

Management of irrigation water storages: carryover rights and capacity sharing

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- Water storages (reservoirs) play a vital role in the supply of water for irrigation farms. Storages smooth variation in the supply of water and in doing so maximise the economic value of water over time. The management of water storages (determining what proportion of available water to store for the future and how much to consume now) is a complex task given substantial uncertainty over future inflows and water needs.
- In Australia, major irrigation water storages are traditionally centrally managed via the announced allocation system, where each season a water manager determines the amount of water available for use now (water allocations) given prevailing storage levels.
- There are a number of practical reasons why a centralised allocation approach alone may fail to achieve an ideal allocation of water across irrigators and across time. In particular, the central water manager is unlikely to have complete information on the water preferences of irrigators. In addition, a centralised approach relies heavily on trade in water allocations to reallocate water between irrigators and in practice, water trade will incur transaction costs.
- As part of this study, an economic model of the water storage problem facing a representative irrigation system was developed. The optimisation model developed was applied to a case study region in order to demonstrate the potential benefits of improvements in storage policy. The results demonstrate the ability of optimal storage management to lead to gains in mean irrigator incomes and reductions in income variability.
- The model estimated a gain to irrigators (increase in the mean economic value of water) of 11.8 per cent and a reduction in variability of around 63 per cent. A sensitivity analysis conducted using the model also demonstrated that the gains from optimal storage management increase substantially as water availability reduces.
- Given the practical difficulties facing a centralised approach, a decentralised approach where irrigators are able to make their own storage decisions, may be preferable. In this ABARE report, two decentralised approaches are considered: carryover rights and capacity sharing.
- Carryover rights allow each water user to hold over a proportion of their seasonal water allocation for use in future seasons. While carryover rights are of some benefit, they are an incomplete solution. Carryover rights generate external effects: where irrigator carryover decisions adversely affect other irrigators in the system. In an attempt to minimise these external effects significant restrictions are often placed on carryover rights which further weaken their effectiveness.
- Capacity sharing is an alternative approach in which users are allocated a share of system storage capacity and a share of inflows. Users are able to manage these capacity shares independently; determining how much water to use and how much to leave in their share of storage for future periods. Unlike carryover rights, capacity sharing ensures that storage space is efficiently allocated and that irrigators take into account their storage losses.

- Capacity sharing has a number of other potential benefits relative to systems of carryover rights. Capacity sharing replaces the traditional announced allocation system and, in doing so, removes a layer of regulatory uncertainty. Capacity sharing involves redefining water rights at the source, which creates a number of potential efficiency improvements.
- Capacity sharing is typically considered in the context of relatively simple water supply systems. While there may be some concerns about the suitability of capacity sharing in more complex systems, it is not obvious that the concept could not be sufficiently generalised. The ability of the capacity sharing framework to be applied to a range of more complex water supply systems remains a subject for potential future research.

Report: Hughes, N and Goesch, T 2009, *Management of irrigation water storages: carryover rights and capacity sharing*, ABARE research report 09.10, Canberra, May.