Submission to Productivity Commission Study

Rural Water Use and the Environment: the Role of Market Mechanisms

From

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Summary

The forest industry has the potential to increase the delivery of water efficiency savings and environmental benefits by varying the forest and plantation management strategies. Changes to the plantation management strategies, such as altering the timing of thinning operations, the length of fallow periods, the use of fertilisers and the plantation design, will be quite costly. To cover these costs, forest managers require access to markets for water efficiency savings or the environmental externalities generated by forestry when using that water. These markets should operate in addition to providing forest and plantation growers with reasonable, equitable and certain access to rainfall on land where the trees are managed for the primary purpose of supplying wood to industry.

For the water efficiency and environmental externality markets to operate effectively, they will need:

1. to be supported by water management plans that include the management of all water uses, not just water interception or landuse change activities;
2. be guided by a framework that assists land managers to consider the economic, social and environmental outcomes associated with all landuse activities and which provides a mechanism to assist catchment managers in weighing up those outcomes;
3. to have water management plans include an adjustment mechanism that assists catchment managers with the redistribution of water entitlements in order to maximise the efficient use of water resources in fully and over-allocated catchments;
4. water management approaches guided by an improved set of key performance indicators than those used for the National Water Initiative, and which apply equally to extractive water uses, 'environmental flows', and dryland farming activities (including plantation forestry);
5. a broader definition of 'environmental flows' which takes into account historical water flows and includes water use by commercial plantations where those trees help to protect against salinity, soil erosion, water pollution, and inundation in low lying areas; and
6. minimal regulation of water use by industries, or sectors of industries, within the water management and water allocation plans.

In catchments that are fully or over-allocated, an improved set of key performance indicators will be required to guide the redistribution of water entitlements between the various water users and uses across time. The markets for water use efficiency and environmental externalities should help to drive this process along, but all of these processes must be built on top of the framework outlined above.

However, where market impediments arise through the excessive controls placed on particular industries, industry sectors or changes in landuse, the water use efficiency and environmental externality markets may not be able to function effectively. In those catchments, water managers may need to use a combination of direct payments and markets to deliver the desired outcomes. Given that State Governments created the water entitlements, the funding required to support any redistribution or possible loss of water

entitlements should be sourced from State Governments and be paid in accordance with catchment managers achieving the targets established by the key performance indicators.

Introduction

Through Clause 23 of the National Water Initiative (NWI), it is intended that a nationally-compatible system for managing surface and ground water resources will be developed to optimise the economic, social and environmental outcomes from the use of Australia's limited water resources. However, with States and Territories agreeing to establish water markets and water trading systems (under NWI clause 58) it is essential that adequate consideration is given to how these markets could operate, how they could include environmental externalities and the factors impeding their contribution to delivering an efficient use of water.

Market mechanisms can be used to deliver specific outcomes and with water, it is often claimed that markets will ensure the water resources are put to their highest-value use. This could be a potential outcome of a market for water. Unfortunately, the reality is that the markets will be influenced by the content of the water management and water allocation plans to be developed by all catchments. The water trading regimes will then be affected by the requirements placed on water use, entitlements and allocations within each jurisdiction.

Unless the water management plans for catchments support an efficient use of water (as described on p.9 of the 'Issues Paper'), it will not be possible to obtain all of the externality benefits associated with current or potential water uses. It should not be sufficient to have rules in place that limit changes in landuse in catchments that are fully or over-allocated without having some means to reduce the water allocations from those uses that are less efficient and to help make that water available for more efficient uses across time.

In addition, there is no clear mechanism provided in current water management plans to redistribute the existing water allocations to a more sustainable basis across time, especially in those catchments that are fully or over-allocated. There does not have to be an immediate change in the allocations. Rather, an approach should be clearly articulated for water managers to follow when delivering a redistribution of allocations and entitlements across time in accordance with maximising the economic, social and environmental outcomes across all water uses.

A reliance on price signals to deliver water use efficiency may be meritorious in theory, but a comparison with the recent changes in land prices (as a reflection of market forces) would indicate that the value of water may end up being significantly higher than the direct economic returns from the use of the water (measured in terms of the value of production). In practical terms, the current land prices appear to exceed the economic returns from the most efficient use of agricultural land over the longer term, demonstrating that other values are built into the prices paid for land.

Changes in farmers' terms of trade have driven changes in land ownership, leading to a significant shift from grazing to cropping and a 25% decline in the number of farming families over the last 20 years. The plantation sector is observing this intensive competition for land in most agricultural areas. These fundamental changes in farming could also underpin the outcomes for water markets and additional water trading mechanisms.

Before any consideration is given to the establishment of a workable market mechanism and additional water trading regimes for water efficiency and environmental externalities, a framework should be provided to assist catchment managers during the development of their water allocation and water management plans. The framework should support changes in landuse changes where they provide a net benefit (even if the catchments are fully or over-allocated), contain a mechanism to help catchment managers weigh up the economic, social

and environmental outcomes across all water uses, and provide an approach for adjusting water allocations and entitlements across time to deliver those outcomes.

Investment in water use efficiency

Only when a comprehensive framework is constructed that includes all water uses, externalities, and a process for adjustment of water allocations or entitlements across time, will the water trading mechanisms operate effectively. The outline for such a comprehensive framework is provided at Attachment A. This strategic approach to the economic, social and environmental assessment of all water uses is quite similar to that used to guide management decisions and industry access to other resources such as forests (through the Regional Forest Agreements) and commercial fishing licences.

At a national, State and Territory level, it should be possible to support such a framework by improving the key performance indicators for the NWI. At the present time, the indicators focus on water use by extractive water users. As a result, catchment managers will only report progress against the existing indicators, which do not account for improvements in water use efficiency for dryland farming practices.

If land managers are provided with an incentive to improve their water use efficiency, such as retaining the rights to any improvements in water use efficiency (recognised as a recharge credit on reducing their use of rainfall that they could use or sell), then the market signals could flow through to the further refinement of management practices. It is therefore essential that water managers provide access to markets that generate the economic incentives for encouraging gains in water use efficiency within their respective approaches to regulating water entitlements.

In potential inundation areas, for example, where plantation forestry can lower otherwise high water tables, plantation growers should be able to access environmental credits for using that water and reducing the ground water to a level that protects the soil and ameliorates the future threat of ground and water salinisation.

For example, in southeast South Australia, the area is criss-crossed by a complex drainage system, employed to drain fresh water out to sea and prevent the inundation of farm land. If new timber plantations are established in the areas where the drains are located, they currently have to obtain what is termed a ‘recharge offset’ as part of gaining a development approval. When all of the offsets allocated to the plantation industry in each particular water management zone have been taken, the growers will need to purchase a water allocation in order to gain an entitlement for using part of the rain falling on their land.

To deliver a sustainable outcome in this particular area, plantation managers should be provided with an environmental credit giving them access to the water in shallow water tables, instead of requiring the plantation growers obtain a recharge offset, as the means of preventing inundation and providing a more productive use of the available water resources.

A framework to underpin market mechanisms

A framework that accounts for all water uses, externalities of water use and changing efficiencies of water use, is an essential requirement to support markets for improving water use outcomes. If the framework were developed at a national level, water managers could incorporate catchment-specific information into their respective water management plans, especially where this has the potential to impact on water allocations, entitlements, environmental outcomes and the efficient use of water. This information would include:

- Whether catchments are over, fully or under-allocated;

- Whether catchments are in the upper, middle or lower reaches of water systems;
- Amount of irrigation relative to both the areas of dryland farming and the total amount of water available for productive uses;
- Environmental impacts of the various farming systems and each water use; and
- The economic and social impacts associated with each water use.

Without such a framework, there is no means to guide the preparation of water allocation plans. Based on current outcomes and in the absence of such guidance, water managers are developing plans that concentrate on a limited number of water uses and outcomes out of the total catchment water use. By focussing the regulations and controls over a limited number of landuses and landuse change activities, the water plans will most likely limit the potential gains in efficient water use and prevent the markets for water use efficiency and environmental externalities from operating in an effective manner.

The framework provided in Attachment A would allow water managers to take into account the catchment-specific characteristics of water use and water availability when developing their water management plans, and at the same time, reduce the possible conflict that might otherwise arise between clauses 23 and 58 of the NWI. Only by developing comprehensive water management plans, will water be allocated to its most effective uses in a manner that will underpin the efficient operation of markets for water, improving the efficiency of water use and obtaining the maximum gains from environmental externalities.

At the present time, water managers are only concentrating on particular water uses and landuse change activities when preparing their water management plans (where the landuse change is registered through landuse planning approvals or development applications). As a result, they will not meet the requirements of NWI clause 23. By not taking into account the full range of water uses and the potential impacts of those water uses, it is also not possible to establish transparent and effective markets for delivering the outcomes sought in clause 58 of the NWI.

Market mechanisms for environmental externalities

Prior to establishing markets for environmental externalities, water managers must establish a baseline for environmental water allocations and provide some recognition of the positive, as well as negative, externalities that may arise from various water uses. This assessment is essential for underpinning environmental flows and for identifying the environmental impacts of each water use to support the new markets.

When estimating the 'environmental flows', strong consideration should be given to the volume and timing of historical flows. The historical water flows are essential for maintaining biodiversity and regaining the natural mix of species that would have most likely existed in the farming catchments prior to the clearing of forests and woodlands for agriculture.

If the water flows are not returned to their historical levels, then the water management plans will impose a new equilibrium set of environmental outcomes onto the catchments, which may not be sustainable or have significant impact on the range of flora and fauna. The new environmental outcomes within catchments will therefore be the result of a new equilibrium, based around surface and ground water use, the amount of water flowing down the creeks and rivers, and the timing of those flows. If the equilibrium changes again in the future, then the resulting outcomes will affect the size of the externalities (eg. salinity, salinity amelioration, changes in biodiversity) and the value of those externalities within the markets created through the water allocation plans.

The current definition of 'environmental flows' as the timing and volume of water travelling through a catchment, is extremely limited. An additional form of environmental flow or water allocation may include the provision of water entitlements to multi-purpose plantations within the water management plans. Multi-purpose plantations are those that produce wood resources for industry and are strategically located within catchments to prevent ground water discharge, dryland salinity, or soil erosion.

As part of the commercial-environmental forestry (CEF) project being undertaken by CSIRO in the Goulburn-Broken catchment, it has been possible to identify areas where trees could be established to intercept rainfall (use surface water), limit ground water recharge and thereby prevent the mobilisation of salts from deep in the soil profile. To encourage these sorts of plantation activities, a proportion of the environmental water flows should be allocated to multi-purpose plantations, where the water is intercepted by trees, as opposed to having an increasing volume of water flowing down the creeks and streams.

In the past, the forest industry had historical rights to the water consumed during the regeneration of forests after the harvesting operations had been completed. When the industry's access to native forests was reduced, this lead to a significant gain in catchment water yields (according to the eNGO that sought to have forestry excluded from catchments). However, the industry was not given access to an alternative source of water entitlements to support the production of a replacement timber resource that must now be grown on farmland. State Governments have not compensated the forest industry for the loss of water entitlements that lead to environmental gains (through biodiversity protection) and increasing environmental flows in the natural forests.

A process for adjustment

In the fully and over-allocated catchments, the water management plans must establish a framework for adjusting water allocations over time and in a manner that will lead to more sustainable volumes of water use, interception, extraction and environmental flows. Without providing a process for adjusting water entitlements across time to reach an efficient use of the resources, it will be quite difficult to establish workable and transparent markets for water use efficiency or water management-related environmental externalities.

The potential outcome is that these two components of the water plans (the adjustment process and the water markets), if not properly constructed, could oppose each other and thereby limit their effectiveness.

Who should pay for a redistribution of catchment water entitlements?

In catchments where the water entitlements have been fully or over-allocated, there will most likely need to be a redistribution of those entitlements across time to achieve both a sustainable and an economically efficient use of the water resources. But at present, there is no mechanism to assist catchment managers in determining how these outcomes will be achieved at a catchment level or how an environmental flow volume will be determined, measured or delivered.

Where there needs to be a reallocation of water entitlements at the catchment level, who will pay for the changes? If it is catchment managers, how would they raise the necessary funds? Given that previous State Governments transferred the water entitlements to landholders, they should have a prominent role in compensating landholders for any future reduction in water entitlements if there is no market available for delivering a redistribution of those water entitlements.

The task will be far more difficult in over-allocated catchments where water managers may need to encourage a redistribution of water entitlements from existing water users to plantation growers. This involves two different sources of water, with existing water entitlements applying to water extracted from the river systems or ground water resource, while the plantation growers are generally intercepting rainfall. Uncertainty over rainfall in any one year and therefore, the variations in interception by plantations (or reductions in surface water run-off), will make it extremely difficult for catchment managers to introduce markets that deliver a sustainable and consistent redistribution of the water resources.

With the growing regulation of water use and the specific regulation of all landuse change activities, it is difficult to envisage that markets alone will provide the impetus for delivering water efficiency improvements and environmental externalities. Alternatively a combination of payments to catchment managers for achieving performance outcomes and some trading of credits and debits associated with water use efficiency and environmental outcomes may be required to deliver the most effective use of the water resources.

To finance and deliver the long-term sustainable use of water, to which the water efficiency and environmental externality markets can be added, a similar framework could be employed as that used for the implementation and deliver of National Competition Policy. Catchments could receive payments for meeting milestones of changing the water allocations to a more sustainable basis, with the money used to compensate landholders who lose part of their entitlements. This approach could be most effective where potential market failure from Government regulations impede the markets for water efficiency improvements and the environmental externalities. However, to achieve these outcomes, the key performance indicators for the NWI would need to be broadened and improved.

Importantly, the payments from Government to achieve sustainable, efficient water use will be necessary because the regulations will be used to control only certain landuses or changes in landuse – not all landuses. All of these issues need to be addressed as the basis of underpinning the effective operation of markets for water efficiency improvements and environmental externalities.

Potentially inefficient water management options

The water management plan proposed for southeast South Australia is one of the more advanced of the catchment management plans developed, so far, around Australia. This plan will contain specific controls over plantation forestry that will be implemented in the absence of any detailed economic, social or environmental assessment of the water used by all landuses within the catchment.

For this particular catchment, the State Government has estimated an average amount of rainfall that ends up as ground water recharge under pasture and under plantations, with the difference being an average rate of ground water recharge intercepted by plantations. However, where the water managers have attempted to model the volume of rainfall interception by plantations, using a combination of data from 1,100 bore sites across the region and climate profiles, they have found that no consistent relationship exists. It is therefore difficult to understand how the plantation components of the water allocation plans and the proposed rates of water interception can possibly be determined with any scientific merit.

From the estimated volume of ground water recharge being intercepted by plantations, the State Government determined the area of plantation establishment that could occur by quarantining that volume of water in the form of a water holding allocation or ‘recharge offset’. The Government also set aside a specified total volume of water to support new plantation developments as part of the ‘permissible annual volume’ of water that could be

extracted from the system. Based on an average volume of recharge interception, the water managers then established a threshold area of plantations that could be developed in each water management zone for the catchment of the lower southeast of South Australia. Each of the zones cover an area of approximately 20,000 hectares and water flows between the adjoining water management zones through the confined and unconfined aquifers of the ground water system.

When applying for a development approval, the forestry companies must obtain a recharge offset. Once a threshold level of plantation development has been reached within each of these water management zones (ie. all of the recharge offsets have been taken), any additional plantation development will require the purchase of a water holding allocation that allows the landholders to use a proportion of the rain falling on their land. In this particular area, the water has been fully allocated through the transfer of water entitlements to landholders in the form of water taking and water holding licences.

The limited scientific information used to determine the recharge offsets will reduce the transparency of water trading markets, including those for water efficiency gains and environmental externalities. Separate water entitlements, or recharge offsets, have been provided for the two main plantation species being grown in each water management zone. However, in the water management zones, there may be recharge offsets available but no suitable land to plant a certain species. Alternatively, the may be a considerable amount of suitable land, but no recharge offsets available in a particular water management zone. At present, there is no capacity to move the excess recharge offsets between the neighbouring water management zones. Every effort should be made to provide a better match of suitable land and the water entitlements available for plantations. This is possible, as the neighbouring water management zones are linked through the ground water system.

If a land owner wishes to plant one of the two main species in a water management zone and the threshold levels of interception have been reached, it is not possible to utilise the water entitlements remaining available for the second plantation species in that water management zone. A separate regulation also allows up to 10% of farms to be planted with trees before landholders are required to obtain a recharge offset or purchase a water entitlement.

These rules over water access, water entitlements and the quarantining of recharge offsets for plantation forestry developments, do not apply to any other dryland landuse. In effect, the State Government has introduced regulations and established arbitrary water management zone boundaries that will most likely impede the effectiveness of any future markets for improved water use efficiency and for environmental externalities.

In other catchments, it will be difficult to obtain water efficiency improvements that can be traded or provide markets for environmental externalities if the water management plans only target landuse change activities and not all landuses. The result of regulating a subset of landuses within the water management plans is that this approach will most likely distort decisions on resource use, resource allocations and the delivery of sustainable, efficient water use.

Markets for positive environmental externalities

In some locations, such as the Denmark River catchment in southwest Western Australia and the rivers in northern Tasmania, plantations have been shown to improve water quality, in terms of reducing the salt concentrations and bacterial concentrations. But who should monitor and pay for these changes, given that they happen quite slowly and produce public benefits that are generally observed across the catchments?

In the Denmark River catchment, for example, it is anticipated that the salt concentrations in the water will return to potable levels some time around 2015. Plantations have been identified as being responsible for reducing the discharge of salty ground water into the river, originally caused by the over-clearing of former woodlands.

Plantation forests in the southwest Goulburn-Broken catchment have also been found to reduce the amount of salt water that is discharged into the river system from the top of the catchment. The primary effect is that plantations have started to control the water tables in those areas where there are high concentrations of salts within the soil that could be mobilised by high water tables. Results from the previously mentioned CEF project, have identified those areas in this particular catchment where plantations could be strategically employed to lower water tables, thereby reducing the amount of salt reaching the rivers while at the same time minimising the impact of the trees on the catchment's water yield.

Overcoming catchment inefficiencies

To provide market mechanisms that support environmental externalities and encourage more efficient water use, the underlying water management plans should attempt to reduce the inefficiencies of catchments. The 2005 study on the Murrumbidgee Catchment (The Business of Saving Water) identified the significant inefficiencies and water losses that could arise with the transmission of water from one part of the catchment to another. These losses may be currently identified as 'leakage' or evaporation, but they still represent a much larger volume than the amount of water that might be intercepted by the plantations proposed for establishment within the Murrumbidgee catchment.

Request for information

Many factors are likely to impact on water use and water use efficiency in individual plantations and across catchments. From the limited amount of scientific information that is currently available, plantation water use is determined by the soil type, slope, proximity to other plantations, requirements on buffers around creeks and rivers, the plantation layout, the heights of water tables, salt concentrations in soils, evapotranspiration rates, the timing of rainfall throughout the year, and the duration of the fallow periods left between harvesting and replanting.

Most of these factors also impact on plantation productivity and with timber products being sold into highly competitive domestic and international markets, the limitations on forestry income places a significant pressure on plantation managers to minimise the costs of these operations. As a distinguishing feature of plantation forestry, the costs of establishment and management are increased by managers having to internalise the costs of meeting the legislated Codes of Practice in each State and Territory. These codes govern all aspects of plantation design and management.

Through the certification schemes now employed by most plantation companies, there are further requirements on the forest management practices to minimise the impacts of plantations on water yields and water quality, as part of their overall management strategies. For plantation managers to further increase their water use efficiency, clear market signals must be provided, so that it is possible to weigh up the economic returns from selling the gains in water use efficiency against either the higher costs of growing the timber and/or the lower productivity of the plantations. These water use efficiency gains for dryland landuses must become part of the set of key performance indicators that water managers report against and which therefore direct the management of the water resources.

If there is no market for the gains in water use efficiency from dryland activities, plantation managers should be able to use those 'credits' to support additional plantation developments.

This may reduce any future requirement on plantation managers to purchase a water entitlement in fully or over-allocated catchments.

Additional scientific information will be needed to underpin any market for trading the gains in water use efficiency and to identify the means of delivering those efficiency gains, which could be derived from the selection of species that are more drought tolerant, an improved use of fertilisers or changes to the design and layout of the plantations. In some cases, if there is sufficient value in the water use efficiency credits, plantation managers could consider a change from two short rotations of planting and clearfelling (with approximately 10 years for each rotation) or a longer rotation that involves multiple thinning of the plantations, if there are water efficiency gains that can be readily identified.

The water use-related environmental externalities should be considered in terms of both the negative and positive impacts associated with each landuse and landuse change activity. In many cases, plantations provide environmental benefits that are not captured or valued through any markets. As an alternative to assessing plantation developments on the amount of water they will use, catchment managers should consider the environmental benefits that the trees will produce and how those benefits will offset the negative environmental effects of other landuses within their jurisdiction.

While there is a significant level of interest in delivering an increasingly efficient use of water, this outcome cannot be achieved without the introduction of water management plans that take into account all landuses. The current reliance on regulating just landuse change activities will not help to deliver a long-term sustainable use of water in the fully or over-allocated catchments. Catchment managers will require a mechanism for redistributing the water entitlements across time so that water can move to more efficient uses, especially when the water entitlements are shifting between competing dryland landuses.

Conclusion

Market mechanisms can be appropriate means for delivering gains in water use efficiency, reducing the negative externalities associated with water uses, and delivering positive environmental externalities. However, before these markets can operate effectively, water management plans must be introduced that take into account the impacts of all landuses, treat all landuses in a consistent manner, and which provide a mechanism for allowing the trade or redistribution of water entitlements within the catchments, leading to a more efficient use of water resources in the fully and over-allocated catchments.

Alternatively, where water managers use regulations to control certain activities, the water use efficiency and water use-related environmental externality markets may not function in a transparent and effective manner. To deliver the sustainable outcomes sought by water managers, compensation payments will be required to allow a redistribution of water towards the most efficient uses and to encourage investment in those activities, such as plantation forestry, that can generate environmental benefits to off-set any negative environmental externalities from other catchment landuses.

Attachment A

Recommended National Water Initiative framework, based on principles agreed by COAG and to be delivered through Water Management Plans.