

GROWERTALKS

Features

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Harvesting Rainwater

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“Capturing rainwater provides a high-quality water source, which can be a good risk management strategy where other water sources limit growth of a greenhouse business or when there are challenges in the quality of their existing water,” says Paul Fisher, professor and extension specialist in the Environmental Horticulture Department at the University of Florida.

More and more growers are turning to rainwater harvesting to capture the water that falls on their greenhouse roofs. Large growers such as AgriStarts in Apopka, Florida, and Green Circle in Oberlin, Ohio, as well as numerous smaller operations, have begun to harvest rainwater for irrigation.

Charles Hayes, president of Advanced Treatment Technologies, notes the rise in rainwater systems has a lot of drivers, including growers facing water shortages, water-quality issues, wanting to get away from technologies like reverse osmosis and environmental reasons.

The system

With gutter-connected greenhouses, you just need to connect the downspouts that drain the gutters to a piping system and storage area. On hoophouses, you can add a gutter to the base of the hoophouse and collect the water that way. And for high tunnels, it's possible to put a hip board at the top of the roll-up sides and sneak in a gutter for water collection, such as the type that Rimol Greenhouse Systems designed for one of their customers. And if you really want to extend the square footage of your harvesting system, look at possibilities for capturing water from other buildings and parking lots.

When designing your system, you'll need to consider how to drain excess water to a wetland or drainage area in the event of heavy rains that cause overflow. Rainwater provides a high-quality water source. However, you'll probably want to consider filtration, chlorination or other water treatment before you use it in irrigation.

Because of its high quality, Paul advises not mixing captured rainwater with other less-clean sources, such as greenhouse runoff, especially in an open pond.

“The quality will decline in terms of algae, agrichemicals, nitrogen and phosphorus, and sediment. Anywhere water is stored, microbes will grow, especially in open ponds,” he explained.

If possible, keep your rainwater stored separately, ideally in a covered tank. You have lots of options when it comes to storage tanks—from low-cost concrete cisterns to above- or below-ground fiberglass or poly tanks and steel tanks. While some growers do use ponds, heed Paul's warning above.

Rainwater does pick up debris as it falls on the roof—or other surfaces—so you may deal with dust, pollen and

whatever else is sitting on the surface where it lands, including biological and chemical contaminants. You can divert the first flush of water with a device called a roof washer and some systems will switch the diverter valve once the rain picks up.

Charles cautions that captured rainwater can pose a risk to plants in the form of molds, fungus, viruses, bacteria, etc. and urges growers to look at ways to filter or disinfect the water. He prefers to use an ozone oxidizer combined with fine particle filtration in their treatment systems.

“It is possible to effectively disinfect the water and create harm to the plants with that water from residual oxidizers,” he says. But they use a system where the ozone is converted back into dissolved oxygen at the end, which he says provides additional health benefits for plants.

While the rain may be free, capturing and storing rainwater has its own set of expenses.

“Be sure to consider the costs for drainage, storage of water in a tank or pond, and treatment for algae,” says Paul. Compare the total cost of the rainwater system to your existing well or municipal supply so that you can get an accurate return-on-investment figure.

John Barktok, extension professor emeritus and agricultural engineer at the University of Connecticut, calculates that 1 in. of rainfall on a 1-acre greenhouse can result in 27,100 gal., but you should assume a 65% yield due to losses from evaporation, leakage and diverting the first few minutes of water harvested in order to eliminate debris.

When you're doing your cost comparison, Paul suggests also budgeting how much rainfall you could expect to capture month by month. Use historical rainfall data and look at the total catchment area (your greenhouse roofs and any other areas) to figure out how much water you can recover each month, then compare this to what you already use each month in the greenhouse.

“This will help you estimate how much rainwater can contribute to total water use and your needs for storage capacity in a tank or pond,” said Paul.

Not so fast

Before you head out to install a rainwater harvesting system, it's important to note that not all locales allow for rainwater harvesting.

Say what? Water is a touchy issue in a lot of places and folks argue over who has rights to it—even when it's falling from the sky. While some states, like California, encourage you to use rainwater and may offer tax credits or exemptions, others are a bit more hesitant.

Take Colorado, where up until 2015, you couldn't harvest rainwater at all. Their reasoning was that rainwater eventually ends up as groundwater or stream water that someone already has rights to. But when the Colorado Water Conservation Board commissioned a study on the issue, they found that on average, only 3% of rain actually reaches streams or groundwater in a native vegetation area. (In a wet year, up to 15% of the precipitation returns to stream or groundwater.) Now Colorado allows homeowners to use two rain barrels that store up to 110 gallons, but greenhouses and other businesses don't have the green light.

As essential as water is to growing plants, rainwater harvesting provides many growers with an excellent water source. While rainfall isn't always consistently predictable, for many, it fills a void where municipal or well sources have fallen—or will fall—short.

How Much Water Can You Get From a 1-in. Rainfall?

$(\text{Square footage of collection area}) \times 0.6 = \text{Total gallons of rainwater that the area will receive in a 1-in. Rainfall}$

Learn More

- State laws around water harvesting: www.ncsl.org/research/environment-and-natural-resources/rainwater-harvesting.aspx
- Incentives for harvesting rainwater: www.harvesth2o.com/incentives
- Reducing and reusing water for greenhouses: CleanWaterR3.org
- November 2018, University of Florida online class in irrigation water and treatment: <http://hort.ifas.ufl.edu/training/>

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