Saline water disposal next step in drainage debate

Many Western Australian farmers frustrated with the limited value of plant-based solutions to the dryland salinity crisis have been overjoyed at the ability of engineered drainage systems to reclaim previously unproductive farm land. But further research is required to clarify the potential downstream impacts of drainage schemes.

by **Janet Paterson,**
for CSIRO

Research in Western Australia's wheatbelt shows engineered drains can reclaim salt-affected land up to hundreds of metres either side of the drainage channel.

Having proven that drainage channels can return saline farm land to production, the drainage debate is now focused on how to dispose of millions of litres of saline water draining from thousands of kilometres of drainage systems across the WA wheatbelt.

Downstream concerns

The issue of safe disposal has raised concerns and often heated debate throughout the State's south-west given the potential for untreated saline drainage water of high acidity to affect ecosystems downstream from the drainage channels.

CSIRO scientist Tom Hatton believes the concerns require thorough scientific investigation so the drainage debate can move from one currently based largely on uninformed fear to one underpinned by technical evidence.

Through his involvement with the Water for a Healthy Country Flagship — a collaborative research programme between CSIRO and the WA Department of Environment — Dr Hatton is carrying out a comprehensive assessment of how salinity will affect regional river systems if no remedial action is taken and if drainage or groundwater pumping systems are implemented to discharge saline groundwater into rivers.

At a glance

- CSIRO research shows deep, open drains can reclaim salt-affected land, enabling crop production on previously unproductive land.
- But there is uncertainty regarding the downstream impacts of deep, open drains on natural ecosystems and farm land.
- CSIRO involvement in Water for a Healthy Country Flagship research will determine the potential benefits and risks of engineered solutions to dryland salinity.

Photos: CSIRO Land and Water

The drainage debate is now focused on how to dispose of millions of litres of saline water draining from thousands of kilometres of drainage systems across the Western Australian wheatbelt.

Ultimately, the Flagship research will determine the potential benefits and risks of engineered solutions to salinity and waterlogging, both locally and downstream.

WA Channel Management Group

The Flagship research is good news for the WA Channel Management Group which has been advocating deep drainage solutions to dryland salinity since 2002. The group has developed a proposal to construct a 900-kilometre arterial drainage system to drain saline water from the WA wheatbelt to the Indian Ocean.

To test the feasibility of the drainage scheme, construction of a 35km pilot drainage channel has been proposed

Drainage reclaims saline land

Deep, open drains are increasingly being used in the Western Australian wheatbelt as an engineering option to control dryland salinity.

But there are still many uncertainties about the quantity and quality of discharge from these drains.

Between 2000 and 2003, CSIRO researchers evaluated the quantity and quality of discharge from deep, open drains at five sites within the Wakeman sub-catchment, near Narembeen, WA where about 100 kilometres of drains have been constructed since 1998.

During the first two years of monitoring, the flow rate in the drains was high — varying from 5–15 megalitres per day, which resulted in 300–600 tonnes of salt being carried away each day.

The outflow rate decreased substantially toward the end of 2002 due to dry weather but increased again following above-average rainfall during winter 2003.

The salinity and pH of the drain water varied between an electrical conductivity of 4000–10,000 millisiemens per metre and a pH of 2–4.

Apart from natural fluctuations caused by rainfall, no significant change in drain water salinity or pH was detected during four years of monitoring.

The salinity of the shallow groundwater at various sites was generally lower than that of the deep groundwater but pH values were similar.

Excessive levels of manganese, aluminium and iron were detected in the drain water and potentially, if left untreated, could be harmful for downstream flora and fauna. Further research will evaluate the potential downstream impact of the metals.

to drain saline water from properties within and adjacent to the pilot channel area in the salt river system, south of Beverley, WA.

If funded, the pilot system would be monitored by CSIRO and other government agencies to determine the environmental impacts of the drainage system.

The group estimates the ongoing restorative benefits of the 35km arterial drainage channel could be as much as $2.4 million each year as thousands of hectares of affected farmland are returned to full production.

When reclaimed, the group predict land values could increase by more than $3 million and flora and fauna habitats could be revived.

The pilot study would see saline water being drained along the existing river course into holding ponds upstream of the Yenyenning salt lakes, where it would be mixed with other waters and then its disposal regulated downstream into the lake system. The drainage water would be released intermittently, when suitable conditions prevail. Concerns surround the interaction of the channel proposal with the long-term health of the Yenyenning lakes ecosystem (part of which is a gazetted nature reserve), ongoing maintenance of the drainage channel, the impact of drainage water along the channel and the potential impact of flood peaks on the lake's storage capacity.

Many possible solutions for the safe disposal of saline drainage water are being investigated. For example, the Western Australian Channel Management Group has developed a proposal to build an extensive arterial drainage system to drain saline water from the WA wheatbelt.

Alternative solutions

Additional solutions to the disposal problem are being investigated by CSIRO and other research organisations. These include either local solar ponds or disposal basins similar to the hundreds already in use in the Murray Darling Basin which intercept and store saline groundwater before it enters the Murray River.

In addition, on-site desalination of saline water is being considered in the WA wheatbelt town of Katanning to reduce the town's reliance on scheme water pumped from the coast.

Extracting the salts and minerals contained within saline water is being considered, which also could generate revenue from the salinity problem.

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Farmers frustrated by slow approach to salinity crisis

Farm information

Farmer
Greg Richards

Location
Quairading, WA

Property size
3800ha

Enterprises
Cropping and sheep

Annual rainfall
300–330mm

Soil type
Light soils to duplex and clay

Soil pH
4.2–7.6 (calcium chloride)

Quairading, Western Australia, farmer Greg Richards is just one of hundreds of WA farmers who lives daily with the devastating impact of dryland salinity.

He is also more than aware of the growing frustration among farmers affected by salinity for whom plant-based solutions to the crisis simply have not delivered.

As chairman of the WA Channel Management Group, Greg is actively involved in attracting funding and support to construct a 900-kilometre arterial drainage system to drain saline water from the wheatbelt and ultimately into the Indian Ocean.

Greg first witnessed the mitigating effect of drainage channels when he visited Narembeen, WA, farmer John Hall's property during 2002.

Impressed with how the drains had reclaimed large tracts of previously unproductive land, Greg returned to Quairading convinced that engineering solutions could be found to reduce the impact of dryland salinity on farming land.

To Greg's surprise, nearly 90 local farmers attended his post-harvest 2002 drainage meeting and the group — which would later be called the WA Channel Management Group — voted unanimously to support the construction of an arterial drainage channel to drain saline water to the Indian Ocean.

Since then, 450 farmers have added their support to the drainage project.

Greg has lost 400 hectares of what was his best land to dryland salinity while, collectively, landholders in the Quairading Shire have lost about 12,000ha.

Given the proven ability of drainage to overcome salinity problems, Greg cannot understand opposition to the drainage project.

Greg acknowledges that research is required to determine the impact of saline drainage water on downstream ecosystems and has enlisted the help of CSIRO and WA Department of Agriculture scientists to monitor the effects of the proposed drainage scheme.

Greg Richards, Quairading, Western Australia, believes draining saline water from the wheatbelt to the Indian Ocean would reclaim hundreds of hectares of saline farm land.

He also believes the way the South Australian drainage scheme is managed is an ideal model for the WA proposal.

Unlike the WA situation, the SA drainage scheme is co-ordinated and supported from a government level and Greg believes this has given the project momentum as well as much-needed funds.

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