From Greenhouse to Field with Quality Transplants

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Overview of Sisters Hill Farm.

Sisters Hill Farm, established in 1999, is a CSA in the Mid Hudson Valley of New York. We grow vegetables for 230 full weekly shares for a 24-week season. Each year we harvest somewhere between 70,000 and 90,000 pounds of the highest quality organic vegetables on about 5 acres of growing beds spread amongst 3 fields (with no double cropping).

We grow all of our own transplants with the exception of onions. Growing quality transplants is essential to our farms success since the quality of our produce is what sets us apart from other farms and keeps members coming back year after year. Each year we grow approximately 55,000 transplants in a 30x48 greenhouse.

Description of our Greenhouse

The house is a gothic style, meaning it has a pointed roof to help it shed snow. I built the house from scratch in 1999, bending the pipe to shape on a homemade jig on the floor of the barn. I utilized a come-along to give me enough mechanical advantage to bend the 1.9" OD pipe by hand. The end-walls and doors are custom built to allow a very large opening at either end of the house. Each door is 10 feet wide by 8 feet tall. These large doors add a great deal of versatility to the house, allowing entire benches of transplants to be rolled out for hardening off. They also allow us to drive a tractor with forks and a bulk bin straight into the greenhouse and position it ergonomically so we can unload both onions and winter squash onto our greenhouse benches to cure or dry. Above each door is a 10 foot wide cantilevered vent that extends all the way to the peak. It is controlled by a rope and a couple of pulleys and can be adjusted to allow varying amounts of fresh air to enter the greenhouse. It is very effective at cooling a house that is only 48 feet wide.

I keep the house on the cool side, maintaining a nighttime temperature of 55 to 60 degrees. This is in an effort to save propane--for global warming reasons more so than financial. For the crops that need supplemental heat to germinate quickly I use an electric heat mat. I get them from Nolts Produce Supply in Pennsylvania. They come in widths of 11 inches by 10 feet. I use a piece of xps foam insulation under the mat to make sure all of the heat is going up into the flat. Another thing that greatly helps with saving fuel is what I call my "heat saver." It's simply a remnant of greenhouse plastic that is cut to fit over any one of my arches from the greenhouse frame. I've souped it up a bit and made it more user friendly with the addition of some special clips that secure the plastic to the frame and a quick opening and closing system—basically a 2x6 ripped down the middle with a tongue on one side that fits into a dado on the other. There is

a door hinge zip-tied to the peak of the house and screwed to the end of each board. This hinge supports the assembly as you fold it over to either side of the house to open it up for better airflow each morning. All told it only takes a few seconds each day to manage the "heat saver" and it can greatly change the heating demands during the coldest nights, especially in the early spring when you may only have a few benches filled with tomatoes and onions. Why heat the entire greenhouse for just those crops?

How Much Greenhouse Do I Need?

I think it's important to keep the greenhouse part of your operation in perspective. For me, as a CSA grower, managing the greenhouse to produce our transplants is a very small percentage of the overall work on the farm. It is certainly important to develop farm wide systems that work and are efficient, but as a farm consultant I often see new growers putting too much money into the greenhouse early in the development of the farm. If your farm's marketing focus will be on bedding plants, or selling transplants, then perhaps high tech innovations such as ebb and flow, bottom heat, or single aisle systems may be worth the investment. If, however, you will be marketing vegetables through a farmers' market or CSA, a much better investment would be to buy a walk-in cooler—it will pay for itself in labor savings and improved crop quality almost immediately. The same is true of greenhouse tools like vacuum seeders. When considering a tool such as a vacuum seeder, closely evaluate what your labor costs are and measure how much placing seeds in trays is actually costing you.

The workforce at Sisters Hill Farm consists of 3 apprentices and me; they love the change of atmosphere that greenhouse seeding, watering, and thinning provides. Plus it's great to be able to save up a little greenhouse seeding for those rainy spring days, when the soil is too saturated to do much outside.

The Keys to Growing Quality Transplants

1. Good potting mix. We buy our potting mix from McEnroe Organic Farm. We've had good success with it for 15 years
2. Good flats or plug trays. We use Winstrip 128 cell plug trays for most of our transplants. We also use some 20-row flats for seeds that we like to germinate with some bottom heat and then pot on to larger cells. And we use a few 72's, 50's and even some 4" pots for our earliest tomatoes, peppers and eggplants. The advantage of the Winstrip trays is that they are very durable and so will last for many years, they foster good "air pruned" root growth, and they don't need a carrier flat.
3. Care when watering. I teach my apprentices how to carefully asses the state of transplants before they begin watering. When trying to figure out when to water and how much to apply, they must be able to analyze out how dry things are, how much drying out is desired between waterings, as well as the impact of the weather. To do this I encourage them to walk around the house and get a sense of things by pulling out plants they suspect might be too dry, lifting the trays to compare relative weights, looking at the bottom of the cells and other simple tests. Watering will then consist of up to 3 or more passes depending on how dry things are. If the cells have dried unevenly, they may first do a spot watering of

the driest cells to break that surface tension that sometimes develops with organic potting mix. Next they will do a pass over every bench moving the spray pattern in one direction. Then they will start at the same point and do a third pass going perpendicular to the last pass. By approaching it in this way, they make sure that no spot has been missed, and the water has had time to fully saturate the media, (but not so saturated that there is a lot of water dripping through the cells and leaching nutrients out of the potting mix.) When I show them how to water I teach them to "dance" with the hose held high and their arm extended, utilizing their larger muscle groups, so that they can maintain an even, metronome-like speed and a consistent angle of approach over the flats. Each apprentice is in charge of watering for a full week at a time.

4. Good air circulation. I designed the house tall, wide and short (30x 48') so that when I open my doors and gable end vents the house will cool quickly without the need for mechanical ventilation. Since the vents extend all the way to the roof, I have nearly the same cooling potential as a ridge vent at a fraction of the cost. There are two HAF fans that help create good airflow and prevent damping off during periods of extended overcast wet weather. They are turned on as needed.
5. An easy transition to the field. I harden the plants off not by restricting water, but by moving them out of the greenhouse into the full sun and wind gradually. The first day may only be an hour or two, the second maybe half the day, and the third perhaps all day, bringing them in at night each time. This process can be easily be done by one person in a matter of minutes because my benches are built with wheels on one end. Each bench holds 30 flats so one worker can move over 10,000 plants in or out of the greenhouse in less than 2 minutes. The rolling benches have dual usage around the farm; they can be used as mobile wash stations as well. Since we have irrigation boxes in the ground in all of our fields, we simply roll a bench out and set up a wash tank right at the end of the field from which we are picking. We are able to keep our small crew together more often this way, which keeps morale high and the speed up. The fact that we hydro-cool the produce so quickly keeps the quality high as well.
6. Precise planting and watering in immediately. We place transplants in the soil by hand. We own a very sophisticated transplanter, but prefer to place them by hand because we can get the spacing more precise and plant them more carefully without idling a noisy tractor down the bed. We are also nearly as fast this way. We can plant over 15,000 plants a day by hand with great precision. But most days we have far fewer plants to put in so the task is never that onerous. This is the quintessential task to new would be farmers; sinking your hands in the dirt and placing a young plant just feels right to them. Joy is an important consideration. I mark the bed with a custom row marker that imprints a grid on the soil; it's mounted under a cub tractor. One person drops plants at the appropriate spacing on the grid and the others kneel in the center of the bed placing plants as they progress up the bed. After all the plants are in we usually water them in with overhead irrigation. That's a quick overview of our transplant production at Sisters Hill Farm.