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Irrigator responses to groundwater resource management in northern Victoria, southeastern Australia

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SUMMARY

In northern Victoria, farmers are the biggest users of groundwater and therefore the main stakeholders in plans that seek to sustainably manage the resource. Interviews with 30 irrigation farmers in two study areas, analysed using qualitative social research methods, showed that the overwhelming majority of groundwater users agreed with the need for groundwater management and thought that the current plans had achieved sustainable resource use. The farmers also expressed a strong need for clear technical explanations for management decisions, in particular easily understood water level data. The social licence to implement the management plans arose through effective consultation with the community during plan development. Several additional factors combined to gain acceptance for the plans: good data on groundwater usage and aquifer levels is available; irrigation farmers had been exposed to usage restrictions since the late 1990s; an 'adaptive' management approach is in use which allowed refinements to be readily incorporated and fortuitously, plan development coincided with the 1998–2009 drought, when declines in groundwater levels reinforced the usefulness of the plans. The imposition of a nation-wide water use reduction plan in 2012 had relatively little impact in Victoria because of the early implementation of effective groundwater management plans. However, economic difficulties that reduce groundwater users' capacity to pay groundwater management charges mean that the future of the plans in Victoria is not assured. Nevertheless, the high level of trust that exists between Victorian irrigation farmers and the management agencies suggests that the continued use of a consultative approach will continue to produce workable outcomes. Lessons from the Victorian experience may be difficult to apply in other areas of groundwater use in Australia and overseas, where there may be a quite different history of development and culture of groundwater management.

1. Introduction

Groundwater resources play a valuable role in agricultural production; the main user of groundwater in most parts of the world is agriculture. In the Australian state of Victoria, irrigated agriculture is responsible for over 70% of the state's groundwater extraction. During the recent period of reduced rainfall and drought from 1998 to 2009, the value of groundwater to many farm enterprises in Victoria was made abundantly clear when surface water supplies dwindled. However, groundwater extraction caused numerous aquifers to suffer significant declines in standing water level, with winter–spring recovery levels falling over 10 m in some areas (G-MW, 2012a). Although the aquifers were not as stressed as those elsewhere in Australia, e.g. Lockyer and Condamine catchments in Queensland (Baldwin and Ross, 2012; Baldwin et al., 2012) and some other countries (Foster and Chilton, 2003; Hoque et al., 2007; Konikow, 2013; Sophocleous, 2010) the declines were nevertheless large enough to precipitate action, leading to the introduction of new regulations to manage demand and respond to community concerns.

In this study, two agricultural areas in Victoria with significant groundwater use (Loddon Highlands and Campaspe Plains; Fig. 1) were investigated using social research methods to learn from the main stakeholders, the irrigation farmers, what they know and understand about the aquifers they depend upon, their thoughts on the groundwater management plans they are involved with and their information needs for more effective participation in the management process. A major goal was to assist groundwater

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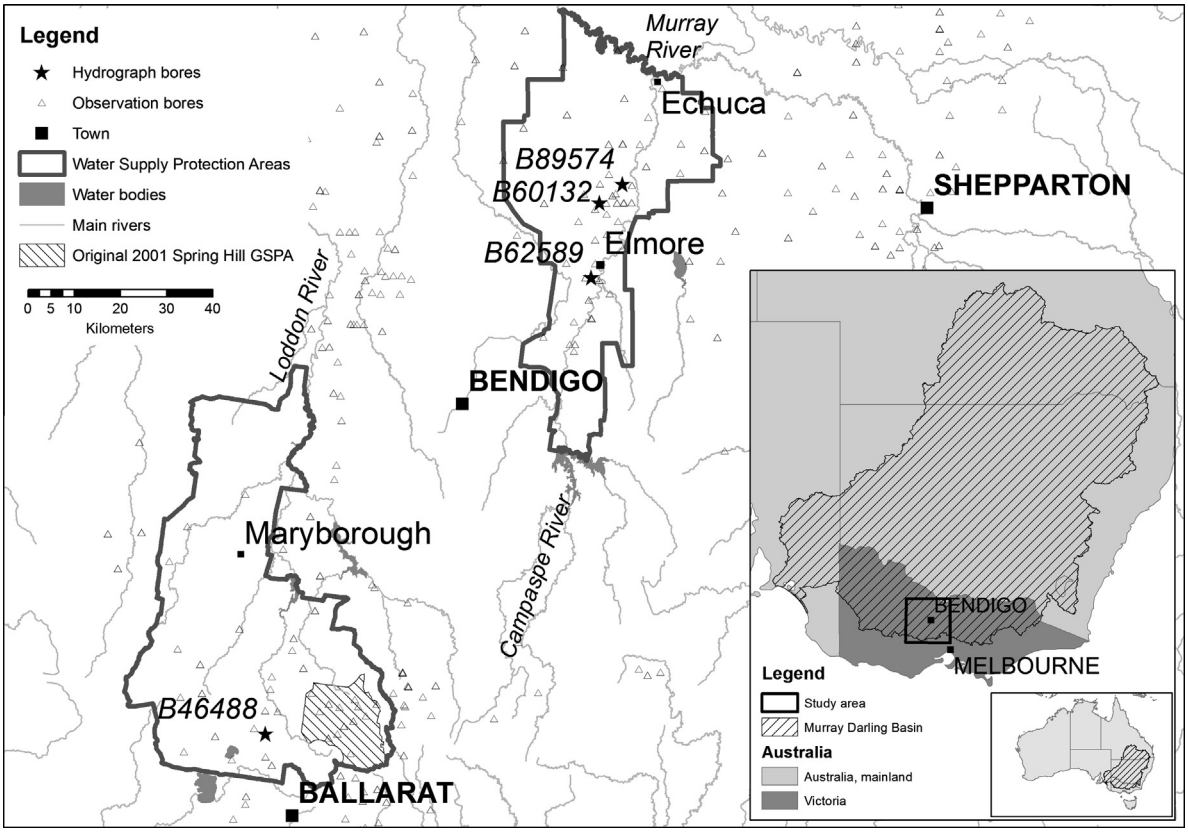

Fig. 1. Location of the Loddon Highlands Water Supply Protection Area (containing the earlier Spring Hill Groundwater Supply Protection Area) - lower left; Centre: The Lower Campaspe Valley Water Supply Protection Area. Inset Map: Location of the study area in Victoria and the Murray-Darling Basin in Australia. Small triangles are observation bores and the numbered stars are the location of the bore hydrographs in Figs. 2 and 3.

resource managers to better understand the mindset and knowledge needs of the irrigation farmers, to enable more effective communication and help improve the strategic fit of sustainable groundwater use plans. The study was also able to highlight benefits from the early implementation of these management plans and flag potential areas of concern that may impact on groundwater users' capacity to financially support the management plans in the future.

2. Groundwater resource concepts

There are fundamental differences between surface water and groundwater; these affect the role that groundwater users play in water management and they informed the development of the interview questions in this study. Surface water irrigation supply systems require costly collection and distribution schemes, generally entirely paid for by governments, to supply even small numbers of users, and it may be difficult to ensure sufficient water availability because of the vagaries of rainfall and losses due to evaporation (Schlager, 2006). In contrast, groundwater irrigation offers ready access for individual users, more reliable year-round supplies and less vulnerability to droughts because it is not subject to evaporation (Garrido et al., 2006). Furthermore, groundwater development is often not subsidised, so that financing, operation and maintenance are paid for by the groundwater users, who may be highly independent and protected by virtue of owning the infrastructure on private land (Turrel and Fullager, 2007). However, limited scientific understanding of cause and effect relationships between the availability and use of groundwater mean that users may not readily see the impacts of their pumping and may be reluctant to reduce usage when called upon to do so, especially if large volumes of water remain in storage. As a result, groundwater can be difficult to govern, particularly if the flow systems are ill-defined, and mapping and modelling to overcome data gaps are expensive.

The intent of any groundwater management plan should be to ensure that the development and use of groundwater occurs at a rate that is renewable, so the natural system retains its integrity for the future, and groundwater resource development must adapt to the aquifer's capacity for replenishment (Kretsinger-Grabert and Narasimhan, 2006).

Different groundwater management approaches have evolved in different parts of the globe (Kalf and Woolley, 2005; Steenbergen, 2006; Villholth, 2006; Garrido et al., 2006; Schlager, 2006; Kretsinger-Grabert and Narasimhan, 2006; Lopez-Gunn and Cortina, 2006) but all seek to impose some form of management and control where increased consumption of groundwater has caused demand to exceed supply and water levels in aquifers to decline.

Llamas et al. (2006) highlighted three problems with the management of groundwater resources. Firstly, the concept of groundwater sustainability is not just volumetric: economic, social, environmental, agricultural, political, and inter- and intra-generational issues must also be considered. The weighting given to these dimensions is mainly a political decision, and there is no blue-print applicable to every case. Secondly, Llamas et al. (2006) challenged the paradigm of the 'fragility' of groundwater development, whereby every groundwater development becomes a 'tragedy of