E Managing river offtake pumps, ring tanks and storages

Objective

To site and design offtake pumps, ring tanks and storages to maximise efficient management of water supplies and minimise environmental impacts.

Recommended management approach

The BMP Manual includes general principles about the siting of water management structures. Cotton growers should follow these guidelines, as well as implement the following recommended management approaches:

1. Wherever possible, tailwater collection drains, recirculation channels and storage tanks should be sited in the lower part of the property, allowing gravity flow and, where possible, a single pump lift back into the delivery system. In siting this infrastructure, it is important to work out the natural discharge points for the property — these are the points where water will leave the farm during a major rainfall or flood event and re-enter the local waterway system. Problems can occur when farm channels and storage overflows become discharge points as they may be vulnerable to substantial erosion unless they are maintained with a high level of vegetative cover.

2. When designing the size, shape and location of storages and channels, the ability to store first flush runoff should be considered (at least the first 15 millimetres of surface runoff). As noted in earlier sections, this first flush of runoff is likely to carry the highest concentrations of pesticides and nutrients. Once constructed, storages need to be managed so that the designed storage capacity is available at times during the cropping season when there is a high likelihood of storms and runoff. This may require growers to circulate captured tailwater to higher parts of the channel system when there is a threat of storm runoff. The order of pump starts and gate opening/shutting will need to be designed and tested to optimise storage and management of runoff prior to its release.

3. Where the shape or location of the property and cropping paddocks makes it difficult to obtain the required level of storage within recirculation channels, reservoirs and ring tanks, consideration should be given to providing a temporary store for first-flush runoff on the lowest paddocks. Storage of this water on cropped paddocks for 24 hours can result in a substantial improvement in the quality of the water without huge detriment to the crop. A volumetric calculation based on the cropped area and the need to retain the first 15 millimetres of storm runoff can be used, with this volume to be matched by the storage capacity of the 'retention' paddock.

4. On dryland cotton farms, as much as possible, the first flush runoff should be kept on the paddock using crop layout, row direction, stubble retention and other agronomic practices, for example, using filter strips at lower-lying headlands to prevent large loads of sediment and pesticides entering waterways. More details about recommended filter strip widths can be found in Section A.

Lombard Farms, Warren, access their irrigation water directly from the Macquarie River. A 20,000 litre fuel tank supplies their five river pumps. The tank is concrete bunded so spillages do not reach the river, 50 metres away. It slopes to a drain hole allowing the spilt fuel to be returned to the tank. The bunding will hold the tank's capacity.

Concrete bunding was chosen over an earthen one because spillages can be salvaged and it prevents seepage into the river. Matt Seccombe, the farm manager, says if they were to do it again, and the funds did not lean towards concrete, he would have an earthen floor with a plastic lined base and walls of concrete or bessa bricks to prevent seepage into the river.

Bunded fuel tank at Wambandry. Photo Kirrily Rourke.

5. When installing a river offtake pump, disturbance to the waterway bank should be kept to an absolute minimum. This is because rivers flow at their fastest on the outside of waterway bends. This often results in a scour pool forming on these bends, and sometimes an equivalent point bar of sediment building up on the inner bend. Growers often prefer to site pumps at the outer bend because of the deeper water. However, because of the higher flow speed, the outer bend is at most threat of bank erosion. Given the expense involved in most pump installations, growers should consider reinforcing the bank to help reduce the risk of future erosion. Vegetation may be enough to protect the bank from eroding, but engineering solutions are required in some situations. This might involve posts and netting to reduce flow speed immediately adjacent to the bank, groynes to direct flow back towards the centre of the channel, or even rock rip-rap along the toe itself. These sorts of in-stream works generally need to be licensed and should only be undertaken after consultation with the agencies responsible for waterway management.

Rock riprap and meshing is being used here to stabilise the channel bank. This type of engineering solution is sometimes necessary to protect pumps and other infrastructure from high water flows. Australian Cotton Research Institute.

Left: Reverse angle from photo above. Photos Guy Roth.

Self-assessment

Cotton growers can check their progress in better managing river offtake pumps, ring tanks and other water management structures by including in their farm plan:

- stormwater management practices that are integrated with local area Floodplain Management Plans and Stormwater Plans, and which meet BMP Manual requirements; and,
- the capacity to retain at least the first 15 millimetres of runoff from total cropped area, with flows leaving channels and storage overflows directed away from waterways so that they run through vegetated areas before they leave the property.

Using on-farm wetlands to manage runoff

By Mick Rose

Artificial wetlands have been used for a number of decades to clean stormwater and urban wastewater of suspended sediments, pathogenic bacteria and excess nutrients. Wetlands work because they slow the water moving across cotton fields and filter it through the plants and animals that live in these environments. Recent studies at The University of Sydney have now identified a number of plants that can accelerate the removal of pesticides from water, including Water Primrose and Slender Knotweed. A pilot study on Mollee, a cotton property near Narrabri, has shown that by arranging these plants in an artificial wetland, a reduction of up to 40% of some pesticides found in irrigated cotton tailwater (over a 12-day period) can be achieved.

It is anticipated that a sub-surface wetland, that is, one that filters water through vegetated gravel or equivalent, will be able to further reduce pesticides whilst allowing water movement to continue around farms. This is now being researched in a number of treatment channels on Auscott Narrabri, another irrigated cotton farm.

This research is showing that successful integration of artificial wetlands into farming systems can reduce the risk of pesticides toxicity to wildlife, native vegetation and livestock. Treated water may subsequently be used for other purposes, such as irrigation of a different crop, watering livestock or aquaculture. This project was funded by the Australian Cotton Cooperative Research Centre.

A final word...

On-farm wetland systems may also provide a number of other services including reduced evaporation through water-cooling and surface windspeed reduction; refuges for beneficial insects; an increase in on-farm biodiversity and feed for livestock after the cotton-growing season.

CASE STUDY chapter three E

An artificial wetland being sampled for water quality. Photo Mick Rose.