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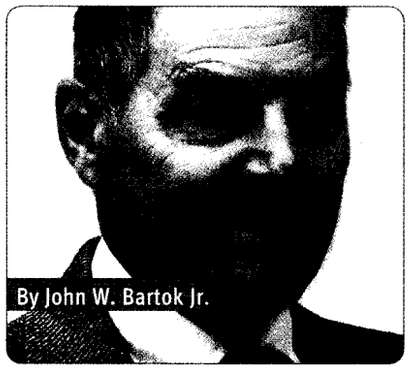

Sizing the greenhouse water system

THE AVAILABILITY OF WATER is critical when planning for a new or expanded greenhouse facility. Some growers have had to abandon plans or move to a different location because adequate water was not available.

Drought conditions in some areas of the United States are affecting the water supply, especially in the Southeast this past year. Restrictions and water regulations can also have an impact on production facilities as well as the use of plants by homeowners.

Plan for peak use period

Water use is affected by many variables. Most important of these is the level of solar radiation in the greenhouse. This varies from a low level during winter to two to three times as much during summer. The design for the water supply has to be made for the peak use time of the year.

There have not been a lot of studies conducted on water use of plants. A rule of thumb is to have available 0.3 to 0.4 gallons per square foot of growing area per day as a peak-use rate for the warmest day. For example a 30-by-100-foot greenhouse with 2,400 square feet of bench area would require a peak-use rate of 720-960 gallons per day. This corresponds with the evapotranspiration rate for most areas of the country.

Factors affecting water use

These factors can increase or decrease the amount of water needed:

Solar radiation. The level of radiation that reaches the plants is reduced by 10-40 percent due to the glazing material and the structural members in the greenhouse. This reduces the rate of transpiration.

Shading. Adding shading outside or inside will reduce the radiation level on the plants. Depending on the level of shade, this reduces evapotranspiration and water needs.

Air movement. Fan ventilation and horizontal-airflow systems increase the rate of evapotranspiration. Depending on location and nearby greenhouses or other buildings, sidewall vents and open-roof designs can also have an influence. A 5 mph breeze can increase evapotranspiration by 20 percent.

Type and size of plants. Seedlings or small potted plants require less water than a full-grown crop. A large root mass or heavy leaf canopy increases water needs.

Type of irrigation system. Only 20 percent of the irrigation water applied with an overhead sprinkler system may reach the growing medium in a potted plant crop with heavy foliage. On the other hand, all the water applied with an in-pot drip system reaches the medium. Uniformity of watering is usually best with a boom system. Ebb-and-flood systems, flooded floors and hydroponics conserve water by recycling and reusing the excess water.

Leaching. The recommendation that at least 10 percent of the water applied to the growing medium be allowed to leach out to remove excess fertilizer salts increases water use. Often leaching accounts for a much higher percentage and can increase water needs significantly. The type of growing mix used also affects the amount of water-holding capacity and the frequency of watering.

Other uses. In addition to plant requirements, water is needed for pesticide application, evaporative cooling, growing media preparation and cleanup. These should be estimated when designing the water-supply system.

Water quality

Municipal system water and deep wells generally provide the best water source for greenhouse operations. Chemical treatment of the water may be required when pollutants, such as iron, sodium, dissolved calcium and magnesium or bicarbonates are present.

Surface water such as ponds and streams may have more particulate matter, such as, suspended soil particles, leaves, algae or weeds that needs to be filtered out. A sample of a potential water supply should be sent to an irrigation water testing laboratory to conduct an analysis.

Water laws

All states have regulations related to water diversion and discharges. Many have restrictions when drought occurs. A permit may be required when water use exceeds a specified level. For example, in Connecticut, using 50,000 gallons a day from any source triggers whether a diversion permit has to be applied for.

Getting a permit is quite involved and takes con-

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siderable time and costs a significant amount of money. An in-depth application document that may cost $50,000 in consultant fees and take a year or more to process is not uncommon. Accurate records of present water use, the impact of the diversion on the area and the creative use of recycling are important. Complying with the regulations can be an unpleasant experience that you may have to go through.

Extending a limited water supply

Water supplies can be extended by several methods. Most common is adopting low-use irrigation methods as described above. Zoning, which involves applying the water to one area or section of plants at a time, allows a low-flow water source to irrigate more plants. Zones can be sized to use the flow from a well or municipal source so that irrigation takes place all day long.

Low-flow wells can be set up to be pumped to a storage tank over many hours. Water from the tank is then used to irrigate plants during daylight hours.

Collection of rainwater to supplement a well or surface system is also possible. This works best with a gutter-connected greenhouse where the water from the downspouts is piped to an above-ground or below-ground storage tank.

From a conservation standpoint, keeping the piping system in good repair is important. A leak of one drop per second amounts to more than 113 gallons per month.

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