

Water Management for Horticulture Factsheet



***Practical water management advice for horticulture
growers in Wales***

RICARDO-AEA



Cronfa Amaethyddol Ewrop ar gyfer Datblygu
Gwledig: Ewrop yn Buddsoddi
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Introduction

Climate change and population growth are increasing pressures on water resources in Wales. Sustainable water management is key to securing a reliable supply of clean water to meet the needs of a growing population and its economy. The horticultural sector is an important and growing contributor to the Welsh economy and in 2014, output from horticulture in Wales was estimated to be worth £39.1 million¹. Within the sector, water is used in both the irrigation and processing of the crops; by improving management of this resource, we will help ensure a sustainable horticulture industry in Wales.

Improving water management through better planning can increase resilience during times of drought or flood, ensure nutrient retention and watercourse protection, and lead to savings through reduced wastage.

This factsheet will provide you with water management advice on:

- ✓ The main legislative requirements/regulations;
- ✓ How to reduce water use;
- ✓ How to improve water quality; and,
- ✓ Where to go for further water management support.

Why reduce water?

Water is vital to the economy, environment and society. It is used to grow food, generate power, and encourages tourism.

Whilst most catchments in the West and North of Wales have water available, water resources in the East of the country are heavily committed (Figure 1). Climate change and population growth are likely to exacerbate the problem.

The water usage for intensive crops such as horticulture can be higher than for other agricultural sectors resulting in a larger water footprint. In 2011, WRAP² conducted a study looking into the largest abstractors of water in England and Wales. The horticulture sector was identified as the second largest abstractor of water, mainly due to the amount of water used for spray irrigation.

Figure 2: Ecological status of potential of surface waters in Wales, 2012 classification³

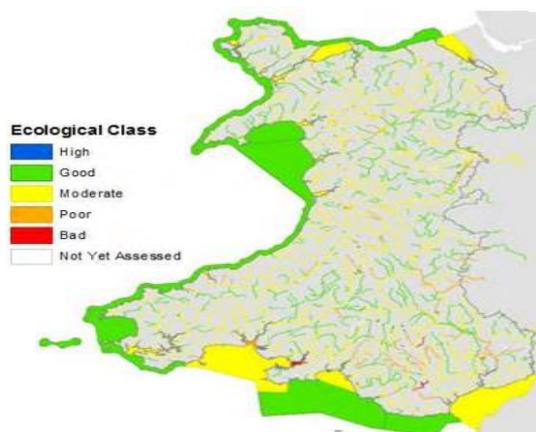
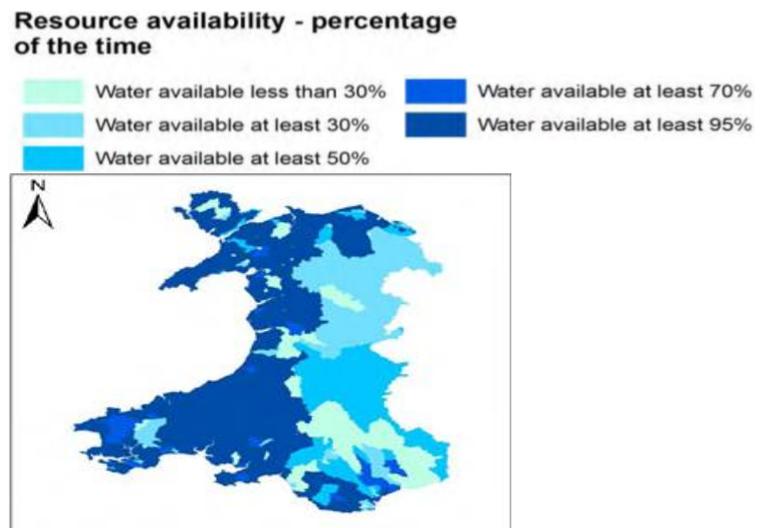


Figure 1: Water resource availability (% of the time) in Wales³



What about water quality?

The sector, through its use of fertilisers and high water use, has a responsibility to carefully consider how its activities affect water quality. Currently, only just over a third of water bodies in Wales achieve 'good ecological status' under the criteria set out in the EU Water Framework Directive (Figure 2). There are many reasons for this but it is thought that mines, contaminated land and agriculture are major contributors.

Horticultural crops occupy less than 4% of the total UK area under crops, as high value crops they can receive large quantities of fertilisers and pesticides on a concentrated area. This can increase the risk of diffuse pollution to ground and surface water.

What are my legislative responsibilities?

There are a number of regulations that govern and control the use and management of water. These are in place to ensure that there is a sustainable water supply for water consumers and for the surrounding ecosystems, and that water supply is of sufficient quality so that it is fit for purpose and can maintain the aquatic and riparian wildlife that depend on it.

Water quantity

Abstraction licensing

If you abstract water direct from rivers, lakes or from groundwater via a borehole you may need an abstraction licence from Natural Resources Wales. This is a requirement if you take more than 20 cubic metres or 4,000 gallons per day. There are currently around 1,100 abstraction licences in Wales. The Environment Agency reported that currently 7% of water bodies in Wales are unable to provide a reliable source of water where abstraction is 'consumptive' and not returned to the waterbody⁴. If you wish to apply for a licence, you must first complete a [pre-application](#) form from Natural Resources Wales.

In 2014 the Welsh Government (WG) launched a consultation on the abstraction licencing system. This is in response to increased areas of water stress and it is possible that there may be changes to the abstraction licence process in the future. Further information can be found [on the WG website](#). The consultation also considered the opportunities for selling water rights between abstraction licence holders. This concept of water trading may continue to be developed over the forthcoming years.



Ystradfellte Reservoir, Brecon Beacons National Park

Water quality

Water Resources Act 1991

The Water Resources Act 1991 sets out measures to prevent water pollution⁵. It is an offence to cause or knowingly permit a discharge of poisonous, noxious or polluting matter or any waste matter into ground or surface waters. However some activities may be exempt if they are covered by a consent or permit further information can be found [here](#)

Water Framework Directive (WFD)

European Legislation known as the WFD requires an integrated approach to managing water quality across catchments. To enable appropriate actions to be taken to restore and maintain water quality, water bodies have been classified based on their current status. You can find out what the quality is of your local waterbody [here](#) by using the interactive map produced by Natural Resources Wales.

Nitrate Pollution Prevention (Wales) Regulations 2008

The use of fertilisers means that horticultural crops can leach large amounts of nitrates into the environment and into ground and surface water. To reduce water pollution caused by nitrates, Nitrate Vulnerable Zones (NVZs) were established. Currently around 2.4% of Wales falls into an NVZ. If your land falls within a NVZ you are legally required to comply with regulations surrounding the storage of organic manure and the application of nitrogen fertiliser.

Details of designated NVZ zones are available from Natural Resources Wales and the NVZ Helpline – 01974 847000.

For specific guidance on how to manage your land and horticultural crops can be found [here](#)

UK Plant Protection Products (Sustainable Use) Regulations 2012

Aims to reduce the risks of the use of pesticides on human health and the environment which includes water. See the Horticulture Wales Factsheet [here](#). This will be achieved by the implementation of a number of measures:

- Establishing National Action plans;
- Compulsory testing of spraying equipment;
- Training and certification for operatives, advisors and distributors;
- Ban of aerial spraying;
- Provisions to protect water, public spaces and conservation areas;
- Minimising risks from handling, storage and disposal

How can I become more water efficient?

With increasingly unpredictable climatic conditions, population growth, and tighter legislation, access to sufficient water supplies all year round may become more difficult. By considering the source of your water, how much water you use, and where you use it, you can take steps to becoming more water efficient, make cost savings and improve your business resilience.

Tips for reducing water consumption

- ✓ Make a water management plan.
- ✓ Record and monitor water use so you know how much is being used and where.
- ✓ Map water lines and ensure staff know where to find stop valves.
- ✓ Improve soil structure to improve water retention e.g. adding organic matter or using mulches.
- ✓ Reduce water loss via evaporation from crops by taking advantage of shading and shelter from wind.
- ✓ Encourage deep rooting crops.
- ✓ Maximise use of rainfall and stop / reduce irrigation accordingly.
- ✓ Prioritise those areas of highest water use first e.g. irrigation.
- ✓ Match irrigation methods with soil type e.g. water flows less quickly through clay soil compared to sandy soil and so will retain water better.
- ✓ Use timers and soil moisture sensors to introduce flexibility into your irrigation schedule.
- ✓ Consider efficient irrigation technology which directly applies water to the plant base and roots. Drip irrigation is an efficient method and transports water through the field in pipes and slowly deposits it into the soil by the plant.
- ✓ Avoid overhead sprinkler systems which result in large amounts of water being lost to the environment through evaporation.

Becoming more water efficient should not impact on the quality or yield of crops and it is important that water management plans are specific to the crops being grown and the environment they are grown in. To understand horticultural water requirements and irrigation systems then the [UK Irrigation Association](#) provides support and further information.

Tips for securing water supply

- ✓ Rainwater harvesting from building roofs
- ✓ Reuse water e.g. from farm or crop processing activities
- ✓ Install Leak detection systems
- ✓ Build storage reservoir enabling water to be stored during period of high rainfall
- ✓ Storm water harvesting



Drip irrigation for salad crops

Making water management plans!

1. **Short-term seasonal plan** e.g. re-scheduling the allocation of water to prioritise crops in critical irrigation periods such as germination or flowering.
2. **Long-term strategic plan** e.g. investing in a reservoir to meet all irrigation needs.
3. **Drought plan** so crops are not affected during a hosepipe ban or drought restriction permit e.g. prioritise higher value crops to minimise impact on financial budget.



Water harvested from roofs and stored for irrigation

Water storage

Rainfall varies over the year and depending on the crops you are growing there may be an opportunity to develop a storage reservoir or install rainwater harvesting on your own property or in conjunction with fellow growers, to provide you with access to water during the summer or drier months. This can be particularly useful if you are in an area of Wales where water can be scarce in the summer months, or is likely to be constrained in the future as a result of climate change. See [here](#) for Environment Agency guidance to help with the process of installing an irrigation reservoir.

Rainwater Harvesting

Set up rainwater harvesting to capture rainfall from roofs and large surfaces, store and use as and when required. In the UK, it is possible to capture up to 60 litres of water per square metre of roof which means less water from abstraction or a saving on your water bills if you use mains water.

For more information on how to setup and install a system, contact the [UK Rainwater Management Association](#).

Rainwater harvesting equipment may be eligible under the government's [Enhanced Capital Allowance Scheme](#), the Water Technology List. An approved list of products can be found [here](#).

Irrigation efficiency

Many horticultural crops grown in Wales can actually be grown without the use of irrigation, but irrigation can in some cases help with crop establishment, improve crop growth, and maximise yield. To improve the efficiency of your irrigation system, consider these 4 areas – **goals, plan, do, monitor & record**.



Irrigators on timers help reduce water loss, particularly when matched the soil's moisture deficit

Goals

- Define what the water goals are and the implications associated with yields, rainfall and crop values

Plan

- Know your soils and readily available soil water
- Design a suitable irrigation system
- Develop a water budget
- Know your water supply

Do

- Determine an irrigation schedule
- Implement strategies to manage nutrient inputs and salinity

Monitor & Record

- Monitor, record and evaluate water use
- Monitor soil moisture
- Measure the performance of the irrigation system

Case Studies

As winners of the Environment Agency's Water Efficiency Awards 2012 the following case studies demonstrate:

- How appropriate irrigation technology and monitoring can improve business performance and save water. See [East Malling Strawberries](#)
- The opportunities of rainwater harvesting. See [Lowaters Nursery](#)

Manage my water quality

Pollution of waterways in Wales is a problem. Discharges and run-off from horticultural activities contribute to poor water quality in our rivers, streams and other water sources. Managing horticultural practices to reduce water pollution and improve water quality can have a number of benefits.

What could be the impacts of not improving water quality?



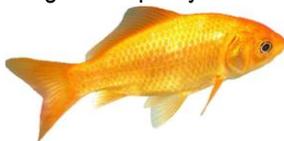
Economic

- Reduced productivity by affecting plant & soil health for example due to increased salinity causing toxicity.
- Damage to infrastructure e.g. blockages in irrigation equipment.
- Increased water treatment costs.
- Reduced recreation and tourism activities due to a decline in bathing water quality.



Health

- Impacts on human and livestock health due to a decline in drinking water quality.



Biodiversity

- Algal blooms due to increased sediment and nutrient levels, leading to eutrophication.
- Siltation of fish spawning grounds.
- Reduced flow from unsustainable abstractions can decrease biodiversity due to low water flow.

Benefits to managing water quality

Financial benefits – nutrient and pesticide planning can reduce the volume and frequency of application so you save money by using less. Reducing run-off reduces the loss of valuable topsoil and can help adhere to regulatory requirements such as NVZs.

Environmental benefits – through reducing water pollution local waterways will improve, with cleaner drinking water and safer bathing water. Benefits to wildlife include increased biodiversity, thriving fisheries and less sediment build up in rivers means a reduction in flood risk.



Runoff from fertilisers leads to algal blooms and pollute drinking water

To reduce pollution from your horticultural crops consider the 3 principles:

- 1. Stop or reduce the pollution at its source**
- 2. Break or slow the pollution pathway**
- 3. Protect the receptor (waterway)**

Field / surface run off

- Minimise surface run off with grass buffer strips and field corners.
- Inter row ground cover.
- Timing of cultivation.
- Use minimum cultivation techniques.
- Stabilise banks with appropriate riverside trees and woodland.
- Woodland can increase water infiltration.
- Soil management plans.
- Sediment traps.

Benefits

- Reduced water pollution.
- Reduced soil / land loss from bank erosion.
- Improved soil water retention and infiltration.
- Improved biodiversity.

Nutrient leaching

- Analyse soils every 3-5 years to match crop requirements
- Match timing and rates of fertiliser to plant demands.
- Calibrate fertiliser spreaders.
- Use a FACTS qualified advisor.
- Consider the use of liquid nitrogen instead of granular fertilisers as plant uptake can be quicker minimising the risk of leaching from slow release fertilisers in adverse weather.

Benefits

- Reduce nutrient costs.
- Increased nutrient use efficiency.
- Improved water quality.

WHAT CAN YOU DO TO MANAGE?

Drought / reduced water availability

- Regularly inspect irrigation system for:
 - Discharge or flow rate variation.
 - Uniformity of distribution.
 - Pressure variation.
 - Leaks and blockages.
 - Sprinkler / nozzle malfunction.
 - Faulty filters and pumps.
- Leak detection on whole water system and fix leaks.
- Install water meters and water use monitoring systems.
- Establish an irrigation schedule and review plans annually.
- Rainwater harvesting (ensure water quality by biological water treatment or chemical, UV treatment as appropriate).
- Match crop demand by undertaking soil moisture measurements.
- Irrigate at night to minimise evapotranspiration.
- Can you install winter storage reservoirs?
- Consider abstraction licence trading/ amendments.

Benefits

- Reduced water losses.
- Improved water systems.
- Greater understanding of economic yield.
- Potential to reduce water demand.

Pesticide run-off

- Minimise spray drift.
- Store, mix and dispose of chemicals appropriately.
- Install a biobed system to treat pesticide washings.
- Ensure there is a chemical spill kit and staff are trained to use it.

Benefits

- Increased biodiversity.
- Increased pesticide use efficiency.
- Improved water quality.
- Safe pesticide handling.

Flooding

- Minimise soil compaction and aerate or sub soil to mitigate if necessary.
- Review and plan for drainage of hard surface.

Benefits

- Reduce loss of valuable top soil and nutrients.
- Improved soil structure.

References

- ¹ Statistics for Wales (2014) Aggregate Agricultural Output and Income, 2014
<http://gov.wales/docs/statistics/2015/150226-aggregate-agricultural-output-income-2014-en.pdf>
- ² WRAP (2011) Freshwater use in the UK: agricultural sector
http://www.wrap.org.uk/sites/files/wrap/PAD101-201%20-%20Agricultural%20sector%20water%20report%20-%20FINAL%20APPROVED%20for%20publication%20-%202012,03,12_0.pdf
- ³ Welsh Government (2014) Consultation Document – A Water Strategy for Wales
<http://gov.wales/topics/environmentcountryside/epq/waterflooding/publications/water-strategy/?lang=en>
- ⁴ Environment Agency (2013), The Case for change: Current and future water availability
<http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho1111bvpe-e-e.pdf>
- ⁵ Water Resources Act (1991)
<http://www.legislation.gov.uk/ukpga/1991/57/contents>

Further Information

Useful websites and documents for sustainable water resources

The following web resources are provided to assist you with finding further information. Click on the links to access the external websites which were current at the time of writing.

Background to the Welsh horticultural industry and further supporting information to the horticultural industry can be found on the following websites:

Welsh Government

<http://gov.wales/topics/environmentcountryside/foodanddrink/foodpolicyandstrategy/horticultureen/?lang=en>

Horticulture Wales <http://www.horticulturewales.co.uk/>

Horticultural Trades Association <http://www.the-hta.org.uk/index.php>

AHDB Horticulture <http://horticulture.ahdb.org.uk/>

For further information on legislation regarding abstraction and impoundment licences: www.naturalresources.wales but for information on the environmental permitting of water discharge activities:

<https://www.gov.uk/government/publications/environmental-permitting-guidance-water-discharge-activities>

Natural Resources Wales have also provided interactive maps to provide information on the **WFD** and water quality at: <http://waterwatchwales.naturalresourceswales.gov.uk/en/>

Information and specific guidance on how to manage your land and horticultural crops within a **Nitrate Vulnerable Zones** can be found at:

<http://gov.wales/topics/environmentcountryside/epg/waterflooding/nitrates-directive/?lang=en>

<http://gov.wales/docs/desh/publications/140422nitrate-vulnerable-zones-farmers-guidance-en.pdf>

Detail on the **Sustainable use of plant protection products regulations** can be accessed on the following link <http://gov.wales/topics/environmentcountryside/farmingandcountryside/plantsseedsbiotechnology/pesticide/uk-plant-protection-products-sustainable-use-regulations-2012/?lang=en> with practical support being provided by the **Voluntary Initiative** <http://www.voluntaryinitiative.org.uk/en/home>

Defra has also produced the following document to support best management practices on rural properties [Protecting our Water, Soil and Air - A Code of Good Agricultural Practice for farmers, growers and land managers](#)

To understand horticultural water requirements and irrigation systems then the **UK Irrigation Association** provides support and further information <http://www.ukia.org/irrigationbooklets> you can also find supporting information about rainfall data from the Met Office <http://www.metoffice.gov.uk/climate/uk/summaries/datasets>

The Environment Agency & Cranfield University has produce the following guidance note – Thinking about an Irrigation reservoir – A guide to planning, designing, constructing and commissioning a water storage reservoir. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297089/gemi0408bnzp-e-e.pdf

Rainwater Harvesting Association brings together information to help setup and install a system and provides links to other relevant organisations. <http://www.ukrma.org/>



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