

Tradeable Recharge Credits in Coleambally Irrigation Area

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THE ISSUE

Irrigated agriculture in Australia often leads to recharge of shared groundwater systems beyond their capacity to absorb water causing salinity and water logging. In turn, salinity and water logging impose a range of costs on individual landowners, their neighbours and the wider community. These impacts are primarily reduced agricultural productivity, damage to ecosystems and degradation of built infrastructure both locally and off-site. Some of these costs are not fully included in farm management decisions because they are largely external to landowners.

Landholder Engagement

INDIVIDUAL INCENTIVES

Researchers and the community must address a number of issues in developing a biophysically integrated market mechanism including:

How to define net recharge and thus measure property rights? The regional groundwater and SWAGMAN® series of models can estimate number of alternatives each of which will deliver subtly different incentives to irrigators.

Who should hold property rights – should they be restricted to irrigators or should others such as water supply authorities and community organisations be able to hold them?

What quantity of property rights should be allocated? Alternatively, how are property rights and salinity targets related?

How should these property rights be allocated amongst irrigators and other eligible holders? What is the legal basis for rights?

What compliance monitoring should be established? Who should police it? What penalties should be imposed for violation of rules?

Should banking and borrowing of property rights or other measures to enhance irrigator flexibility in managing recharge be incorporated? What limits should be imposed on this flexibility?

What would a recharge market look like? Should there be a single clearing house? Who will approve and register trades? Is an individual or small group likely to gain market power?

Should activities to 'offset' net recharge be allowed? How should they be measured and included?

THE PROJECT

This proposed National Market Based Instruments Pilots Program project will build on the net recharge and groundwater management work by Shahbaz Khan and colleagues at CSIRO Land and Water in Griffith to develop methods to physically measure recharge from irrigation systems and the resultant biophysical and economic impacts. The goal of this project is to work with the Coleambally community to develop and test the potential for an integrated market mechanism to improve irrigation-induced salinity management.

The pilot will commence in late 2003, running for two years, and operate in the Coleambally Irrigation Area in the lower Murrumbidgee Catchment and will involve irrigators, the Coleambally Irrigation Cooperative Limited (CICL), CSIRO and government agencies. This project is the only MBI pilot aimed at managing salinity from 'existing' irrigation as defined under the MDBC Salinity and Drainage Scheme pre-1988 benchmark.

Develop draft recharge credit mechanism

CONCEPTUAL FRAMEWORK

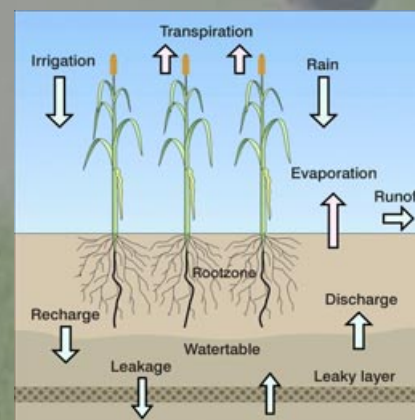
This pilot is based on developing (cost-effective) incentives to individual irrigators that reflect their impact on a shared groundwater aquifer. The shared resource means that one individual's actions may affect other irrigators and the wider community. Any proposed solution must therefore be based on sound **biophysical information**, and development of **individual incentives** that reflect these biophysical relationships.

Behavioural responses to incentives are also dependent on the nature of the motivation. Prescription or standard based regulations allow no flexibility for individual responses. Persuasion relies on sufficient motivation from knowledge alone about the impacts of my actions on my neighbours and the irrigation area as a whole. Payments and tradable property rights systems allow maximum flexibility whereby the lowest cost individual management solutions may be sought across the shared aquifer. For any motivation to be effective the community must be comfortable in engaging and using the mechanism. Hence, the project goal of **working with the Coleambally community** towards developing a biophysically integrated market mechanism.

Farm Visits

Paper Trial

Evaluation and Modification



NET RECHARGE equals
IRRIGATION + RAINFALL + CAPILLARY UPFLOW
minus
EVAPOTRANSPIRATION + LEAKAGE + RUNOFF + CHANGE IN SOIL WATER CONTENT

BIOPHYSICAL INFORMATION

Information is required about individual irrigator's impacts on shared groundwater aquifers and the consequences of these actions on other irrigators and the wider community.

In the Coleambally region there are more than 800 shallow and deep piezometers in the area that have been used to model regional groundwater movement.

Information from these wells and regional groundwater models has been used to build and calibrate the SWAGMAN® series of models by Shahbaz Khan and colleagues at CSIRO in Griffith. Their research has resulted in the development of the concept of "net recharge" as an important management tool (see above Figures).

Elements of the SWAGMAN® series are able to estimate biophysical relationships at the paddock, farm, sub-region and regional scale for different variables including soils, crops, irrigation technologies and climatic outcomes.

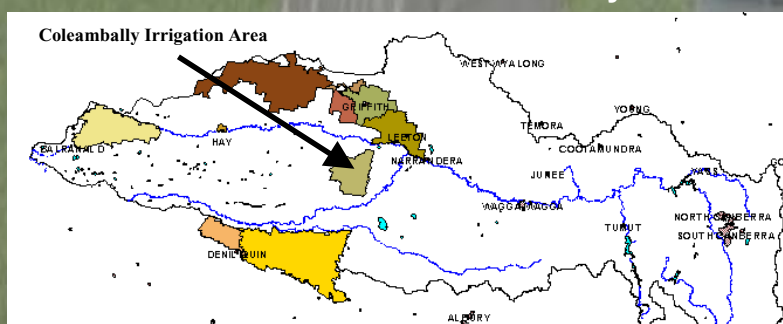
This information can be used to design biophysically integrated market mechanisms to manage net recharge and salinity.

Full trial in pilot sub-regions

Monitoring and Evaluation

Recommendations for whole of system implementation

Location of Pilot Case Study



WORKING WITH THE COLEAMBALLY COMMUNITY

Irrigators and the Coleambally community are familiar with the current system. This system is largely based on a regulatory approach (through the Rice Environmental Policy and water use monitoring) combined with persuasive instruments and payments under the Coleambally Land and Water Management Plan.

For irrigators and the community, the development and implementation of an integrated market-based solution presents substantial challenges and changes in their approach to recharge management. The Coleambally community will need to carefully consider the options available and will need support and information from biophysical and social scientists. This pilot study into the potential application of tradeable recharge credits will meet these expectations through:

Community engagement through individual meetings, workshops and a comprehensive issues paper;

Trial of any proposed changes within pilot areas across the region. These trials will incorporate visits to individual farmers, a paper trial of potential mechanisms to show how these would impact on their enterprise and a comprehensive evaluation the trial; and,

Advice and help in moving from a paper trial to full implementation of any changes.

At each stage the community can decide whether to proceed based on what they have learnt about the problem and the advantages and disadvantages of the solution compared with continuing the current strategy.

WHAT DO WE HOPE TO LEARN

The pilot must strike a balance between delivering better environmental outcomes and imposing additional costs on irrigators. Within this context we hope to learn more about:

Developing property rights and markets for the management of problems which are difficult to measure because of their with dispersed sources. In particular we hope to learn more about the integration of advanced biophysical models (such as SWAGMAN®) with market mechanisms;

How to allocate and monitor property rights for aspects of existing systems – in this case irrigated agriculture;

Integration of beneficial and harmful actions across different timeframes within a single market; and,

How to measure the nature and scale of the gains from trade in a market compared to existing systems (including the cost of implementation).

The lessons learnt will be valuable in the development of other integrated biophysical models and MBIs, especially those targeting nutrient and salinity management.

References

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