



Rainwater harvesting in agriculture

Rainwater harvesting is the on-site collection and storage of rainfall from impermeable surfaces and storage for later use. In the UK, the rain is mostly collected off existing roofs, though it can also come from hard standing (e.g. car parks) if water quality considerations allow, and/or from specially prepared surfaces such as compacted soil or plastic sheeting.

Current status and uptake

Rainwater harvesting is increasingly well established in UK domestic and urban applications, and in agriculture for animal watering, washing down cattle yards and for irrigating protected cropping. Rainwater harvesting is more often used to replace high cost mains water than replace direct abstraction.

Suitability and target use

Rainwater harvesting works best in locations where rainfall is heaviest and for uses where the water demand is year round; such as for stock watering in the north or west. It is best used for meeting base demand than dry weather extremes, and requires a back-up source if supply has to be guaranteed. It is less well suited to Eastern England, and could become less reliable with climate change. Within irrigation, rainwater harvesting is particularly well suited to glasshouses and polytunnels. These provide the required large areas of impermeable collection surfaces (Table 1), and a continuous demand for irrigation even in wet weather. In some cases, the runoff has to be collected anyway to control downstream flooding and/or soil erosion. Security of supply is often provided by a mains water back-up, reducing the storage volume needed.

Rainwater harvesting is less suitable for extensive outdoor crops, where there is usually no natural collection surface, and where demand is greatest in dry summers when rainfall is minimal; the storage capacity would then have to approach peak seasonal demand to ensure security of supply.

Table 1 Areas (ha) of glasshouses and protected crops in UK in 2012 (Source: Defra Farming Statistics, 2012).

| Type | Area (ha) |
|-----------------------------------|-------------|
| Vegetables, salad and fruit | 1717 |
| Flowers, foliage and other plants | 601 |
| Not in use | 234 |
| Total | 2552 |

Investment cost

The complete system will include the impermeable surface, adequate storage to balance supply and demand time differences, collection and delivery pipes and pumps, and possibly water cleaning and treatment systems. In many cases the impermeable surface is already available, e.g. the roof. The cost of the water storage is often the major part of the remaining system cost.

Total costs vary from a thousand pounds to hundreds of thousands, depending on scale and the size of storage required, but can often pay back in 3 to 6 years if replacing metered mains water.

Design and management issues

The water obtained from a rainwater harvesting system depends on the amount and intensity of rainfall, the collection area and the runoff coefficient of the roof material. Gutters, filters and pipes need to be adequately sized to collect heavy rainfall. At least some gravity-filled buffer storage is required; water can then be pumped more slowly to the main storage if necessary. The required volume of storage depends on the relative volumes and the timings of rainfall and water demand, and the required level of security of supply.

Management requirements are generally low, and mostly involve routine maintenance such as keeping filters clear of leaves and pumps operational. Water treatment is not normally required for irrigation use when the water is collected off roofs, but treatment may be needed off other surfaces or for particular uses, such as for livestock drinking water and in dairies.

Other issues (e.g. environmental, legal)

Rainwater harvesting collects water that would otherwise flow to streams or groundwater, and thus does deplete natural recharge. However, it is only collected during rainfall events, and is a very small proportion of the overall catchment, so this is usually ignored. The implications of rainwater harvesting for on-site energy use and carbon emissions depends largely on whether pumping is required; however they are likely to be much lower than using mains water. The manufacture and installation of the equipment also has potential environmental impacts.

Documented case studies

See EA (2007) leaflet for selected case studies.

Relevant references and further contacts

Rainwater harvesting as a resource – An on-farm guide. Environmental Agency, 2009. 41 p. Download from <http://www.environment-agency.gov.uk/business/sectors/32759.aspx>

Reducing mains water use through rainwater harvesting Envirowise leaflet EN896, 4 pp, download from http://www.ceac.co.uk/Envirowise_Rainwater.pdf

Further contacts

UK Rainwater Harvesting Association: <http://www.ukrha.org/>

European Rainwater Catchment Systems Association: <http://www.rainwaterconference.org/>

International Rainwater Catchment Systems Association:
<http://www.eng.warwick.ac.uk/ircsa/index.htm>

GARNET research network for the theme “Rainwater Harvesting” (henceforth RWH):
<http://info.lut.ac.uk/departments/cv/wedc/garnet/tncrain.html>