# ENVIRONMENTAL CONTROL FOR HOME GREENHOUSES

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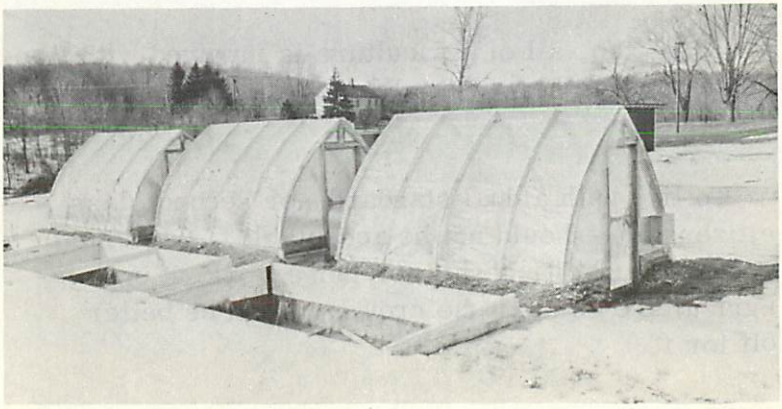
Growing plants in home greenhouses in a rapidly expanding leisure time activity in the suburban areas of the United States. A large number of these structures are now being built using polyethylene or fiberglass as a covering material. A major problem in operating the greenhouses has been a lack of environmental control systems compatible with their relatively small size.

A recently completed research project at the University of Connecticut has investigated the effectiveness and cost of utilizing various types of commercially available fans and electric heating units in plastic covered home greenhouses.

The research was conducted in three Gothic style, polyethylene-covered greenhouses located on concrete block foundations. The area inside the greenhouse was excavated to a depth of 15 inches and the foundation walls were insulated on the in-



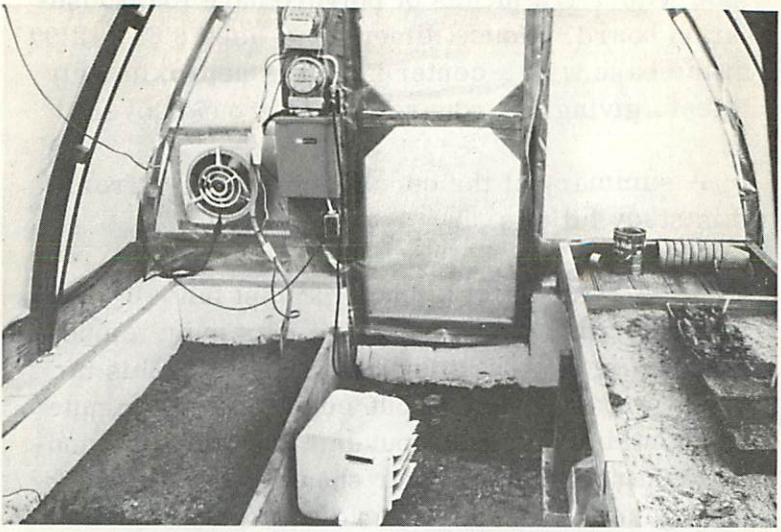
side with 1 1/2 inches of polyurethane foam insulation board. House dimensions were 8'6"x12'0" at the base with a center height of approximately 8 feet, giving 102 square feet of ground covered.

A summary of the conclusions reached from this study follows:

1. A residential kitchen exhaust fan (10") will provide satisfactory control of maximum temperatures from early fall until late spring. This fan has a rated delivery of 500 cubic feet per minute and contains a gravity louver. A cooling thermostat controls the fan. Air should be admitted through an 8" diameter perforated polyethylene tube (4 mil) attached under the ridge of the greenhouse. During the summer, the doors can be left open or the plastic removed.

2. Lowest heating costs were obtained using infrared heaters (utilizing a transistorized control unit). Plant response has not been fully assessed. The temperature was sensed using a thermister inside a black bulb which was located on the surface of the soil. Four 2-kilowatt units were located approximately 20 inches above the soil. Yearly heating costs in a double covered house (8'6"x12'0") were approximately $45.00 when the inside black bulb temperature was maintained at 60°F.

3. Another heating system utilizing two 3 KW fan forced hot air unit heaters worked well. These 220 volt units were controlled by air temperature sensing thermostats. Yearly heating costs of an identical greenhouse were about $57.00.
(See photo on next page.)



4. A third system utilizing two 1.5 KW quartz tube infrared heaters and two 1 KW soil heating cables gave the best results for germination and starting plants. Air temperature sensing thermostats were used to control the temperature. The infrared heaters were located below the ridge at a height of 6 1/2 feet from the ground and heating cables were buried in the benches. Heating costs per year were approximately $63.00.

5. Heating costs increased about 28% when the houses were covered with a single layer of plastic.

Based on the above research, the cost of heating small home greenhouses is from 45¢ to 63¢ per square foot depending on the system used. As a comparison, heating commercial size greenhouses with oil usually costs from 20¢ to 25¢ per square foot because the differential cost of heat and the ratio of surface area to ground area is much smaller.