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The oldest practical example of soil heating is growing cucumbers on manure ridges which generate heat on decomposition. There is now a great deal of interest in soil heating with warm water pipes under the crop. The idea is not new. Many growers in Holland have installed soil heating systems, especially in cucumber, melon, and pepper houses. On the whole the results were disappointing, but it was discovered that soil heating with a warm water system caused the loss of CO_2. In tight green houses, CO_2 could drop to very low levels. With newer methods of introducing CO_2, practically the entire pepper crop is now being grown with soil heating. Experiments have proved conclusively that much higher crop yields may be obtained with soil heating.

Economically, soil heating is a good proposition in Holland. The annual capital costs are no greater than the cost of one batch of straw bales used in crop production. Experience has shown that irrigation requirements are more exacting, especially with initial stages of growth. A soil-heated crop should be given less water. The heating installation must be good. There may be increased risk from disease.

There are three requirements for a soil heating system; it should provide an even temperature, it should be easily controlled, and it should be reliable. An even temperature is achieved by limiting the length of the warm water pipe loops so that sufficient water circulates at all times. Dutch growers generally use polypropylene pipes, 0.6 inches inside diameter, in the shape of loops buried at 15.7 inches. This is deep enough not to interfere with cultivation. The loops should be no longer than 262 feet, providing a flow rate of 0.4 gallons per running foot per hour. This is usually adequate. With a loop arrangement, flow and return mains can be fitted at one end of the greenhouse. The mains should be separate from the space heating system. Few growers have found it worthwhile to automate the system. Most installations are fitted with a manual mixing valve, with a short-circuit connection between the flow and return pipes which are taken directly from the boiler. The mixing valve is set in such a way that 20% of the water from the boiler is pumped into the soil system, and 80% is returned to the boiler. This ensures that the temperature in the soil heating pipes cannot exceed about 104°F.

A filter is usually required to prevent blockage, located before the mixing valve. Special couplings connect the plastic heating pipes to the steel mains. Hose clips are not reliable.

Calculations for the system are generally based on a heat requirement of about 40 kilocalories per hour per sq. m. (14.7 BTU per sq. ft.). However, as the soil retains heat to a remarkable extent, once the required temperature has been reached, very little additional will be required. The system is usually switched on about one week before planting, and the soil temperature raised to 73-75°F.

Experiments with other crops such as gerberas and lilies have shown that soil heating offers considerable advantages in terms of higher yields, better quality and lower costs.

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