Application Technology Research Unit: Greenhouse Production Research Group

Developing a Computer-Based Greenhouse Management Tool for Growers

MISSION STATEMENT

To conduct fundamental and developmental research on production technologies, diseases, pests, and abiotic stresses for the greenhouse ornamental industry while safeguarding environmental quality, food, and worker safety. To transfer that technology to the industry through partnerships with state extension service and direct stakeholder interactions.

MAIN AREAS OF STUDY

Plant nutrition
Root and foliar disease management
Water management
Interactive greenhouse model

PERSONNEL

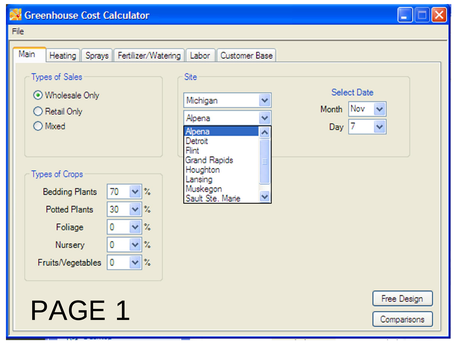
Lee Buckingham, IT Specialist
Jonathan Frantz, Research Horticulturist
Charles Krause, Research Leader
James Locke, Research Plant Pathologist
Medani Omer, Research Plant Pathologist
Doug Sturtz, Analytical Chemist
Ann Widrig, Horticulturist

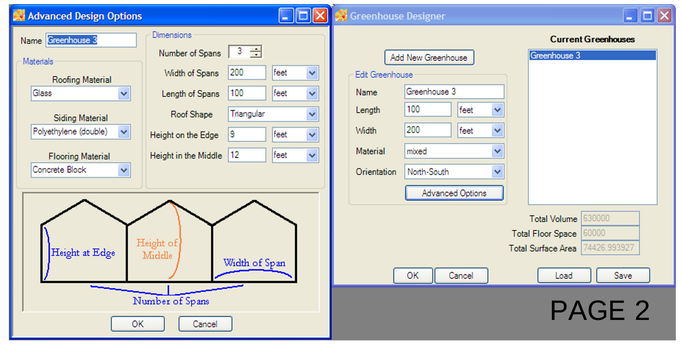
COMPREHENSIVE COMPUTER GREENHOUSE MODEL

MODEL FEATURES

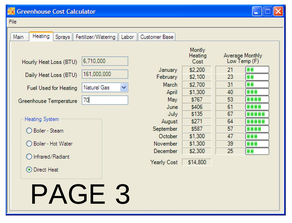
- Choose your location in the US (including Alaska, Hawaii, and US Territories)
- Build your own greenhouse including materials, orientation, and fuel type
- Estimate fuel costs for a growing season
- Change fertilizer and watering needs
- Spray growth regulators, pesticides, and algaecides
- Manage labor
- Optimize for plant productivity
- See how all management changes influence profitability and determine pricing!

USING THE MODEL

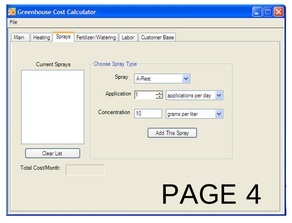




On the model's main page (PAGE 1), select your state and city from the drop-down menus. Then, you can design a greenhouse (PAGE 2) choosing materials, roof style, orientation, (N-S or E-W), and number of spans. The program updates each change and you can save or delete your settings as needed.



Based on location, fuel, greenhouse temperature, and greenhouse style, the model can estimate fuel costs (PAGE 3).



Separate pages allow inputs into labor, sprays (PAGE 4), fertilizers, watering, market information, and sprays.

LIGHT
× light capture
× quantum yield
× carbon use efficiency
× harvest index
× fraction of carbon
YIELD

The plant growth portion is based on a simple "energy cascade" approach wherein light drives plant productivity, and other environmental and management decisions (i.e., temperature set point, nutrition) influence plant growth.

GOAL

When optimizing production for one feature (energy, plant growth, or labor), the outcome from other parameters (plant productivity, profitability, sprays, labor) will be affected. Management decisions can then be made with an eye on overall system function.

COOPERATING INSTITUTIONS & ORGANIZATIONS

N.C. State University, Michigan State University, Toledo Area Flower and Vegetable Grower's Association, Ohio Florists Association, Center for Innovative Food Technology