

Bottom Heat

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Research has shown that root zone temperature is more critical than leaf temperature in achieving good plant growth. It can also reduce the time needed to root cuttings and germinate seed.

Bottom heat can also reduce energy consumption as some of the heat needed by a greenhouse in the spring and fall can be provided by the root zone heating system. This can substitute for a central boiler operating inefficiently during mild weather. During the coldest part of the winter the central system may still have to provide up to three-fourths of the total heat needs.

Because the root zone is maintained at the ideal temperature, the air temperature for some crops can be lowered as much as 15°F. This reduces heat loss from the greenhouse and thereby energy consumption. Poinsettia, cineraria, calceolaria, dieffenbachia, roses and bedding plants will do well with a cooler night air temperature.

A number of systems have been developed to provide additional heat to the root zone.

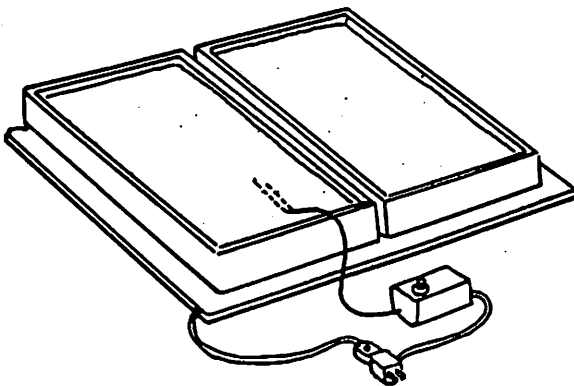
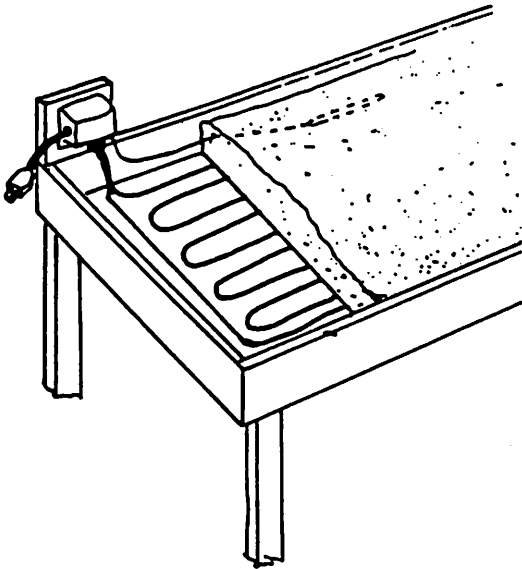


Figure 1. A propagation mat is convenient for a couple of flats.

Propagation Mat—For heating small areas, germinating a few flats or rooting some cuttings, the Progro propagation mat is a good choice (Fig. 1). Made with the electric heating cables molded into a flexible rubber mat this unit is waterproof and impervious to soil,

chemicals and fertilizers. Available in two sizes (22" x 22" and 22" x 60") it is carried by most greenhouse suppliers.

Heating Cables—One of the many uses for electric heating cables is for bench heating (Fig. 2). These consist of a loop of resistance wire that



heats up when electricity passes through it. The older style lead sheathed sets are well suited to use in exposed locations. They can be bent to a radius of 1/2 inch and, because of their weight, lay flat on the bottom of the bench. Plastic covered cables are insulated to give mechanical toughness, heat, moisture and chemical resistance but will probably not last as

Figure 2. A sand bed is frequently used to distribute the heat from electric heating cables.

long. Cables are available in many lengths and several heat outputs per foot.

Agritape—This relatively new bench heating system consists of thin, closely spaced electrical resistance wires sealed between two layers of mylar plastic (Fig. 3). It is available in three configurations from Ken-Bar, 24 Gould St, Reading, MA 01867, the manufacturer, or from one of the greenhouse suppliers.

1. A three-inch-wide continuous tape that can be used for smaller pot plants placed pot to pot.
2. A three-inch-wide intermittent tape with a five-inch-long heat section each foot for larger potted plants.
3. An 11-inch-wide continuous sheet that is placed under flats of seeds or cuttings.

Warm Water System—This system is practical in greenhouses of 500 square feet or more. A typical system contains piping, a circulating pump, a source of hot water and a control system (Fig. 4).

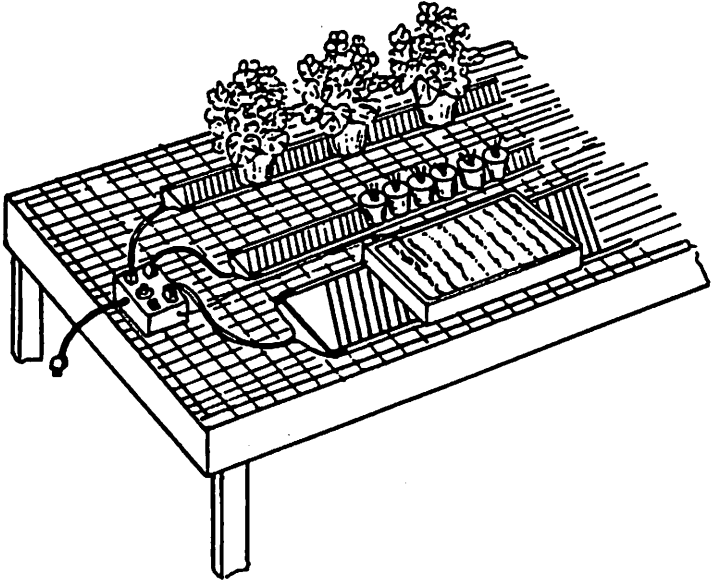


Figure 3. Three types of Agritape are available for different applications.

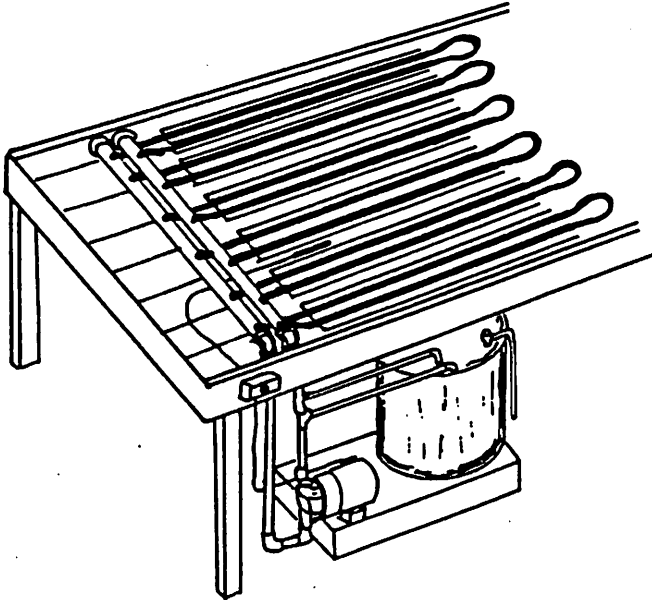


Figure 4. A warm water system contains a water heater, circulating pump, piping and controls.

It can be installed in the floor, on benches or in soil beds. Warm water (90° to 140° F.) is circulated through the pipes providing an even heat to the root zone area.

Commercial piping systems that are available include *Gro-Mat*, Bio-Energy Systems Co., 221 Canal St., Ellenville, NY 12428 and *Biotherm*, Biotherm Engineering, Inc., P.O.Box 6007, Petaluma, CA 94953.

This small-diameter tubing is spaced evenly across the growing area, with one end of each tube connected to a warm water supply header and the other end to a return header. Because the rubber tubing is very flexible, it conforms to the surface it is laid on. Pre-assembled, ready-to-roll-out units including the pipe and header can be ordered from the manufacturer. Polyethylene, polyvinyl chloride (PVC) or polybutylene of 1/2-inch inside diameter also work well but are not as flexible and require more fittings and installation time.

More details on sizing the heater, pumps and headers and laying out the piping are given in an information sheet on *Bottom Heat* available from Natural Resources Management and Engineering, 1376 Storrs Road, The University of Connecticut, Storrs, CT 06269-4087.

Note of Interest

During the April meeting of The University of Connecticut Board of Trustees, Dr. Mark Bridgen was promoted to Associate Professor of Floriculture with permanent academic tenure. Dr. Bridgen will be on sabbatical leave this fall semester at the Danish Research Centre for Horticulture in Aarslev, Denmark.