



# VEGE *notes*

Your levy @ work

## Irrigating Vegetable Crops with Recycled Water

Reclamation and reuse of a variety of treated wastewaters on food crops has been practiced for more than 50 years around the world.

Any reuse scheme developed now is by no means a 'world first'. For example, recycled water has already been used for many years in the United States, Israel and Australia for irrigating a range of food and fodder crops.

### Recycled water quality

Most Australian states have guidelines for irrigation with recycled water; there are also national guidelines.

These guidelines have been developed from extensive research, and risk management principles from Australia and around the world.

Users and consumers can be confident that the quality of produce grown with recycled water is as high as produce grown from any other source.

To ensure recycled water is fit for purpose, scheme operators, managers and practitioners should consult state and national guidelines for detailed information regarding the appropriate water qualities required for a particular reuse scheme.



*Pipes carrying recycled water are obvious from their lilac colour*

### Benefits

Recycled water irrigation schemes offer substantial environmental benefits:

- Reduction of nutrient loading into sensitive aquatic environments
- Replacement of drinking water sources, freeing up our limited water resources for urban uses or environmental flow

There are also potential benefits to agricultural enterprises:

- Guaranteed water supply and quality
- Recycling of valuable nutrients
- Security for investment where water is scarce

### The Bottom line

- Recycled water is used around the world for vegetable production.
- Recycled water schemes must be approved by health and environment related departments in your state.
- Recycled water irrigation schemes offer substantial environmental and agriculture benefits to the community.

Recycled water can be produced through different types and degrees of treatment, to supply a defined quality of recycled water.

There is now technology to produce safe potable (i.e. drinking) water, if there is ever a demand. In fact, recycled water for potable use is currently being undertaken in some countries.

## Can you grow vegetables?

In Australia, Class A is the highest rating for recycled water used for irrigation and is equal to the most stringent guidelines worldwide. Australian standards for Class A recycled water exceed those recommend by the World Health Organisation for irrigation of food crops<sup>(1)</sup>.



*Fresh produce crops can be grown with Class A recycled water*

State Departments of Human Service and Environmental Protection Authorities (or the equivalent) set these strict guidelines to ensure the safety of growers irrigating with recycled water and the produce grown with it. Every reuse scheme requires the approval of these departments and must show that appropriate safeguards are in place (before the reuse scheme is commissioned). This guarantees a particular water quality to growers, which is fit for purpose.

These extensive safeguards ensure the microbiological and chemical safety of recycled water, and the quality of food and salad crops grown with it.

## Guidelines for recycled water

There are extensive guidelines for use of recycled water in most states of Australia. Contact your Environmental Protection Agency for a copy (details on back page).

## Food quality and safety

There should be no difference in the quality of food irrigated with recycled water. There have been hundreds of scientific research projects and trials completed around the world to ensure it is safe.

For example, a ten-year project in Monterey, California has been the subject of a landmark study on crop irrigation with recycled water<sup>(2)</sup>.

The Monterey study investigated and compared crops grown with recycled water (Class A equivalent) and those irrigated with water from other sources.

In terms of health and nutrition, the findings confirmed that food produced with high quality recycled water is the same as any other produce.

The research found no significant difference between the two types of produce in terms of heavy metals or the presence of bacteria.

The research also examined a number of other issues. In terms of crop yields, few differences were recorded,

although higher yields from celery and broccoli crops were noted when they were irrigated with recycled water.

The quality and shelf life of produce was also put under the microscope. It was found to be as good, and in some cases, superior to, produce grown with the bore water used in the area.

There are no restrictions on irrigation methods or the types of crops that can be grown when using Class A recycled water. Restrictions only apply when using a lower class of recycled water such as Class B, C or D.

## Potential issues

All crops grown with recycled water must adhere to the strict guidelines mentioned above. These

cover classes of water, types of crops and irrigation methods used, and are designed to ensure all produce is safe for consumption. If guidelines are not followed, despite inbuilt safety barriers, health concerns may arise and should be directed to your State Environment Protection Agency (or equivalent).

## Salinity

Recycled water often has higher salinity levels than surface or groundwater commonly used for irrigation, although this is site specific. The important point to remember is that the salinity of recycled water must still be matched with the:

- crop to be grown
- soil to be irrigated
- leaching required

Salinity of irrigation water is generally measured by electrical conductivity (EC), which indicates the total dissolved salt content (TDS).



*Saline soil*

Plant tolerance to water salinity varies considerably between species and can range from sensitive crops (EC < 650  $\mu\text{S}/\text{cm}$ ) to tolerant crops (EC ranges from 2900 to 5900  $\mu\text{S}/\text{cm}$ ). Note: 1 dS/m = 1000  $\mu\text{S}/\text{cm}$  = 640 mg/L of TDS (TDS value can vary from 550 to 950 depending on water chemistry)<sup>(3)</sup>.

## Sodicity

Sodicity refers to the amount of sodium in the soil or water. For soil, this is measured as the Exchangeable Sodium Percentage (ESP), which is the proportion of sodium as a percentage of all the exchange cations (e.g.



*Sodic soil*

*Source: Pichu Rengasamy*

calcium, magnesium, potassium, etc) adsorbed on the soil.

The sodicity of water is measured as the Sodium Absorption Ratio (SAR). Put simply, the SAR is the amount of sodium present in a solution, relative to the amounts of calcium and magnesium.

SAR can be used for measuring soil sodicity by measuring the SAR in soils by mixing (extracting) water with soil and measuring the concentration of calcium, magnesium and sodium in the extract.

Use of irrigation water with a high SAR can lead to soil structural and drainage problems.

## Boron

Higher concentrations of boron are often found in recycled water compared with bore and surface waters (site specific). Sensitivity of plants to boron varies significantly between species and baseline soil concentrations of boron. Both need to be considered before irrigating with the recycled water.

## Heavy metals

Heavy metals concentrations in recycled water are usually low and not a significant factor in preventing its use in horticulture. However, it is still important to check that no guideline values are exceeded<sup>(3)</sup>.

## Nutrients

Significant amounts of nutrients can be applied when irrigating with recycled water. The amount applied depends on the source of the water being recycled, treatment process (e.g. if nitrogen and phosphorus are removed) and the amount of recycled water irrigated per crop. Simple loading calculations can be used to estimate the nutrients applied in each irrigation.

## Recycled water vs reclaimed water

These terms are often used interchangeably according to the terminology that different states have adopted.

- **Recycled water** – is a generic term for water that is suitable for a controlled use as a result of treatment of waste. This use would otherwise not occur.
- **Reclaimed water** – is a more specific term for water going to waste that is reclaimed to be used in a different industry (e.g. agricultural irrigation of treated urban sewage effluent which would normally go out to sea).



Recycled water storage

## Acknowledgements

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 Daryl Stevens and Jim Kelly  
 Arris Pty Ltd  
 ph (08) 8303 6707  
 dstevens@arris.com.au

### State contacts for more information on recycled/reclaimed water and state guidelines

#### New South Wales

NSW Department of Environment and Conservation  
 ph (02) 9391 9000  
[www.epa.nsw.gov.au](http://www.epa.nsw.gov.au)

#### Queensland

Department of Primary Industries and Fisheries  
 ph (07) 3404 6999 or 13 25 23 (within QLD)  
[www.dpi.qld.gov.au](http://www.dpi.qld.gov.au)

#### South Australia

EPA South Australia  
 ph (08) 82042097  
[www.deh.sa.gov.au/epa/contact.html](http://www.deh.sa.gov.au/epa/contact.html)

#### Tasmania

Department of Primary Industries, Water and Environment  
 ph (03) 6233 6518  
[www.dpiwe.tas.gov.au](http://www.dpiwe.tas.gov.au)

#### Victoria

EPA Victoria  
 ph (03) 9695 2722  
[www.epa.vic.gov.au](http://www.epa.vic.gov.au)

#### Western Australia

Department of Environment  
 ph (08) 9278 0427  
[www.wrc.wa.gov.au](http://www.wrc.wa.gov.au)

#### Northern Territory

Project Manager Water Recycling  
 ph (08) 89517218

## References

- (1) WHO (1989). "Health guidelines for the use of wastewater in agriculture and aquaculture." World Health Organisation, Geneva.
- (2) Sheikh, B, Cort, R, Kirkpatrick, W, Jacques R and Asano, T, May/June 1990 "Monterey wastewater reclamation study for agriculture" Research Journal of the Water Pollution Control Federation, Vol 52 Number 3.

- (3) ANZECC and ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, **National Water Quality Management Strategy** Paper No.4. Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand. [www.affa.gov.au](http://www.affa.gov.au) (look in the Natural Resource Management page - Water).

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VEGEnotes is coordinated, edited & printed by:  
 ARRIS Pty Ltd, ph (08) 8303 7247 fax (08) 8303 6752

Level 1, 50 Carrington Street  
 Sydney NSW 2000 Australia  
 Telephone (02) 8295 2300  
 Facsimile (02) 8295 2399  
[www.horticulture.com.au](http://www.horticulture.com.au)



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