UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY—COLLEGE OF AGRICULTURE

HortFacts 21-03

LETTUCE GROWS UNHARMED IN BELOW-FREEZING WEATHER WHEN

Earth Helps Heat Greenhouse

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Department of Public Information

Old Mother Earth helped heat some U. K. Agricultural Experiment Station plastic greenhouses this past winter.

Here's how it was done: Ground heat was combined with solar heat to keep the temperature of the experimental greenhouses well above the outside temperatures. In one house, the heat came from ditches, just inside, running the length of the greenhouse and extending outside for several feet beyond the end of the greenhouse, which sloped downward. The ditches were 3 feet deep and 8 inches wide.

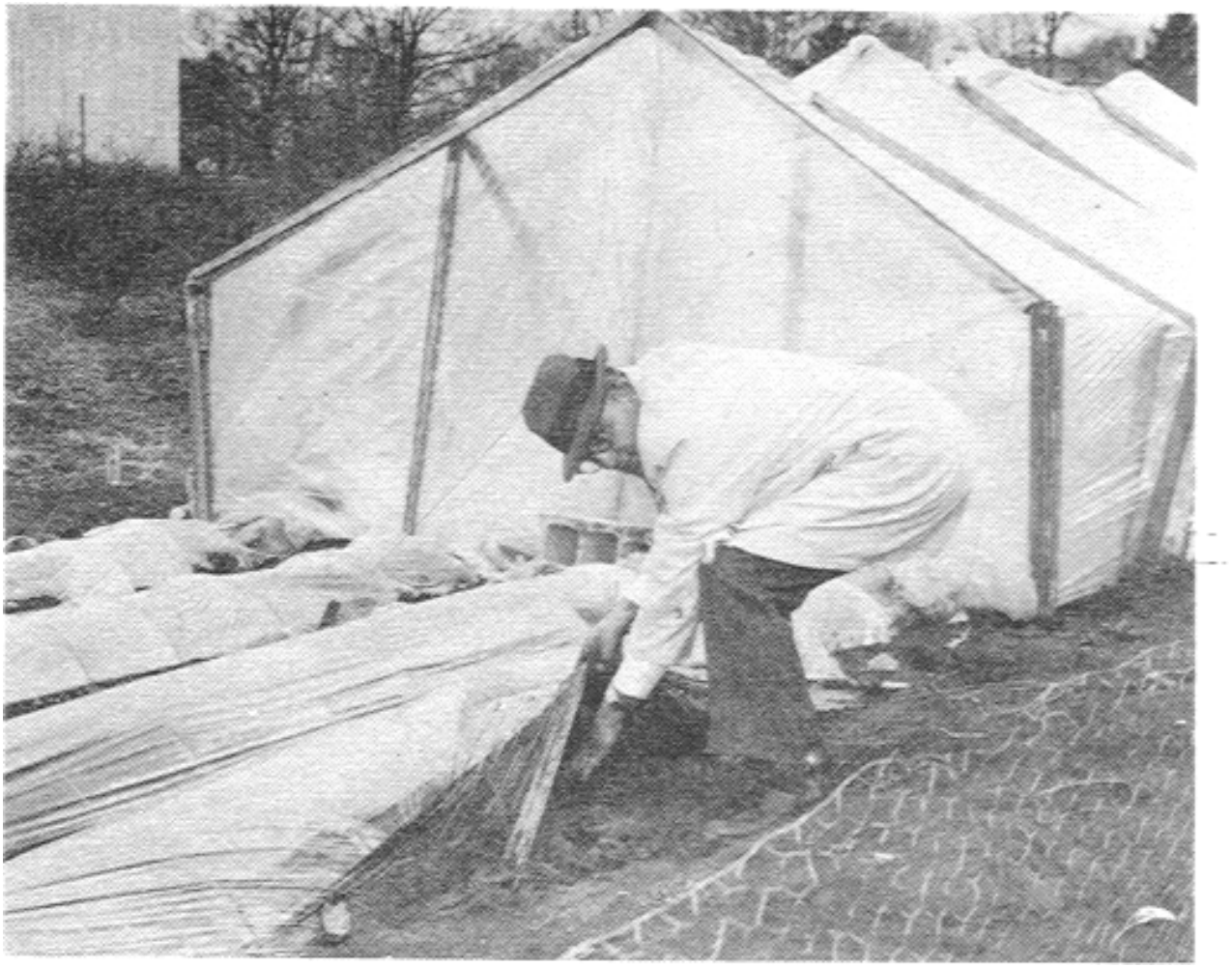
Plants in the greenhouse were protected with a double layer of very thin (3/4 mil) clear plastic supported by wires. The outer edges of this plastic extended over the ditches. The part of the ditches beyond the greenhouse was covered with a double layer a double layer of clear

Ground heat coming from trenches helped these two lettuce varieties, growing in a plastic greenhouse, to survive when outside temperatures were well below freezing. The plastic has been pushed back over the supporting wires to show the trench. Note the uprights placed in the trench.

clear over black plastic, also supported by wires. The clear plastic was actually an extension of the 3/4-mil plastic covering the plants.

According to Horticulturist E. M. Emmert, ground heat from the ditches flowed up under the plastic covering the plants. Lettuce plants in this greenhouse did not freeze when the outside temperature went to 10 degrees below zero. This means that the difference between the outside and inside temperature was at least 42 degrees.

When the sun shone on the part of the ditches outside the house, the ground absorbed heat under the plastic cover. Then later the heat flowed upward out of the trenches into the plastic protecting the growing crops. In addition to saving on heating bills for the plastic greenhouse, Emmert found that the ditches drained away excess water and reduced excessive heat build-up inside the house on sunny days.

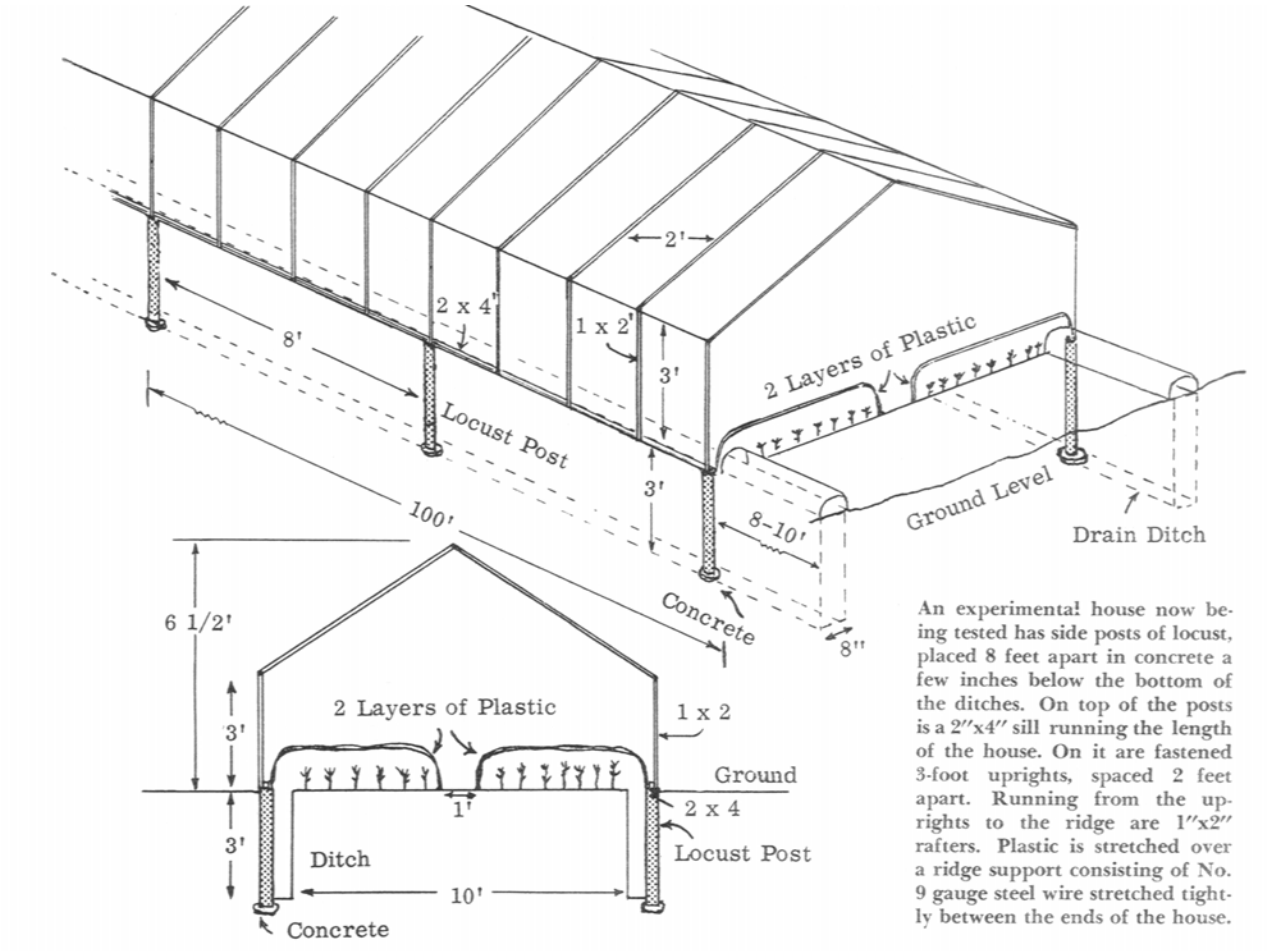


Dr. Emmert demonstrates one of his experimental plastic greenhouses where, this past winter, heat came from the ditches that extended from inside the house down a slight slope outside the house. The ditches outside the house were covered with a double layer of clear over black plastic supported by wire wickets.

An earlier type house Emmert devised utilized four narrow but deep ditches covered tightly with a semicircular plastic hood. These ditches, dug outside the house, were 12 inches wide, 3 feet deep and 50 feet long. The end of the trenches was somewhat lower than the

greenhouse, so the ground heat flowed upward to enter the greenhouse. Inside temperatures in this house were as much as 5 degrees above those of houses not having any ditches. This margin could be very important when the freezing point is reached in late winter or early spring. If the outside temperature were to drop to 8 degrees, inside the house under a layer of plastic stretched a few inches above the ground the temperature would likely be about 28 degrees. However, with the ditches putting heat into the lower end of the house, the reading would be 33 degrees. Some crops that might tolerate near-freezing temperatures thus would be saved by the 5-degree margin.

Emmert said that one night this past winter the outside temperature reached 5 degrees. Yet, there was no freezing at the upper end of the ditched house (where the heat flowed) and only slight freezing at the lower end. Emmert makes no claim his experimental heating system will replace gas burners. He feels, however, that the margin of temperature provided by the ground heat system will be helpful when the greenhouse operator has started spring crops or when he is trying to maintain production in late fall.



An experimental house now being tested has side posts of locust, placed 8 feet apart in concrete a few inches below the bottom of the ditches. On top of the posts is a 2″x4″ sill running the length of the house. On it are fastened 3-foot uprights, spaced 2 feet apart. Running from the uprights to the ridge are 1″x2″ rafters. Plastic is stretched over a ridge support consisting of No. 9 gauge steel wire stretched tightly between the ends of the house.

Cooperative Extension Work in Agriculture and Home Economics: College of Agriculture and Home Economics, University of Kentucky, and time United States Department of Agriculture, cooperating. William A. Seay, Director (acting). Issued in furtherance of the Acts of May 8 and June 30,1914. 1M--9-61

(Reprinted from Kentucky Farm and Home Science, Spring 1961, Vol. 7(2):4-5.)
MISC. 235 UNIVERSITY OF KENTUCKY, AGRICULTURAL EXPERIMENT STATION

Scanned and reformatted Jan. 2004 by Robert G. Anderson, Extension Floriculture Specialist