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SPECIAL REPORT:

Greenhouse Climate Control

Growers offer insights into how they are managing their greenhouse climate to optimize growth and achieve success.

TOGETHER IN EVERY CLIMATE.

As we continue into 2025, we're honored to share this report with you — an industry-wide look at greenhouse climate through the lens of the people who live it every day: you, the growers.

At Svensson, we know that every flower and ornamental crop grown across the U.S. represents the hard work, passion and innovation of greenhouse professionals like you. Whether you're cultivating houseplants, bedding crops or premium roses, your success is what drives us forward.

Since 1887, our roots in Sweden have shaped our values: quality, reliability and a deep respect for craftsmanship. Today, that legacy lives on as we support growers around the world with advanced climate solutions. We're proud to be known not just as the original climate screen manufacturer, but as a trusted partner to those striving to create the optimal greenhouse environment.

What makes Svensson different? It's not just our climate solutions like screens, insect nets and ventilation systems — it's our people, our partnerships and our promise to help growers succeed. Our U.S. team works hand in hand with growers to find the right fit for each greenhouse. We believe in results, and we're here to support you — from tailored product recommendations and climate strategy to rebate guidance and support during the product life cycle.

This report is part of our commitment to create a better climate for people and plants. By gathering insights directly from growers, we aim to foster shared learning and spark conversations that move our industry forward. Together, we can meet today's climate challenges with practical solutions, innovative thinking and collaboration.

Thank you for the trust you place in Svensson. We're proud to be your partner and excited to keep growing — together.

Dian Smith
General Manager, Ludvig Svensson

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by Patrick Alan Coleman

BEATING THE HEAT:

2025 Greenhouse Climate Control Research Report

The climates within the walls of poly houses, glasshouses and hoop houses are no less dynamic than the ones that bring rain, sun, wind, clouds and snow to the outside world. But the inside has one tremendous advantage: growers can control the climate with a wide variety of methods.

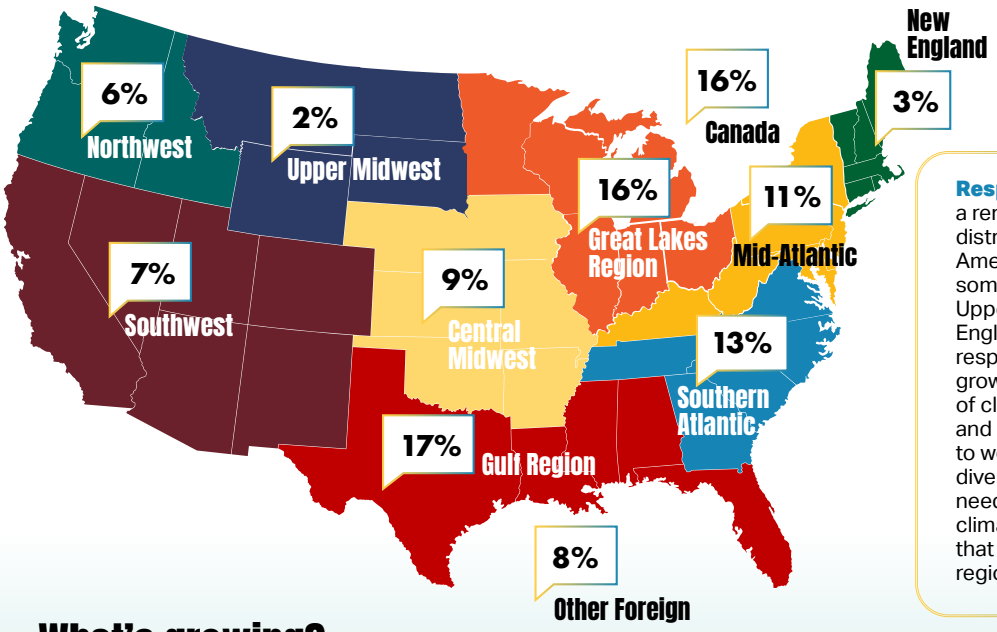
This report surveyed more than 100 growers to find out where they're growing, what they're growing and the methods and challenges of controlling the most micro of microclimates within their operations. They reported a constant concern with heat and puzzling over the ability to ensure a variety of plants grow optimally under the same roof.

Survey methodology: In April 2025 we surveyed greenhouse managers whose primary business is growing ornamental or edible crops for either wholesale or retail operations. The base for questions ranges between 107 and 125 participants. Answers were collected in May.

Editor's note: Not all percentages add up to 100% due to rounding, non-responses and some questions allowing respondents to select multiple answers.

LOCAL CLIMATES

Where is your operation located?



Respondents showed a remarkably even distribution across North America and abroad, with some exceptions in the Upper Midwest and New England. However, the respondents represent growers from a diversity of climates — from hot and humid, to temperate, to wet and cool. That diversity speaks to the needs for growers to have climate control solutions that can adapt to their region.

What's growing?

20% YOUNG PLANTS AND PLUGS FOR PROPAGATION

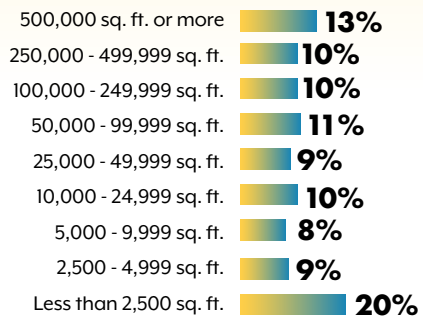
36% FINISHED PLANTS

43% BOTH

While specialists in young plants for propagation represent just under a quarter of responses, generalists who may grow both young and finished plants make a big showing in our data, again reflecting a diversity of climate control needs for those who took our survey.

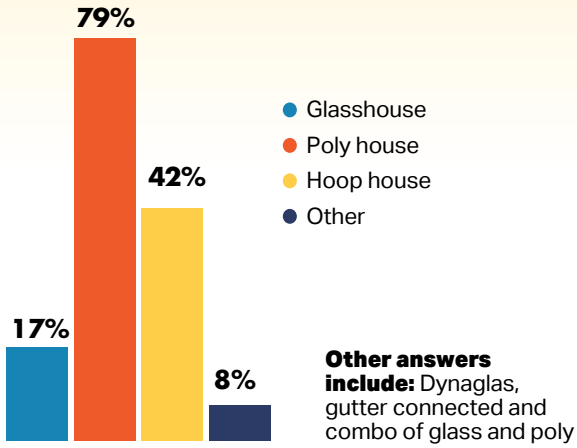
PRODUCTION AREA AND GROWING METHODS

Square footage of greenhouse space in active production:



Base: 124

Type of greenhouse structure:



Other answers include: Dynaglas, gutter connected and combo of glass and poly

Type of growing surface:

10% FLOOR

34% BENCHES

56% BOTH

Nearly half of respondents have more than 50,000 square feet in active production. But the majority grow in less space. Of those growers, they are most likely to have under 10,000 square feet in active production.

Covering that area are a variety of greenhouse structures, though most of the responding growers are using polyhouses. Those who grow exclusively on the floor or benches inside those structures are rare compared to those who prefer a combination of floor and benches, according to respondents.

How are you controlling the climate in your greenhouse?

77% HEATERS (I.E. ELECTRIC, PROPANE OR NATURAL GAS)

71% VENTILATION FANS

70% NATURAL VENTILATION (I.E. VENTS, DOORS AND ROOF GABLES)

49% MECHANICAL VENTILATION

41% GREENHOUSE CURTAINS/ CLIMATE SCREENS

37% Automated environmental control system

32% Under-bench heating

31% Supplemental lighting

28% Glazing/white wash

26% Sensors

23% Cooling pads and fans

16% Fogging systems

14% Reflective films

12% Insect nets

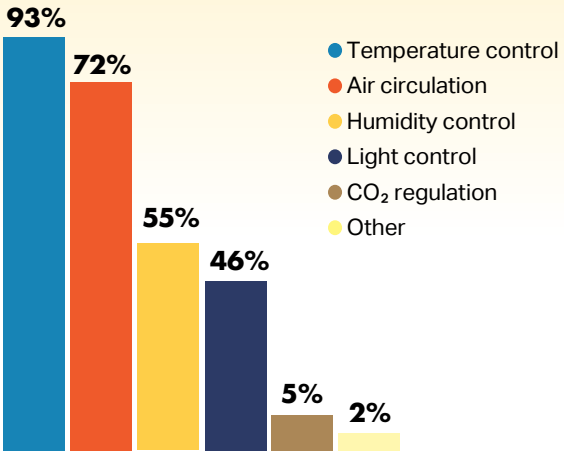
11% Insulation panels

5% CO_2 tanks or burners

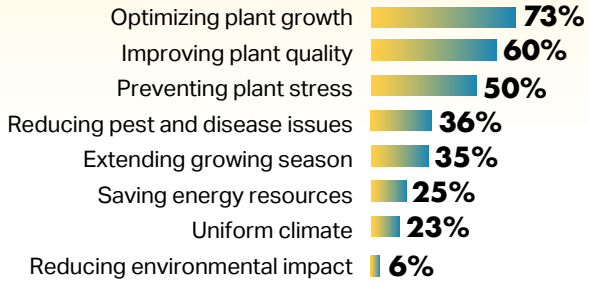
4% Other

Respondents could select multiple answer options

What are the three most important factors of your growing environment to control?



What are the top three benefits of using climate control solutions?



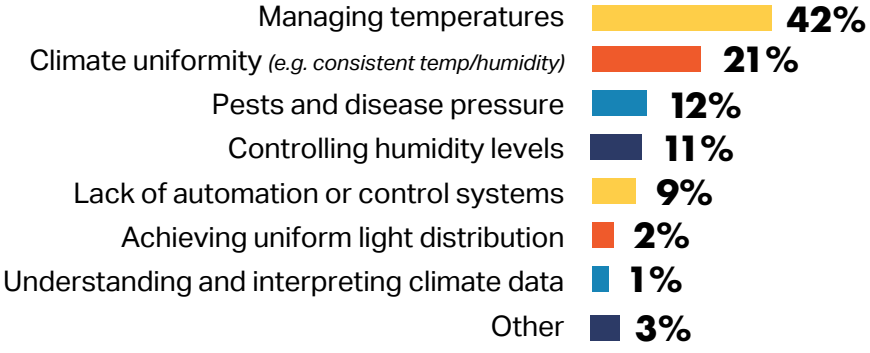
The top five most popular ways growers control the climate in their facilities in descending order are: heaters, ventilation fans, natural ventilation, mechanical ventilation and greenhouse curtains/climate screens. Those methods significantly outpace the bottom five options: fogging systems, reflective films, insect nets, insulation panels and CO_2 tanks/burners.

Those top options are brought into deeper focus when considering respondents' most important environmental factors to control. At the top of the list is temperature, followed by air circulation, humidity control and light control.

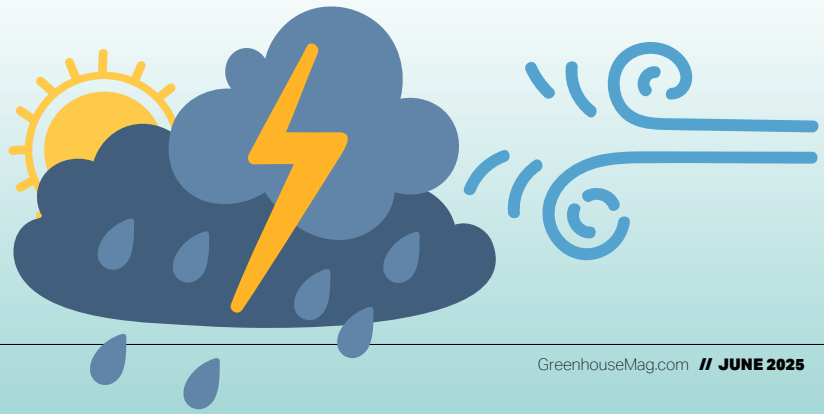
But the reason responding growers control their greenhouse climate varies in importance. The top concern is optimizing plant growth. Improving plant quality, preventing stress and reducing pests remain important in that order, but few growers use climate control to create a uniform climate throughout their facility, or reduce the environmental impact and save energy resources.

CHALLENGES, PERFORMANCE INDICATORS AND UPGRADES

What is the biggest challenge when obtaining your optimal climate?



Other answers include: Water management, training team and determining optimal climate needs for plant varieties and ages

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Even better blooms.

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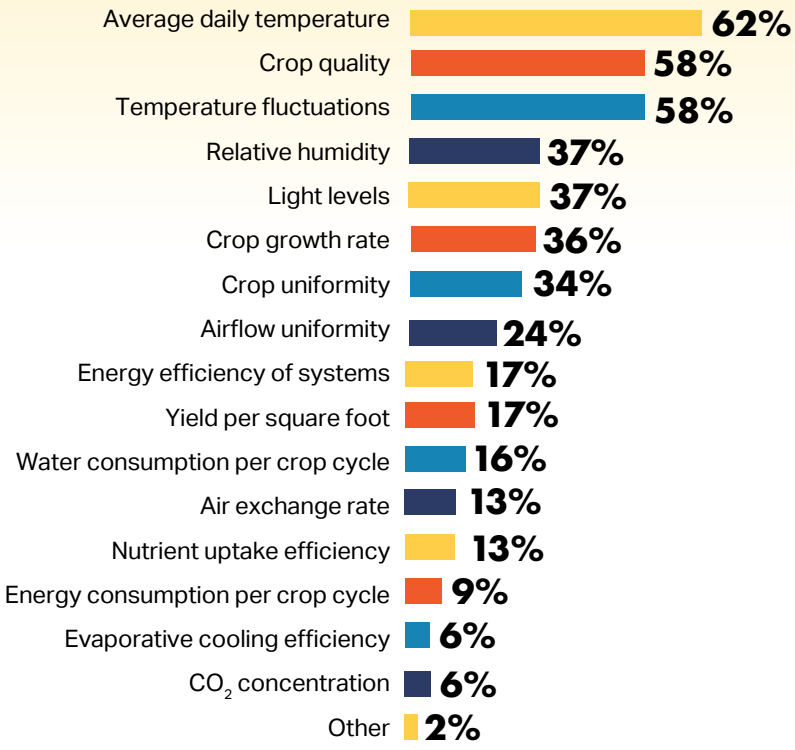
By mixing and circulating fresh air through the crop canopy, ClimaFlow reduces humidity, supports active photosynthesis, and improves overall plant health and uniformity. **And with support from Svensson's Climate Advisors, you'll get expert guidance tailored to your greenhouse and your goals.**

Discover ClimaFlow

What are you tracking related to greenhouse climate? (Select all that apply)



What are the top three factors you consider when selecting a product/ solution to control the climate in your growing operation?

60% Product price

49% Ease in installation & maintenance

42% Ease of use

40% Support before and after purchase

39% Availability & reliability

27% Trusted manufacturer

23% Compatibility with my other systems

22% Recommendation from a trusted source

1% Other

Which climate control solutions are you planning to upgrade within the next 1-2 years? (Select all that apply)

31% Lighting

31% Ventilation system

29% No plans for upgrading

26% Heating

23% Greenhouse curtains

14% Fogging systems (high pressure/ misting)

7% Climate computer

6% Dehumidification

3% Other

When asked about the primary challenge they face, a majority of responding growers (42%) choose managing temperatures. Half as many (21%) picked climate uniformity. The remaining top five challenges reported by the most to least growers were pests and disease, controlling humidity and lack of automated control systems for their climate control method of choice.

When judging the performance of greenhouse climate control, there are three standout indicators responding growers track above others: average daily temperature, the fluctuations of temperature and the quality of the crop. This makes sense, considering controlling temperature is the top concern among growers.

The remaining performance indicators also mirror climate control needs in terms of importance, with relative humidity and light levels as the fourth and fifth most tracked parameters and CO_2 concentration as the least tracked.

In terms of planned upgrades, lighting and ventilation topped the list, while 29% had no plans to upgrade their systems at all. However, 26% planned to upgrade heating, while 23% planned on upgrading greenhouse curtains.

But what are the top three factors when looking for a solution to climate control? The answer is clear: product price, ease of installation and maintenance and ease of use, in that order. GM

TIGHTEN UP

Part of staying competitive means running an efficient operation. Consider these steps to improve greenhouse efficiency. **By Daniel Ciolkosz**

Growers are under pressure to lower operating costs and stay competitive in today's dynamic market as they work to produce high-quality, low-cost crops.

Apart from labor, energy is probably the top operating cost for most growers. Therefore, one of the best ways to help reduce costs is to improve the energy efficiency of their operation. Energy-efficient greenhouses cost less to operate, and in some cases perform better than less efficient facilities. When you think about the fluctuating and (usually) rising costs of energy, it only makes sense to ensure that your greenhouse is as energy efficient as possible. The following are some of the most common successful measures that greenhouse growers can use to reduce energy use without compromising the performance of their greenhouse.

Tighten up the house

Many greenhouses are extremely leaky, meaning they have cracks, holes and openings in the walls or roof that allow cold air to leak into the house and warm air to escape. This infiltration can account for a significant portion of a greenhouse's winter heating bill and can often be eliminated with the help of a sharp eye, a can of spray foam and a tube of caulk. This measure can often reduce your heating bill by 5 to 10%. Tightening up the house has the added benefit of improving control over airflow patterns in the house, which can make temperatures and humidity levels more uniform.

Metal posts and frames that are embedded in a greenhouse's walls or roof are another spot where heat can leak

Check roof vents for cracks and leaks.

PHOTOS © ADOBESTOCK

out. Even though there is not a physical opening to allow hot air to escape, the metal, with its high thermal conductivity, provides an easy pathway for heat to move from indoors to out. Cover these structural elements with insulation whenever practical.


Fans that are clean and well-maintained will use less energy.

Add a thermal screen

Greenhouse coverings are clear to allow sunlight into the house. Unfortunately, clear panels are also poor insulators. You can minimize your nighttime heat loss in the winter by using a movable thermal screen that can be drawn across the roof and walls of the greenhouse. Often, these thermal screens can serve double duty: providing shade from excessive sunlight in midsummer and providing thermal insulation during winter nights. The reduction in heating costs will vary depending on your situation but can be as high as 30 or 40%.

Seal the fans

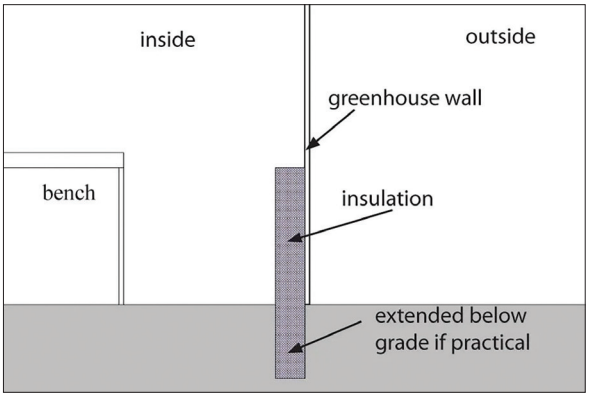
When ventilation fans are turned off, the fan's louver will automatically close the fan opening — at least that's how it's supposed to work. Unfortunately, bent or malfunctioning louvers are all too common in greenhouses, as well as drilled holes or gaps around the fan housing. This leads to air leakage during the winter, which translates into higher heating bills. Malfunctioning louvers need to be repaired, and any holes or cracks should be covered over. Growers can also cover the fan inlet with a sheet of foam insulation board during the coldest months, when the fan is not needed.

Insulate the perimeter of the greenhouse

One of the spots where heat is lost in the winter is along the perimeter of the greenhouse: through the ground and through the bottom part of the sidewall. You can reduce energy losses by installing an insulated board that extends from the height of the greenhouse's benches down into the soil along the greenhouse's perimeter.

Insulate the north wall

The north wall of a greenhouse lets in surprisingly little light — especially in the winter, when the sun is low in the southern sky. You may find that it's cost effective to cover the north wall of the greenhouse with insulating board to reduce heat losses. If the insulation is painted white, it can even enhance



A cross-section drawing shows the installation of perimeter insulation.

light levels inside the greenhouse by reflecting back winter sunlight that would have otherwise passed out through the north wall.

Replace ventilation fans with high efficiency models

Ventilation fans vary in their performance. If you purchased the cheapest ones available, chances are they're also very energy inefficient. Now might be the time to upgrade to a higher efficiency model — ask the fan manufacturer to give you their product's ventilation efficiency ratio or look it up online. Larger fans are often more efficient than smaller ones, but the variation in efficiency from one fan to another can be quite large. The University of Illinois Bioenvironmental and Structural Systems (BESS) Lab maintains an online database of fan data information. The fans are searchable according to size, airflow, ventilation efficiency ratio and manufacturers. Access it at **bess.illinois.edu**.

Upgrade the lighting

Not all greenhouses use electrical lighting, but those that do should investigate the possibility of upgrading their system to a more efficient variety. The relatively high cost of lighting in a greenhouse makes this an important measure, especially if the lighting system is kept on for long periods of time.

Reflectors can be added to have bulbs direct more light down to the plants and reduce the number of fixtures needed.

Clean the fans

Greenhouse growers usually care a lot more about their plants than about their fans — that's one of the things that makes them good growers. However, it pays to look over the fans from time to time to see if they are in good operating order or if they need a cleaning. Accumulated dust on a fan's blades and safety screen can increase ventilation energy use by as much as 20%! All that is needed to correct this problem is a rag and some elbow grease. Be sure to deactivate the electrical circuit for the fan before starting, just to be safe.

Replace motors with properly sized, energy-efficient models

Electrical motors operate most efficiently if they are running at full capacity — a motor that is twice as big as it needs to be will use extra electricity to keep itself energized, leading to additional energy costs. Electrical measurements by a competent electrician are needed to determine if a motor is oversized or not, but the savings from replacing oversized equipment can be significant. You can also look into switching to energy-efficient motors that cost a bit more to purchase but use less electricity than standard motors.

Don't overlook electrical motors in certain greenhouse equipment for potential energy savings.

Tune up the control system

Automobiles need a regular tune-up if they are to run properly, and the same is true of your greenhouse control system. Whether you use mechanical thermostats or a fancy computer system, it is still worthwhile to check its operation to make sure everything is running properly. A thorough inspection of the control system requires a bit of technical knowledge about the controls equipment. However, it's possible for just about anyone to catch simple problems by simple observation. For example, if the ventilation fans are on while the heat is on, there's probably something wrong. If the lights are on in a greenhouse when there are no plants in the house, it's worth figuring out why and correcting the problem.

Other ways to save money on energy

If you are using expensive heating fuel, it may be worthwhile to switch to a more economical option. This does not reduce the amount of energy that you are using, but it can reduce your operating costs significantly.

Burning wood or other biomass for fuel is often cost effective as well as being renewable and locally produced. It's not always easy to tell which fuel is the cheapest to use — some fuels are sold by gallon, some by cubic foot, others by ton. Penn State Extension's Online Energy Selector Tool (**extension.psu.edu/online-energy-selector-tool**) can help you cut through this confusion and figure out which fuels are the most economical to use.

Conclusions

Energy efficiency for your greenhouse is a great way to reduce your operating costs and improve the profitability of your operation. Keep in mind that not every one of the measures described here will be appropriate for every house — sometimes an energy conservation measure is simply too expensive to install, relative to the expected savings. A careful energy assessment is the best way to determine which measures will be worthwhile. However, there's a good chance that some of the suggestions above will help make your greenhouse more energy efficient and cost effective in the coming years. GM

Daniel Ciolkosz is an associate research professor at Penn State's Department of Agricultural and Biological Engineering. Contact him at **dec109@psu.edu**.

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