

# New software calculates heating costs in greenhouse operations

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In parts of the United States where ornamental and vegetable plants are produced in greenhouses during cold seasons, heating costs are second only to labor costs for greenhouse operators. Greenhouse growers are faced with important management decisions that rely on understanding how temperature settings, heating systems, fuel types, and construction decisions influence their heating costs. To address the lack of user-friendly computer programs currently available for calculating heating costs in greenhouse operations, scientists have created a state-of-the-art system they call "Virtual Grower".

"Virtual Grower was designed to help calculate heating costs at many U.S. sites," said Jonathan Frantz, a researcher with the USDA-Agricultural Research Service. The program uses a weather database of typical hourly temperature, light, and wind information of 230 sites from the National Renewable Energy Laboratory. Frantz and colleagues Bryon Hand, Lee Buckingham, and Somik Ghose reported on their cost-saving program in HortTechnology.

Highlights of Virtual Grower are features that allow users to define unique design characteristics such as building material and construction style. "Users can also define the type of heating system and heating schedule; the program will then predict heating costs based on typical weather at the selected location", Frantz said. Using the 'Add New Greenhouse' button on the site, values are automatically populated for greenhouse name, length, width, knee wall height, materials, fuel types, infiltration, and heating system efficiency. Users can change the values

in drop-down windows or describe the house in more detail through additional buttons on the screen. The program also features methods for estimating typical commercial-scale [heating system](#) efficiencies and air infiltration values.

The team has plans to enhance the capabilities of Virtual Grower.

"Adding plant growth and development models will allow for scheduling and an assessment of plant quality, while improving the realism in heating systems and partitioning of greenhouses would provide more realistic simulation opportunities," they said. "Carbon footprints could be calculated from the existing software's framework, and predictions of plant pest outbreaks and water use could also be folded in, with linkages to the historical weather database already used."

"Continued development will improve the software and allow users to perform baseline analysis of their heating costs, identify areas in their production to improve efficiency, and take some of the guesswork out of energy analysis in greenhouses", Frantz said.

**More information:** The complete study and abstract are available on the ASHS HortTechnology electronic journal web site:  
[horttech.ashspublications.org/...nt/abstract/20/4/778](http://horttech.ashspublications.org/...nt/abstract/20/4/778)

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