Using Compost Heat for Perennial Production
Pat Gianunzio, Petal Pushers Farm Laconia, NH
A Northeast SARE funded project

The expense of heating oil limits our production, thereby forcing us to lay off our two full-time, seasonal employees during the winter months. Other growers in the Northeast face the very same dilemma.

Recently, we have begun growing our own perennials instead of buying in the plants wholesale. We also produce compost from plant waste and municipal yard waste from the city of Laconia. We then use the compost in our soil mix for our perennials, and are able to produce a one gallon perennial for $1.18, as opposed to $4.50 when bought through a wholesale outlet. After converting to our own production, we have established a few wholesale accounts of our own with other local growers. From these relationships, we have discovered that we have the potential to double our perennial production. However, we will have to increase our fuel consumption in heating the greenhouses during January and February.

A solution to the fuel costs, as well as labor, is to use the heat that is generated from our compost pile to heat the greenhouse structure used for perennial production. For the past two years, we have been monitoring the temperatures of the compost pile during the winter months, and have found that it reaches between 140 to 155° F. Furthermore, we have discovered that to maintain these temperatures, we must maintain the mass and shape of the compost pile. Regrinding the pile provides aeration, adding oxygen, which keeps the heat building in the pile. Our idea is to remove the heat from the core of the pile to heat the perennial greenhouses to 40 to 50 F, primarily at night.

We compost leaves and grass clippings, which we obtain from the city and area landscapers at no cost to us. It takes 3,000 yards of leaves and grass clippings to form the pile that we will use in this project. Landscapers must pay the town or city to take yard wastes, whereas, a grower who has a compost pile can easily use this material to build a compost pile. The turnaround of the pile is relatively quick, and we foresee a pile reaching the optimum temperatures in as little as a few months. Furthermore, we believe a compost pile will heat up faster, and requires less acreage than does the windrow method of composting.

We would like to develop this project so that we can establish a heating system that will carry the heat from the compost pile to the greenhouse, while also monitoring the temperatures of the compost pile to ensure adequate temperatures to complete the composting process. Furthermore, this process will test the assumption that the composting process will not slow down if heat is drawn out of the pile. By proving our theory, we can share our results and system design with other growers, who can then reduce their fuel expenses and potentially increase crop production.


Figure 1: Compost Pile

What we did

We built a coil and placed it in the compost pile, which is contained in a box tube frame, with the coil made of copper. We built the compost pile around the coil-

frame. From the compost pile, tubing was placed under ground and insulated. The tubing runs from the pile to the greenhouse.

A heat pump and thermostat was installed inside the greenhouse, with water lines filled with water. The water lines were filled with biodegradable anti-freeze, resulting in a closed system.

Figure 2: Compost Pile to Left, Greenhouse to Right

Radiant Heat Bench System

We built greenhouse benches with saw horse brackets and 2 x 4's. We set Styrofoam sheets down for bench tops, with dimensions 4'x8'x2". Next, we cut 2'x8'x2" boards into one foot side boards and used silicone to hold in place. We set ½" poly pipe on the bench tops and connected manifolds to the pump line. This is a radiant heat set up. We added a thin layer of soil over the ½" lines and set one gallon perennial pots on the soil. To the benches, we added hoops and row covers over the tables to hold in the heat at night. Our goal is to keep the night temperature at 45® F.

Figure 3 Radiant Heat Bench System

Figure 4: Row Covers placed over benches

Monitoring the Temperatures of the Compost Pile and the Greenhouse

We added ten probe wires with three placed in the compost pile, one to take the outside temperature, one to record the greenhouse temperature, one to monitor the air temperature under the row covers, and four in the soil on the benches to record the root zone temperature. We have a readout device that is manual, and therefore we have to go in at times to see the ten readings and record. We would like to obtain a device that will record the data for us electronically and export to a computer to get hourly readouts so that we do not have to manually observe and record the temperatures.

Figure 5: Readout device and manual recording system

We will record and give readouts to our project technical advisor, Kelly McAdam with UNH Cooperative Extension, on a monthly basis for publication. We are committed to this project and as we refine in the future, we will keep Kelly updated.

An interesting note, when we ran cold water into the system, the compost pile temperature increased by 5® F. If this concept holds true with future testing, our premise was correct: If you take heat away from the compost and then stop, the compost will regain its temperature to continue the composting process.

Project Expenses

Materials and Supplies:	
Copper Coil	$ 2,190
Internal Fans	540
Probes and Wire	160
Recording Device	950
Tubing and coupling	367.82
Table materials	2172.66
Row cover	373.54
Row cover wire	126.85
Other Direct Costs:	
Labor-Welding	$ 720
Labor-Fabrication	4360
Labor-Installation	1300
Total Expenses	**$13,260.87**

Water Tanks, not purchased

Conclusion

We will help farmers in the Northeast by furnishing a new demonstration for added heat during winter production, particularly with perennials. Compost just keeps on giving. You can use the heat of the compost to maintain heat in your greenhouse for perennial production and some vegetables. When compost is finished we use it as soil mix for planting all of our perennials. With heat and soil from compost it will diminish our costs of production.

We will demonstrate the compost process, the equipment that is necessary to produce a large enough pile for this heating system, as well as the materials needed for the heating system itself. The cost of the system is available, as well as price comparison to heating fuel so that growers can identify the savings before undertaking such an investment. We could further test the system in the future with trying other crops that require slightly higher growing temperatures, such as vegetables.

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University of New Hampshire Cooperative Extension

Petal Pushers Farm
2635 Parade Rd.
Laconia, NH 03246