



### The Green Book Best Management Practice Guide

## 2. Water

Best Management Practice (BMP) of irrigation water on horticultural farms strives to maximise water use efficiency and minimise the impacts of irrigation on regional watertables and salinity levels, and off-farm and downstream environments.

This section of *The Green Book* provides the key objectives of BMP for water management and presents a list of management actions to help achieve those objectives. At the end of this section is a checklist of BMPs recommended for sustainable management of horticulture farms in the Murrumbidgee Irrigation Area (MIA).



The actions for BMP presented in this document are a summary of the key issues for environmentally sustainable horticulture in the MIA. Full details and references can be found in *The Green Book* companion chapter – WATER.

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## BMP objectives

### Objective 1 – Demonstrate water use efficiency on horticultural farms

As much as 40% of irrigation water can be lost through surface run-off and deep drainage. Excess water losses impact on downstream water quality (through turbidity, salinisation and chemical contamination), as well as crop production and sustainability (through waterlogging, salinisation and loss of soil structure).

Water use efficiency can be demonstrated on farm through the following actions:

- Test irrigation system efficiency every year against the systems performance at installation. Pressurised systems should reach an operating efficiency of 95%.
- Schedule irrigations according to crop requirements using soil moisture monitoring equipment (eg gypsum blocks, capacitance probe, tensiometer), crop coefficients and evapotranspiration data.
- Keep irrigation records that include:
  - water meter readings pre and post irrigation (by crop type/variety/block)
  - water application rate
  - rainfall
  - watertable depth (from test wells).
- Compare actual water use with expected water use to demonstrate a water use efficiency of 80% or greater.
- Compare seasonal water use (ML/ha, \$ return/ML, yield/ML) across years and between like enterprises. Use this information to set water budgets and improve water use efficiencies for subsequent years.



### Objective 2 – Monitor and take action to reduce on-farm impacts on watertable depth and salinity

Watertable depths have risen from 20 m to around 2 m in the MIA over the last 100 years and up to 80% of the agricultural land in the area is predisposed to waterlogging. The presence of shallow saline watertables and continued waterlogging inhibit crop production and impact on downstream water quality as subsoil salts are mobilised and nutrients are lost to drainage water.

Management to reduce on-farm impacts on watertables and salinity can be demonstrated on farm through the following actions:

- Measure and record test well depth pre and post irrigation for surface irrigators and at least quarterly for pressurised systems.
- Measure and record groundwater salinity at the beginning and end of the irrigation season.
- Irrigate efficiently so that actual water use is less than 20% above estimated crop water use requirements.
- Leave tile drain pumps off as default position. Do not operate during irrigation or immediately after chemical application. Adjust float switch to 30 cm above drain pipe.
- Ensure surface drainage systems are capable of completely draining the block in 12–24 hours.
- Collect surface drainage water and reuse on farm or dispose of via regional drains.
- Plant deep-rooted perennials on slopes below horticultural plantings and along farm supply channels to intercept drainage and channel seepage.
- Use inter-row swards (perennial crops or sod culture) to reduce subsurface drainage on surface irrigated farms and in areas prone to waterlogging.
- Maintain vegetated (grass or volunteer weed) verges along head lands and channel banks to minimise erosion and intercept drainage.
- Strategically plant trees in recharge areas (seek advice of Landcare or NSW DPI).



Photo - Wine Grapes Marketing Board

### Objective 3 – Minimise negative impacts from horticultural enterprises on the aquatic environment and downstream water quality

The Department of Environment and Climate Change (DECC), through the Environment Protection Authority (EPA), sets regulations for the quality of drainage water in the MIA. Murrumbidgee Irrigation monitors water quality in relation to chemical residues, salinity, nutrient loads and turbidity. Water quality impacts on downstream users and directly on the survival of many aquatic species.

Management to minimise impacts on the aquatic environment and downstream water quality can be demonstrated on farm through the following actions:

- Transport, store and dispose of chemicals (including fuels) and containers to minimise risks of spillage and contamination of water bodies, eg:
  - prepare chemicals away from any water body
  - contain and clean up pesticide, fertiliser or fuel spills immediately (see CHEMICALS section).
- Avoid pesticide application immediately prior to irrigation or rainfall. Use biological agents and non-residual chemicals as a first choice.
- Wash down farm equipment (including harvesters and spray tanks) away from water bodies, especially channel banks, and not in groundwater recharge areas or areas of known high watertables (within 1 m of surface).
- Irrigate efficiently (based on identified crop requirements) to minimise loss of nutrients and pesticides via drainage. Note that drainage is likely to be greatest in first one or two irrigations of the season.
- Apply nutrients based on crop need, in several smaller applications and banded to crop root zone. Incorporate fertilisers into soil where possible.
- Use slow release fertilisers or a fertigation system especially on permeable soils.
- Maintain vegetation near water bodies and channels to act as a buffer zone from chemical application and trap silt and nutrients from surface run-off.

#### In focus – Protecting aquatic systems

All pesticides except biological agents (eg Bt) should be assumed to be detrimental to aquatic life. Certain groups are particularly toxic, eg:

- all pyrethroids (active ingredient ending with ‘-thrin’) and rotenone are very toxic to fish and crustacea and may persist in the aquatic environment for several weeks
- most organophosphates (active ingredient generally contains -thion, -oate, -phos, -fos)
- organochlorines
- some carbamates, eg methiocarb and propoxur.

Nearly all wetting agents used with herbicides are toxic to aquatic fauna, particularly frogs.

The triazine group of pre-emergent herbicides, which includes atrazine and simazine, is an example of chemicals that are at high risk of being transported into streams, wetlands and dams by run-off and erosion. The herbicidal properties of triazines can persist for up to four months.

## Key legislation and codes of practice

- *Protection of the Environment Operations Act 1997* (NSW)
- *Water Management Act 2000* (NSW)
- *Water Management Amendment Act 2008* (NSW)
- Murrumbidgee Irrigation Shareholders' Handbook
- MIA and Districts Community Land and Water Management Plan (MIA EnviroWise)
- Murrumbidgee Catchment Management Action Plan (2006)
- Australian Code of Practice for on-farm irrigation (2001). Irrigation Australia.  
[www.irrigation.org.au/index.cfm?/publications/downloadable-publications](http://www.irrigation.org.au/index.cfm?/publications/downloadable-publications)

Acts, and amendments and regulations relating to acts, of the NSW Government can be found at [www.legislation.nsw.gov.au/](http://www.legislation.nsw.gov.au/) and then easily found using the 'Browse' or 'Search' facilities at the site.

## More information

### Key contacts

Murrumbidgee Irrigation .....	02 6962 0200
NSW Department of Primary Industries (Griffith) .....	02 6960 1300
NSW Department of Environment & Climate Change (Griffith) .....	02 6969 0700
NSW Department of Environment & Climate Change (general) .....	131 555
CSIRO Land & Water .....	02 6960 1500
Irrigation Research and Extension Committee .....	02 6960 1550
Murrumbidgee Landcare Incorporated .....	02 6925 7718
Greening Australia .....	02 9560 9144

### Industry

Murrumbidgee Horticulture Council .....	02 6964 2420
Wine Grapes Marketing Board .....	02 6962 3944
Australian Prune Industry Association .....	03 5023 5174
Riverina Citrus .....	02 6964 4333

### Web sites

Department of Agriculture, Fisheries & Forestry .....	<a href="http://www.affa.gov.au">www.affa.gov.au</a>
NSW Department of Primary Industries .....	<a href="http://www.dpi.nsw.gov.au">www.dpi.nsw.gov.au</a>
CSIRO Land & Water .....	<a href="http://www.clw.csiro.au">www.clw.csiro.au</a>
Et data for Griffith .....	<a href="http://www.clw.csiro.au/services/weather">www.clw.csiro.au/services/weather</a>
Cooperative Research Centre for Viticulture .....	<a href="http://www.crcv.com.au">www.crcv.com.au</a>
Department of Environment, Water, Heritage and the Arts .....	<a href="http://www.environment.gov.au">www.environment.gov.au</a>
NSW Department of Environment and Climate Change .....	<a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a>
DPI - Fisheries & Aquaculture .....	<a href="http://www.dpi.nsw.gov.au/fisheries">www.dpi.nsw.gov.au/fisheries</a>
Irrigation Australia .....	<a href="http://www.irrigation.org.au">www.irrigation.org.au</a>
NSW Landcare .....	<a href="http://www.landcarensw.org">www.landcarensw.org</a>
Land & Water Australia .....	<a href="http://www.lwa.gov.au">www.lwa.gov.au</a>
Land & Water Australia - River Landscapes .....	<a href="http://www.rivers.gov.au">www.rivers.gov.au</a>
Murray-Darling Basin Commission .....	<a href="http://www.mdbc.gov.au">www.mdbc.gov.au</a>
MIA EnviroWise .....	<a href="http://www.mirrigation.com.au/EnviroWise">www.mirrigation.com.au/EnviroWise</a>
Murrumbidgee Irrigation .....	<a href="http://www.mirrigation.com.au">www.mirrigation.com.au</a>

## Best Management Practice checklist for water management in the MIA

Use this checklist to assess how you are managing water on your farm.  
Depending on your answers, this list can form the basis of a plan  
for improving the sustainability of your farm management practices.

Best Management Practice	Yes	Partly achieved	To do	N/A
1 Irrigation system efficiency is optimised (maintained at 90% for pressurised systems and ~80% for surface irrigation).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Irrigations are scheduled in response to crop requirements using soil moisture monitoring equipment, evapotranspiration information and crop coefficients to achieve a water use efficiency (expected water use vs. actual) of 80% or greater.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 Irrigation efficiency is demonstrated through comparisons of expected and actual water use. Records are kept and compared across seasons and between like enterprises.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 On-farm watertable depth is recorded at the start of the irrigation season and strategically throughout the season (before and after each irrigation for surface irrigators).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Storage and mixing of all farm chemicals (and storage of chemical containers) occurs away from any water body or where run-off may contaminate a water body.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Drainage from irrigation and rainfall is managed to prevent subsoil salt and chemical mobilisation and waterlogging.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Surface run-off is collected and reused (on farm or via regional drains).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Risks to water bodies and aquatic species from chemical and fuel contamination are identified and managed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Nutrient loss through leaching and erosion is minimised.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Land next to water bodies is actively managed to prevent water contamination and protect aquatic species.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>