

FNE-93-29

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report

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SOIL HEATING IN UNHEATED TUNNELS USING SOLAR PANELS

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In the past I have grown tomatoes in an unheated tunnel to supplement my main greenhouse crop after it is on the decline in late July, but before the local outdoor crop forces the price down. My tunnel crop generally comes in two to three weeks ahead of the outdoor crop. At high early season prices even a one week gain could add significantly to profits. Soil heating may be one way to achieve this gain.

In this experiment I heated the soil in one row of an unheated tunnel and compared this row's earliness to that of a row with unheated soil.

Originally I planned to heat the soil with a hot water system fueled with propane. If this succeeded I would generate my hot water with solar panels. I couldn't afford the propane system, so last year I set up the trial using six donated solar panels. In addition to the tunnel's heated row, I heated two rows outside to make more realistic use of the solar panels.

I planned on planting the first week of May, a week to ten days ahead of my normal outdoor planting date. Due to some cool weather I held the plants in five inch pots until May 10th. I planted 125 plants per 100 ft. bed, staked them, pruned them to one stem, and in late July, topped them at three feet.

My results were measured by comparing the quantity of tomatoes I harvested before the wholesale price dropped significantly.

In the first weeks I recorded morning and evening soil temperatures. The morning I planted, the soil temperature in both rows was 58°F. That evening the temperature was 68° in the heated row and 62° in the unheated row. This daytime difference increased, but morning temperatures remained close, with the heated row 2-4 degrees higher than the unheated row. After five days, daytime soil temperatures were reaching 80° in the heated row, and between the 16th and 20th of May we had a stretch of cloudy and cool weather. By May 20 the daytime temperatures were 58° (heated) and 56° (unheated). A sunny day on the twenty first brought the afternoon soil temperature up to 80°(heated) and 66°(unheated). After this we had some hot weather and the temperature in both rows rose quickly and the plants in both rows grew well. It is important to note that outdoor conditions were also good.

I harvested my first tomatoes for market on the twenty third of July, with the price at 2.80\lb. retail and 2.00\lb. wholesale. I picked 90 lbs. with the heated and unheated rows producing

equally. I picked 220 lbs. on the 30th. This weekend the retail price dropped to 2.00\lb. and the wholesale to 1.00\lb. On August 2nd, I still got 1.00\lb. wholesale and 1.50\lb at the Farmer's Market. I picked 144 lbs. this week, but by the weekend the market for tomatoes was flooded. Before this week the total value of the tomatoes was \$902.00 (retail) and \$540.00 (wholesale). By August 26th, I picked 1200 lbs. of marketable tomatoes. After this the fruit was of poor quality. I picked equal quantities of fruit from both rows.

Heating the soil in an unheated tunnel made no difference in this experiment, but I believe this is due to the solar panel's unreliability. It was eleven days after transplanting, that afternoon soil temperatures were consistently at 80° in the heated row. Soon afterwards, the temperatures in the unheated row would approach this. These temperatures were also much closer by morning. Had the water been heated with propane so soil temperatures were maintained at 80° there might have been a notable difference in early growth between the unheated and heated beds and as a result a difference in early yields. Cool and cloudy early May weather, along with a warm late May (that resulted in an early outdoor crop) also reduced the profitability of tunnel crops.

**-Some other notes of interest-**

I made my tunnel from bent  $\frac{1}{2}$ " X 3" ash strips. The logs were donated, but I paid \$300.00 to have them sawed, \$150 per 12" tunnel. These tunnels only lasted two years. Setting them up was labor intensive and the plastic had to be removed before winter. A metal frame the same size is \$750.00, but they last much longer, can be fitted with roll up sides, look neater and can support a snow load, so the plastic need not be removed. Three year plastic is not much more expensive then 1 year.

I would also consider heating this late tunnel crop. The ability to estimate and plan around more consistently early harvests would easily make up for low May heating costs.

Although the solar panels were unreliable as a main source of heat, they produce a lot of hot water and I plan on using them to supplement my propane water heater in my main greenhouse.