Engineering options 'one part of the salinity toolbox'

Garry English is a farmer who says engineering options such as drainage and pumping have a big role to play in managing salinity, but people need to do their homework first.

'If we want to do anything about managing salinity, we have to try just about everything that's in our toolkit,' says Garry.

Garry is the WA Farmers Federation spokesman on land management and conservation issues. He's also on the Steering Committee for the Engineering Evaluation Initiative assessing the effectiveness of engineering options around the State.

'I have a responsibility to see that our members and farmers are gaining the best information to support wise investment. While I believe all engineering options work, the question is at what cost?' he says.

'And quite often, the benefits are not quite as good as some would say they are.'

Garry has been nationally acknowledged for his efforts in managing salinity over several decades, culminating in winning the prestigious McKell Medal in 2001 for outstanding on-farm land and water management.

At his farm at Gibson on the Esperance sandplain, he and wife Jan have used a variety of methods from their 'toolkit' to contain salinity, including drainage, alley farming, perennial pastures, and retention of native vegetation.

He has also adapted some saline areas by growing saltland pastures and trees.

Engineering solutions such as drains, pumps, and siphon wells can work well; however, he believes surface water management is probably the number one priority for managing salinity — moving water off the landscape before it seeps in and raises the watertable.

'I would think deep drainage is probably the most contentious simply because you are putting a big scar on the landscape, there's debate as to the zone of influence, as well as the unknown of off-site impacts,' he says.

Garry says he believes drainage is likely to work on a regional scale — but a lot of homework has to be done first, such as who would be responsible for such a system.

'I would think in future we are going to see regional drainage, he says.

'It's OK for one individual to say "I'll just drain on my farm" but then if he can't contain all the effluent in an evaporation basin or some local lake on his property, then you've got to join up with others in a catchment.

'So we envisage all future drainage will end up linking and it will become part of a regional drainage system.

'And then we're going to have to be looking at the bigger issues of who's responsible, who's liable etc.

'There's a whole lot of governance issues that need to be addressed in early planning, such as who's responsible for the maintenance and liability, who pays for the main drain — is it the contributors of drainage water, all beneficiaries or is it the State or a combination?

'It's a bit like putting in a main road and having local government handle it at one level and the State at another level — and then there are even national roads and federal implications.

'So it's vital we recognise the need to sort these things out up front.'

Apart from checking local soil conditions and doing cost-benefit analyses, there are also environmental concerns to be addressed with any regional scheme, and consultation between farmers, industry, government and environment managers is crucial.

'Everyone's got to have a say in this, he says.

He points out that some of the soils in the South-West are virtually watertight, and drains would be of limited use, whereas other places appear to show a lateral effect for more than several hundred metres.

'That's why we're doing this engineering evaluation, simply to see where it works

best, what the costs and benefits are, as well as find what the impacts are on disposal options for the water,' explains Garry.

'And hopefully there, the impacts are less than what you're saving and it's not causing aggro to some other party, whether it be the State or whether it be a neighbour.'

Garry says apart from governance issues, he's concerned about the cost of engineering options as well as off-site and downstream management of the discharge waters.

'But at the end of the day, we're going to have to do something to lower groundwater,' he says.

'And engineering methods seem to be the only option we've got at the moment that we can do anything about it.

'We can't rely just on plant-based methods, we can't rely on surface water management, we've got to use everything that's available at our disposal.'

Share your news and views

We welcome your feedback and salinity-related news.

The deadline for the next issue is 15 November 2004.

Please keep brief (about 150-200 words is fine) and email them to **eei@environment.wa.gov.au**

Salinity Engineering
— Better Ways to Manage Salinity

Newsletter of the Salinity Engineering Evaluation Initiative Issue 6 Spring 2004

action Salinity & Water AUSTRALIA

Department of Environment

The Engineering Evaluation Initiative (EEI) is a priority project under the National Action Plan for Salinity and Water Quality, to be jointly funded in partnership with the Commonwealth.

It was established to develop approaches to engineering schemes to help manage salinity.

How to subscribe

To keep up to date with the EEI, you can subscribe to this newsletter by ringing Jane Filmer on 9278 0450 or email eei@environment.wa.gov.au or fax: 9278 0586.

Latest News

Update on groundwater pumping and regional drainage in next issue.

First deep drain dug for EEI

During winter, Kingsley Roach was busy digging an 18-kilometre long drain, as deep as 2.6 metres in some places, to lower the watertable in his paddocks.

Kingsley's farm is approximately 20 km east of the Wheatbelt town of Pithara which lies north-east of Moora. Some 278 ha — or about 8% — of the property is severely salt-affected, with another 1037 ha (28%) moderately to slightly salt-affected.

'The idea is that the drain takes seepage water only, it doesn't take surface water, from the paddocks,' says Kingsley.

'The main deep drain follows the valley floor with some lateral drains going out to the base of the sandy hillside in an effort to intercept the recharge from the upper areas.

In this project, saline water — which Kingsley says is generally as salty as seawater (35 000 mg/L) — will be disposed of into naturally saline creek lines and then into salt lakes.

An important part of the evaluation project is keeping a close eye on the watertable.

'The monitoring is a big part of the project and possibly that is the most important part of it, and we've gone to considerable trouble with the Department of Environment to install the piezometers in four different places,' explains Kingsley.

'And we're going to monitor them on an ongoing basis. If it works for me, it would probably work for my neighbours as well, and salinity in this area is a massive problem.'

Nick Cox and Shawan Dogramaci (DoE project team) are already assessing early results from the groundwater monitoring.

The drain's in — now how do you recover productivity?

What happens to soil properties and agricultural productivity after salt-affected and waterlogged soils have been drained? What are best practices in soil remediation in saline areas? Answers to these questions are the expected outcomes of this Soil Assessment project.

The work is being conducted by Associate Professor Richard Bell, Murdoch University in conjunction with Dr Surender Mann, Chemistry Centre Western Australia (CCWA), Mr Noel Schoknecht, Dr M. Hamza, Mr Justin Hardy, Department of Agriculture Western Australia and Dr Craig Russell, Centre of Excellence in Natural Resource Management, UWA Albany (CENRM).

The purpose of this project is to examine the changes in soil properties after salt-affected and waterlogged land is drained by engineering works. Given the diverse nature of soils subject to salinity and waterlogging in Western Australia, the expected responses in soil quality to drainage will vary. Three sites (Dumbleyung, Narembeen and Beacon) varying in soil properties, types of drainage intervention and rainfall patterns have been chosen for detailed study. Less intensive soil investigations will be carried out at other sites of deep drains installed under the EEI (Pithara, Morawa, Date Creek).

These investigations will enable us to recommend the best approach to soil amendment.

A range of possible amendments could be needed to accelerate the recovery of soil productivity. Ripping at least on duplex and clay profiles may be necessary to accelerate the leaching of salts. Gypsum and lime application may also be needed on the sodic or dispersive soils, but research is needed to define the soils that respond to gypsum or lime, work out the amount required and whether a single application is sufficient. The development of stable soil structure usually also requires organic matter otherwise the effects of ripping and gypsum or lime can be short lived. Finally biological priming of soil by plant roots of salt-tolerant species may be used to accelerate the recovery of soil qualities.

Joint project to tackle effects of acidic groundwater

The problems associated with acidic groundwater and drainage systems are to be the subject of a $660 000 project involving catchment groups, government agencies and research bodies.

Acidic, saline and metal-rich groundwaters are a natural part of the environment in some areas of the Wheatbelt and south-eastern WA.

The flushing of this acidic or metal-rich groundwater can cause unwanted off-site impacts including ecological damage to aquatic and riparian ecosystems; reduction of agricultural productivity through metal contamination of soils; and damage to infrastructure through the corrosion of concrete and steel pipes, bridges and other sub-surface assets.

Field observations suggest that the development of acidic seepages in parts of the higher rainfall areas of the Wheatbelt is a result of rising groundwater. In the northern and eastern areas, there are indications that acidic and saline groundwaters are entering surface systems as a consequence of high watertables and drainage systems.

The growing demand to install deep drains and other forms of drainage highlights the need to better understand and manage any acidic groundwater and the potential mobilisation of trace elements associated with such drainage systems.

The project is focussing on assessing the risk of enhanced discharge of acidic groundwater from engineering approaches and evaluating management options.

The joint project will involve government agencies, catchment groups, and research bodies including the Department of Environment, Department of Agriculture, the CRC for Landscape Environments and Mineral Exploration (CRC-LEME), and CSIRO Healthy Country.

The project will be integrated with the current Avon Regional Drainage Evaluation project undertaken as part of the Engineering Evaluation Initiative (EEI).

The EEI will provide funding of $200 000 which is to be matched with $460 000 from the CRC LEME.

Final approvals for the project are currently being sought as part of the National Action Plan for Salinity and Water Quality.

For more information contact Jane Filmer on (08) 9278 0450 or email jane.filmer@environment.wa.gov.au.

Skaggs to speak at Engineering Salinity Solutions conference

International drainage expert Dr Wayne Skaggs will be the keynote speaker at the upcoming 1st National Salinity Engineering conference to be held at the Burswood in November. Dr Skaggs has taught and conducted research into drainage and water management for 34 years. He is a member of the Overholt Drainage Hall of Fame, and has been presented with the prestigious John Deere Gold Medal which is awarded for achievements that advance the development of agriculture.

Papers will be presented on themes that include:

- Drainage design and assessment
- Groundwater pumping
- Saline water use / Downstream disposal
- Extent of salinity / Salinity mapping
- Salinity and roads
- Urban salinity
- Environmental impact assessment
- Instrumentation and systems
- Catchment modelling
- Innovative salinity management
- Catchment and regional scale engineering

Details of the conference program can be found at www.congresswest.com.au

The conference organisers have also announced a pre-conference technical tour. The tour will focus on salinity-affected areas in the Wheatbelt South Region of Western Australia. Check details on the conference website.

Groundwater pumping a palaeochannel — first find the palaeochannel

It is proposed to investigate depressurising the palaeochannel aquifer in the South Tammin area by pumping groundwater from it. Preliminary results suggest that the groundwater systems comprise a palaeochannel aquifer with overlying saturated sandy clay sediments. The aim is to dewater the sediments above the palaeochannel and so improve agricultural production.

The first step is to locate the palaeochannel. Like surface drainage, palaeochannels may meander or braid across the valley floors so it is expensive to locate them using drilling techniques alone. The EEI Project engaged the Cooperative Research Centre in Landscapes Environments and Mining Exploration (CRC LEME) geophysics experts to use ground-based geophysical techniques, gravity and electro-magnetics in particular, to help locate and delineate palaeochannels within the valley floors of Tammin and Dumbleyung.

Four transects were selected across the valley floor for geophysical survey. Both gravity and Transient Electromagnetic survey (TEM) results showed clear evidence for a palaeochannel trending approximately 330 degrees and with the deepest part of the palaeochannel close to the minimum in the gravity profiles. The palaeochannel appears to be asymmetric with gentler base slopes on the south-west side of the channel. The maximum depth of the palaeochannel is thought to be approximately 50 metres.

On the road again — EEI workshops set for March

Following on from the Salinity Engineering conference, the EEI team are set to have community-based workshops in March next year.

At this stage one workshop will be held in Dalwallinu and another in Dumbleyung.

The workshops will present outcomes from the Salinity Engineering Conference, present progress on EEI and provide an opportunity for feedback, and look at potential next steps in this program.

The next issue will provide more details of the workshops.

For more information contact Jane Filmer on (08) 9278 0450 or email jane.filmer@environment.wa.gov.au.