Airing It Out

Naturally ventilating your greenhouses can help control energy costs and produce healthy plants.

BY NEIL MORAN

Like any greenhouse business, you probably have concerns about energy costs, best ventilation practices and how to best invest your hard-earned money. It is understandable that you want to make the best decisions that will get you off on the right foot. To choose the right type of ventilation for your greenhouse, it's important to take an in-depth look at the features and cost-effectiveness of each.

MECHANICAL VENTILATION

In mechanical ventilation, fans are installed in a greenhouse to exhaust the rising hot air. This creates a vacuum that draws cooler air through louvers on the end of the greenhouse. When properly designed, this type of ventilation can maintain ideal internal greenhouse temperatures even while operating in a variety of locations and weather conditions.

There will need to be multiple greenhouse ventilation fans installed to provide ventilation at various rates. Ventilation fan motors also should have multiple speeds to allow for user control of the ventilation rate.

CURTAIN VENTILATION

For most growers in the temperate zones, natural ventilation is the best choice for climate control and cooling in a greenhouse. Natural ventilation, or curtain ventilation, uses a series of roof and sidewall vents. As the temperature increases within the greenhouse, hot air rises and escapes through the roof or sidewall vents. This creates a vacuum that draws cooler air into the greenhouse through the sidewall vents located closer to the ground.

Curtain ventilation systems allow for air movement across the width of your greenhouse. Since the width is the shortest dimension, the new air will stay cooler than air moving along the entire length of a greenhouse, which is common in mechanical systems.

Since these systems don't require fans, they are much more energy efficient, helping to reduce operating costs. They're also easy to automate with climate controls to increase crop yields and labor efficiency.

Natural ventilation offers many advantages over the traditional fan and louver cooling, a big one of course, being the energy savings. "It depends on the use, but the trend is toward natural ventilation," says John W. Bartok, Jr., a consultant who does energy audits for green industry businesses and works with the USDA on energy issues. "Even high tunnels, which generally never had vents — some are now putting them in to allow for natural ventilation."

Bartok attributes this trend to the increasing costs for electricity, the costs of fans and fan installation, and the "positive ventilation" that is achieved with natural ventilation.

Automated roll up curtain system.

Natural ventilation accounts for 80% or more of the ventilation in a greenhouse, according to Bartok, something that is costly to achieve with fans alone. "You need to run a lot of exhaust fans to recoup the amount of air that would flow through natural ventilation," says Dave Stoltzfus, president at Advancing Alternatives. "If you have three, 36-foot fans in a 30x96-foot greenhouse you would still fall short of providing the recommended air flow of 40,000 cu.ft/min. Natural ventilation will easily provide that amount of airflow without having to turn on a fan."

Stoltzfus adds, "If you open up the sidewalls 6 feet on a 30x96-foot greenhouse and the air is moving at 2 mph — and it is uncommon that it would be less — natural ventilation will move the air through fairly quickly."

Stoltzfus also conveyed that not all growers take into account that fans must be kept running during the heat of the summer — when the greenhouse is often empty — just to keep the greenhouse poly from deteriorating. Natural ventilation, however, will eliminate the need to run fans during the summer months, further reducing energy costs.

In addition, Bartok says fan cooling can result in a temperature difference of up to 8 degrees from one end of the greenhouse to the other, possibly resulting in uneven plant growth. Properly configured natural ventilation systems offer more even temperatures throughout a greenhouse

or high tunnel and overall better environment for growing plants.

Ventilation serves various crucial functions in the growing process: temperature control, improved air circulation, humidity control and carbon dioxide/oxygen replacement to name a few.

Greenhouses accept and trap solar radiation, which causes rising temperatures in the growing environment. Beneficial to a point, temperatures that are allowed to climb too high can be detrimental to plant growth and health.

Greenhouse ventilation systems allow growers to exhaust excess heat and keep their plants thriving at an optimal temperature.

Plants benefit from breezes in terms of transpiration and cell wall strengthening. Air moving and blending throughout a greenhouse balances temperatures, humidity, CO_2 and oxygen, helping to create uniform conditions, which plants respond to better.

Without adequate ventilation, humidity will build up. Transpiration (evaporation of water from plants) and condensation that occurs naturally as part of the water cycle increase humidity levels within a thermally dynamic structure. High humidity levels in a greenhouse invite pathogens, molds and fungi that can interfere with plant growth. With an automated ventilation system, humidity control can be achieved by replacing wet warm air with cool dry air as needed.

Fresh air from ventilation provides plants with carbon dioxide that's critical for photosynthesis and oxygen that's required for root growth. A greenhouse ventilation system introduces fresh air and exhausts stale air, increasing the health and quality of your crop. Without ventilation, the air inside becomes oversaturated with oxygen and plant life suffers.

Additionally, ventilation assists with pollination. In a natural growing environment, plants rely on the wind to spread their pollen. In a greenhouse, ventilation is necessary for plant movement and the release of pollen.

Poor ventilation also weakens plants, which makes them more susceptible to pest damage.

Improper ventilation also creates humid conditions that are perfect for pests to lays their eggs.

For these reasons and others, it is clear that ventilation must be a top priority in any greenhouse. "People are definitely finding out that the environment of your greenhouse is what controls the quality of your product," says Stoltzfus. gpn

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