C Managing farm drains and channels for water quality

Objective

To ensure that farm drains and channels are managed to maintain or improve water quality.

Recommended management approach

The limited availability and cost of irrigation water makes it a valuable resource, and irrigated cotton farms now include a system to capture and reuse tailwater draining from furrows. These systems also provide an opportunity to capture runoff following rainfall. The water captured includes surface flow and water that has drained through the cropped bed profile and into the furrows. This water can carry large quantities of nutrients, particularly nitrogen, as well as herbicides and insecticides. If it is allowed to discharge directly into waterways, it raises nutrient levels and significantly affects water quality by promoting the growth of nuisance aquatic plants and algae. This problem is made worse when there is no riparian vegetation to lower light levels and reduce in-stream growth of nuisance plants or algae. By carefully siting drains, channels and storages for drainage water, cotton growers can minimise these negative in-stream effects.

Many of the recommended management approaches outlined in this guide can be applied to surface channels, drains and tailwater return channels on irrigated farms, as well as to dips, gullies and creeks on dryland farms that sometimes run with water. These are in effect, small streams, and even though they run intermittently, they represent a significant waterway network that has the potential to have large effects on downstream water quality. As a general rule, the battle to maintain water quality is won or lost in these small channels and drainage lines and, as a result, plans for new cotton farms or paddocks should include details about the management, treatment and reuse of drainage waters, both surface and sub-surface. Ideally, plans should also include provision for the capture and recirculation of excess drainage waters from within furrows. Paddock size and layout should be related to the furrow length required to provide adequate, but not excessive sub-soil moisture in the paddock. In this way, over-irrigation and excessive drainage of some parts of the paddock will be avoided, helping to maximise crop production for the irrigation volume available.

The management approaches recommended for farm drains and channels are as follows.

1. Minimise the movement of soil and nutrients into surface channels through the use of grassed filter strips where practical, or by using the crop itself and accumulated surface litter as a trapping mechanism (see Section A).

2. Wherever practical, ensure that surface channels are shaded. This helps to reduce the temperature of water draining into adjacent waterways which, in turn, decreases the growth of in-stream nuisance plants and algae (see graph page 69). If it is not feasible to plant shading vegetation, then it may be necessary to consider an artificial wetland or detention pond to capture and 'polish' the water from drainage channels. For dryland cotton farms, this will apply for all drainage waters (where feasible); for irrigated cotton farms that are required to retain tailwaters, there may be opportunities to also improve the quality of stormwater before it leaves the property. A natural or artificial wetland or detention pond with fringing vegetation and water depth of at least 50 centimetres, will enable water temperatures to drop, cause sediments to sink and enable nutrients to be absorbed by wetland plants. All of these lead to significant improvements in water quality before the drainage water reaches the natural waterway system . This is a particularly important issue for dryland cotton farms. On irrigated farms, the reservoirs or ring tanks used to store tailwater before it is recirculated can perform these very valuable functions, and growers aim to reuse all such water rather than allowing it to discharge from the property.

The term '**polish**' is used to describe actions aimed at improving the quality of water before it leaves the farm. For dryland cotton farms this refers to any water leaving the property; for irrigated farms the emphasis is on storm runoff. Actions to polish water generally involve removal of contaminants such as crop residues, soil particles, or nutrients and pesticides attached to those particles. This may be achieved through the use of grass or artificial filters, or by temporary detention in channels, storages or wetlands, or on paddocks.

3. Use furrow orientation and agronomic practice (e.g. stubble retention, reduced tillage) to minimise any loss of soil, crop residue or drainage waters from paddocks that directly discharge into waterways. Ways of designing on-farm drains and channels to improve water quality are:
   - using contour banks within cropped paddocks;
   - maintaining vegetation within drains and channels;
   - retaining a stand of short grass at the bottom end of gullies and channels;
   - using vegetation filters wherever possible;
   - using drop boxes, stilling ponds and return drains to store water and allow sediment to settle out (periodic removal of sediment will be required);
   - reducing erosion risk by using wider channels of low slope and grassy beds; and,
   - calculating likely flow volumes and velocity before drainage or recirculation channels are designed.

By incorporating these design criteria, the costs associated with improving the quality of water leaving cotton farms can be reduced to a minimum. In areas where captured water is a valuable resource for irrigation, the additional costs incurred may be recouped quickly through increased production.

There are several examples within the industry where growers have incorporated such practices in a way that improves yields (for example, by constructing small levees to establish a wetland and storage for reuse) which more than compensated for the costs.

Self-assessment

Cotton growers can check their progress in better managing farm drains and channels by including in their farm plan:

- design and layout of paddocks to allow for the capture, polishing and reuse of drainage waters;
- practices designed to improve the quality of water leaving the farm, either through active management of surface channels, or through collection and treatment of drainage waters;
- periodic testing of surface and sub-surface waters leaving the farm, to test whether water quality standards are being met;
- keeping all water in-field or on farm. Failing this, runoff should be kept away from sensitive areas, or 'cleaned up' before it reaches sensitive areas. This is a particular issue for dryland farms that do not have the channel infrastructure found on irrigation properties; and,
- using BMP Manual (farm design and stormwater management sections).

The value of artificial wetlands

Wayne Reeves — 'Parker Joint Venture', Emerald

By David Kelly

'Parker Joint Venture' is a mixed farming operation producing an average of 550 hectares of irrigated cotton per season as well as dryland and irrigated cereal and fodder crops. The property takes its irrigation water from the Fairbairn Dam via the Nogoa River. All irrigation water is retained on the farm by using an artificial wetland located in the centre of the property. The wetland is used throughout the year, with all irrigation tailwater passed through it. The area is home to a myriad of wildlife, including many waterbird species. Regular testing is carried out on water quality in the wetland to determine the chemical content and to assess aquatic species diversity.

Since the testing began in 1999, water samples from the wetland have not shown excessive levels of chemicals, and monitoring done as part of the Waterwatch program has shown that the wetland contains freshwater macro invertebrate species that would not be present if the water was polluted.

Parker Joint Venture was winner of the Australian Cotton Grower of the Year and Cotton Achiever of the Year in 2002, with special commendation in both awards for the environmental and irrigation management practices used on-farm. Wayne Reeves, the manager of Parker Joint Venture believes that the contained system working on the property allows much greater water use efficiency as tailwater from irrigation and stormwater events can all be reused. He maintains that the money spent on building the wetland has paid for itself many times over as a result of this improved efficiency.

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A final word...

'The wetland is an indicator of our on-farm environmental practices. Maintaining a healthy wetland such as this on a cotton farm demonstrates the industry's environmental awareness and responsibility.' Wayne Reeves

Regular sampling of the wetland areas enables water quality to be monitored. Photo David Kelly.

CASE STUDY C chapter three

Containing tailwater on-farm

Millar Farms — 'Trawalla', Emerald

By David Kelly

'Trawalla' is a 280 hectare irrigation farm on the left bank of the Emerald Irrigation Area. Getting its water from Fairbairn dam via the Selma Channel, it produces irrigated cotton and winter rotation crops such as wheat and chickpea.

Trawalla has a fully contained tailwater system that allows all irrigation and stormwater to be kept on farm. The system is all gravity fed except for 40 hectares of the property, this means the ability to catch water is not reliant on pumps. To further assist this, all dams are kept at a relatively low level during the season.

Water quality is monitored regularly through collaboration with the Waterwatch program. Testing up to this point has not found any excessive levels of nutrients of pesticides in the system. The storage dams also play host to a large range of aquatic fauna including small shellfish and insect species that are good indicators of water quality.

Water quality monitoring is an ongoing activity on the farm. From left Daniel Bock, Charles Forsyth, Sala Rankine. Photo Patricia Bock.