

Establishing a resilient water supply



Figure 1. Reservoirs can help to provide a resilient water supply throughout the irrigation season

Action points

- Review the various water sources available to the business, taking account of future supply requirements
- Undertake an analysis of the irrigation water used, at least annually, for chemical, physical and if necessary biological content
- Audit current water usage, water harvesting/ recycling potential, storage and application facilities and draw up an action plan to address recorded deficiencies (Figure 1)
- Develop mitigation plans to protect the business from interruptions to the water supply
- Be prepared to negotiate the business mains water supply contract with water retailers
- Check licences are appropriate, undertake new applications in a timely manner and explore the potential for licence trading
- Become involved with local Initial Pilot Catchments or water abstractor groups

Background

Access to reliable sources of water is critical for most horticultural businesses as the majority are reliant on some form of irrigation, irrespective of the crops produced, to maximise yield and maintain quality. The latest published figures indicate that over 50,000 ha of land producing horticultural crops was irrigated using around 75 million m³ of water (Figure 2).

Even though this represents less than 1–2% of the total water abstracted in England and Wales, it is a consumptive use, concentrated in the drier catchment areas in the driest months, and horticulture can be the largest abstractor in some catchment areas during dry summers. Coupled with this, most horticultural businesses are located in catchment areas already defined as ‘having no more water available’ or in areas which are classified as ‘over-licensed’ or ‘over-abstracted’.

Changing rainfall patterns are also exacerbating the issue. Climate projections suggest that summer rainfall may decrease in key horticultural production areas, while the chance of a summer as hot as the one experienced during 2018 has already increased to 10–20%, from less than 10%.



Figure 2. Drip irrigation in an apple orchard and overhead boom irrigation in field-grown brassica production

This, combined with increased pressure from a growing population in the UK and government focus on ensuring abstraction is environmentally sustainable, makes it vitally important to secure a sustainable water supply for crop irrigation while protecting resources from over-abstraction and potential pollution.

Sources of irrigation water

Any water supply needs to be adequate to meet both the daily and annual requirements of horticultural businesses and may include one or more of the following sources:

Mains water

Mains water is supplied to geographical areas by wholesalers (formerly public water companies). With the opening up of the water retail market, businesses are now able to shop around for a water retailer (not necessarily the local wholesaler) who provides billing and other services. Although the most convenient source of water, mains water is also the most expensive; prices vary depending upon tariff and area, but per cubic metre are generally up to 15 times the cost of winter-abstracted water. It is important to check that the most cost-effective tariff is being utilised; for example, some water retailers offer an interruptible tariff for irrigation use which is at a lower cost. If sewerage charges are based on water meter readings, a cost reduction for the water used for irrigation purposes can be requested from the sewerage charge.

When using water from the mains, always include a break tank between the incoming mains supply and the irrigation system to prevent any risk of mains contamination through back-siphoning. Compliance with The Water Supply (Water Fittings) Regulations 1999 is required and may be inspected by water wholesalers.

Hosepipe bans or Temporary Use Bans (TUBs) and Drought Orders may be brought in during periods of water shortage. TUBs only apply to domestic or other non-commercial premises. There is also a statutory exception from Drought Order restrictions for irrigating plants that are grown or kept for sale or commercial use.

Surface water and groundwater

Water can be abstracted from rivers, streams, ponds, wells, boreholes and even drains but will require an abstraction licence from the environmental regulator¹ if volumes are above the daily *de minimis* limit (see the Licensing and permits section). In some cases, a licence may also be needed for installation of a well or borehole to abstract groundwater.

The cost of abstracted water is much cheaper in the winter period (November to March) than the summer period (April to October). Abstraction costs are subject to regular review by the environmental regulator.

There are separate regulations for private water supplies where the water is intended for human consumption, such as domestic use or in food manufacture, to ensure it is safe at all times.

Water harvesting and recycling

With some businesses, useful amounts of rainwater can be collected from roofs or irrigation water can be recycled after application for reuse, usually after some form of physical or chemical treatment (Figure 3). Rainwater harvesting or recycled water use may require a licence, depending upon the collection process. Water from these sources should be used where non-potable water is suitable. Note, in the case of edible crops production, recycled water may be excluded from use by customers. Adequate on-site water storage capacity is required to improve the water supply resilience of businesses undertaking rainwater harvesting.

Water quality

Mains water is supplied as 'potable' quality. The quality of abstracted or recycled water should be assessed to ensure it is fit for purpose. A risk assessment should be carried out, supported by regular analysis of the chemical, physical and biological make-up of the water (including nutrient content, alkalinity, electrical conductivity, biochemical oxygen demand (BOD), suspended solids and microbial pathogens) to establish what treatment is required to make it suitable for irrigation purposes and to monitor water quality throughout the season.

¹ Environment Agency (EA) in England, Natural Resources Wales (NRW) in Wales, Scottish Environment Protection Agency (SEPA) in Scotland, and Northern Ireland Environment Agency (NIEA) in Northern Ireland



Figure 3. In-line filtering systems are a prerequisite for removing suspended solids from irrigation water

Storage and water management

Reservoirs

Reservoirs can greatly improve business water supply resilience throughout the irrigation season. Taking water daily and storing it requires little energy and can accommodate a low source flow. Larger reservoirs also offer the capacity to store water abstracted or harvested through the winter at peak flow or rainfall periods. The Environment Agency (EA) can also permit filling of winter storage reservoirs during periods of summer flooding, which further increases water supply resilience.

Reservoir construction requires planning permission and compliance with the Reservoirs Act 1975. Large, raised reservoirs of 25,000 m³ capacity (10,000 m³ in Scotland) above natural ground level must be designed by a qualified panel engineer and registered with the environmental regulator (this figure will be reduced to 10,000 m³ pending a change in legislation). New legislation is also expected to bring in the need for an abstraction licence from a reservoir under certain circumstances.

Reservoir construction has been financially supported through various grant schemes in the past and it remains to be seen what new schemes may be available in the future. It is important to have all the necessary permissions and records in place in order to be able to access funding from such schemes.

Water storage tanks

If suitable available land restricts the potential for a reservoir, then the short-term water supply resilience of a business can be improved via the installation and use of water storage tanks. Water storage tanks should be sized to allow for enough water to be available for a minimum of 48 hours during peak irrigation demand in the event of a mains failure (Figure 4).



Figure 4. Water storage tanks can add to the short-term water supply resilience of a business

Water licensing legislation

Licensing and permits

A licence issued by the environmental regulator is required to abstract water over the *de minimis* limit of 20 m³/day (10 m³/day in Scotland and Northern Ireland in some circumstances). Note that this is a daily (24-hour) limit, not an average. Over the coming years, the abstraction system in England is moving to a system of permitting. Licences/permits are subject to application and annual subsistence charges.

An abstraction licence does not guarantee the supply of water, as the future reliability of available water is not absolute, for example during a period of prolonged dry weather. There is also the possibility of constraints being placed on licences when river flows or groundwater levels fall below set levels. These are termed 'Hands off Flow' (HoF) or 'Hands off Level' (HoL) conditions. Daily permission from the environmental regulator may need to be sought under such circumstances. The government can also issue an emergency restriction on abstraction for spray irrigation under Section 57 of the Water Resources Act 1991. There is an exemption for commercially grown crops under protection and container-grown crops.

Licence renewal

When abstraction licensing was first introduced, licences were issued as a permanent licence of right. Since the Water Resources Act 1991, most new licences are now time-limited and subject to regular review. In England, there are common end dates within EA Catchment Abstraction Management Strategy (CAMS) areas so that licences can be reviewed at the same time. Renewal volumes are linked to past usage, so if a high proportion of the licensed volume has not been used, a lower annual volume may be granted at renewal.

Business water use schedules should also be reviewed to avoid losing water volume. For example, licences could be aggregated into one to allow the water volume to follow crops around production land while abstracting from different locations.

Trickle and drip irrigation

In England and Wales, trickle and drip irrigation were previously exempt from the need for a licence (Figure 5). However, the exemption has now been removed and those using trickle or drip irrigation must have it added to any existing licence or apply for a new licence before the end of 2019 (unless abstracting less than 20 m³/day). The environmental regulator has a three-year period to authorise any licence.



Figure 5. Use of drip irrigation in field-grown tree production

Catchment management

Increasingly, ‘catchment approaches’ are being used for specific water-related challenges as an alternative to ‘one size fits all’ approaches, such as regulation. These attempt to bring all stakeholders into the discussion rather than placing responsibility solely with the regulator. Solutions are being sought in catchment areas where there is a high demand for water or low water flows and the potential to share water more effectively between different users. Options to manage water differently, instead of relying on regulatory tools alone, will be attempted in Initial Pilot Catchments (East Suffolk, Cam and Ely Ouse, South Forty Foot (Witham) and Idle and Torne).

Consideration should be given to joining or forming a grower-organised abstractor group to coordinate activities and communications. Existing groups can be identified by contacting the UK Irrigation Association (see Further information section).

Environmental constraints

There is increasing focus on reducing environmental damage caused by abstractor and it is possible in future that licences will be changed due to actual, or risk of, damage to protected sites or failure to meet environmental objectives.

Abstracting water near protected sites, for example Sites of Special Scientific Interest (SSSIs) or Special Areas of Conservation (SACs), has resulted in licences being reduced or revoked in recent years.

Abstracting near to these sites should be avoided if at all possible as licences are likely to be subject to regular scrutiny against the environmental objectives of the sensitive sites.

Licensed abstraction is also being examined as part of the Water Framework Directive, due to around 18% of surface water and 28% of groundwater bodies in England being affected by unsustainable abstraction. In England, the EA will be reviewing licences in these areas in order to meet the required standards by 2021 and beyond.

Ensuring water supply resilience

Auditing the business water use

Understanding the business water supply need and how it varies through the year is required both to support licence applications and to demonstrate any ongoing need for water. Conducting a water audit can help to demonstrate efficient water use and identify where water could be saved or recycled. The audit should include records of weekly/monthly water use by different production areas (Figure 6), options for harvesting or recycling, actual and potential water storage capacity, types of irrigation systems used and their relative efficiency, how crop water demand is assessed and a detailed summary of measures in place to avoid water pollution.



Figure 6. Using meters to record the water volumes used is an important element of water management

Consideration should also be given to how long the business could cope, or the level of damage to crops that could be tolerated, should the water supply be interrupted by a temporary emergency, under licence restrictions or during drought conditions (Figure 7). The audit findings may point towards a need for storage, an alternative source or a strategy for mitigating impacts on crops when water is limited.



Figure 7. Drought conditions can impact crop emergence and yield, factors to be considered in any water use audit

Headroom calculations

Protection against uncertainties can be built into supply requirements by including a headroom allowance in abstraction licences. Headroom is having a greater amount of water available in licence conditions than is typically used and acts as an insurance policy for businesses against dry weather or drought when water usage is greater than average. Having sufficient headroom in licensed volumes is important for businesses to manage during dry years.

In recent years, the EA has been seeking to revoke unused licences or reduce underused licences to manage the potential risk of over-abstraction on the environment (in the event that all licensed amounts were to be used). Reviewing the available licensed water and headroom using a software tool such as D-Risk (www.d-risk.eu) can provide insights into abstraction-related risks in crop production. The tool can help gauge resilience to drought or the impact of reduced headroom on licensed volumes.

Supply interruptions and diversification

Supply interruptions are always a possibility, whether as a result of an emergency such as a burst pipe, shallow boreholes drying up or restrictions on abstraction during periods of dry weather. Businesses should determine how quickly the situation could become critical and consider what plans could be put in place to mitigate the effects as far as possible.

Having the ability to switch supply could be a lifeline if issues arise. Businesses with mains water could consider boreholes to abstract groundwater, while those abstracting for irrigation directly from watercourses may find that stored water in a winter-filled reservoir provides a more reliable source in summer months when restrictions are in place. Likewise, the ability to switch to mains supply when unable to abstract water, although more expensive, could be a possibility to avoid detrimental impacts.

Licence trading

In England, it is becoming easier to trade spare licensed water volume between licence holders on a temporary or permanent basis. Typically, this involves one party reducing their abstraction volume while another party, abstracting from the same source, is allowed to take

more than their licensed amount. If a part trade of licence is agreed, then the donor and recipient must ensure that the total abstraction does not exceed the licensed volume. The licence recipient is bound by any abstraction restrictions. Trades require approval from the EA and may be restricted to past usage rather than full licensed volumes. Trading of surface abstraction is usually easier to accomplish than trading of groundwater since more complicated analysis may be required to establish that a trade via groundwater licences is possible.

Further information

AHDB Horticulture factsheets and publications

Factsheet 18/17 **Methods and equipment for matching irrigation supply to demand in container-grown crops**

Factsheet 17/17 **Measuring and improving the performance of overhead irrigation for container-grown crops**

Factsheet 05/17 **Precision scheduling of irrigation in the production of container-grown hardy nursery stock in various growing media**

Factsheet 01/14 **Irrigation in bulb onions**

Factsheet 15/06 **Water quality for the irrigation of ornamental crops**

GREATsoils **Soil health and water supply**

Grower Guide **Water harvesting and recycling in soft fruit**

AHDB Horticulture grower summaries and reports

CP 110 **Developing a water strategy for UK horticulture**

CP 064 **Development of a water strategy for horticulture**

CP 013 **Promoting the efficient use of water, and reducing environmental impacts, in horticultural field vegetable irrigation**

FV 326a **Impact of irrigation practices on Rijnsburger bulb onion husbandry, quality and storability**

HNS 182 **Developing optimum irrigation guidelines for reduced peat, peat-free and industry-standard substrates**

PC 166 **Protected ornamentals: the efficiency of water use in different production systems**

SF 136 **Improving water and fertiliser use efficiencies and fruit quality in commercial substrate strawberry production**

TF 210 **Deriving irrigation set points to improve water use efficiency, fruit quality and sustainability of irrigated high-intensity apple and sweet cherry orchards**

TF 198 **Developing water and fertiliser saving strategies to improve fruit quality and sustainability of irrigated high-intensity modern and traditional pear production**

TF/PO 001 **FERTINNOWA: Transfer of innovative techniques for sustainable water use in fertigated crops** (www.fertinnowa.com)

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Other information

Licences and permits

- Water abstraction or impoundment licence application (England): www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence
- Abstractions (Scotland): www.sepa.org.uk/regulations/water/abstractions
- Water abstraction or impoundment licence application (Wales): naturalresources.wales/permits-and-permissions/water-abstraction-and-impoundment/apply-for-a-water-abstraction-or-impoundment-licence
- Abstraction and impoundment licensing requirements (N Ireland): www.daera-ni.gov.uk/articles/applying-abstract-or-impound-water
- Abstraction licensing strategies (CAMS process): www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process

River flows

- Water situation reports for England: www.gov.uk/government/publications/weekly-rainfall-and-river-flow-reports-for-england
- Water scarcity (Scotland): www.sepa.org.uk/environment/water/water-scarcity
- How we manage Wales' water resources: naturalresources.wales/about-us/what-we-do/water/resources
- Rivers and lough levels (N Ireland): www.infrastructure-ni.gov.uk/topics/rivers-and-flooding/rivers-and-lough-levels

Hydrological summary and outlook

- Monthly hydrological summary: nrfa.ceh.ac.uk/monthly-hydrological-summary-uk
- Hydrological outlook: www.hydotuk.net

Weather data

- AHDB WeatherHub – a source of weather and related data: ahdb.org.uk/weatherhub

Cranfield University D-Risk tool

- A planning tool to manage irrigation abstraction and drought risks: www.d-risk.eu

General guidance

- UK Irrigation Association: www.ukia.org
- Information on water retailers: www.open-water.org.uk
- Private water supplies: www.privatewatersupplies.gov.uk

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