp increases in bore numbers in response to droughts, for salinity management purposes and agricultural expansion. Especially during the 1997–2009 'Millennium' drought (Schwabe et al., 2013; Kendall, 2013) groundwater usage peaked in Victoria. Groundwater management areas (GMA) were first mapped in the late 1990 s based upon high levels of development and potential growth. A permissible annual volume was determined for each GMA based upon the long term sustainable yield of the aquifer system. In a GMA where the total volume allocated approached the sustainable yield, a Water Supply Protection Area (WSPA) was declared, which triggered development of a