

# Case Study: Cedar Meadow Farm

Steve and Cheri Groff, and their three children, live in Holtwood, Pennsylvania, in southern Lancaster County. On rolling land near the Susquehanna River, they produce 210 acres of small grains and vegetables including no-till tomatoes, pumpkins, and sweet corn. Steve has become known for his success with a permanent cover cropping system in which he establishes vegetable crops without tillage and makes use of cover crops and crop rotations as a way to save soil, reduce pesticides, and increase profits.

Like many no-till farmers, Steve has noted that because soils remain colder under no-till conditions, they tend to produce later crops. Steve grows nine acres of no-till tomatoes, and his inability to capture the lucrative early market had been a frustration.

Steve had been growing some tomatoes in a 15' x 96' high tunnel for nearly seven years, and was pleased with the benefits a high tunnel offers including earliness, improved fruit quality, and increased yields. But he wanted to produce his early tomatoes on a much larger scale. So, four years ago, Steve built a one-acre, multi-bay Haygrove tunnel.

Steve's decision to purchase the Haygrove tunnel was based primarily on economic considerations. The initial cost of the structure, 6 mil plastic cover, and mulch, with about 250 hours of labor for assembly, was about \$30,000. On a square-foot basis, that was less than half what a high tunnel would have cost him to build. Steve calculates the annual cost of maintaining his acre of Haygroves at \$4,000. This figure includes one-third of the cost of the polyethylene film, which he replaces every three years, labor for covering the structure in the spring and uncovering it in the fall, and labor for venting.

Steve was also attracted to the scale of the Haygrove. One multi-bay unit would give him an entire acre of tomatoes under cover. Finally, he liked the fact that the structure was tractor-accessible, giving him greater flexibility to perform tillage and other operations with machinery.

Steve's tunnel has six bays that are 24' wide and 300' long. To maximize its use, Steve planted 6,000 plants in the first season, but the result was tall and leggy plants. He sought to control the vegetative growth by reducing nitrogen rates and watering, which did seem to retard growth but also resulted in smaller tomatoes.

The next year, Steve reduced the plant population to 4,800 plants per acre and was pleased with the results. In his first year, Steve planted into bare ground and had a difficult time with weeds despite using herbicides. In the second season, he formed raised beds and installed a woven plastic ground cover, which resulted in a warmer soil and effective weed suppression. He plans to maintain the beds permanently and to reuse the mulch and stakes.

Steve now makes weekly nitrogen applications through a drip irrigation system, and vents to control excessive growth. He irrigates three times each week, providing 3 pounds per acre of nitrogen per watering. In the past, he used calcium nitrate and liquid nitrogen. Now that he has established permanent, mulched beds, he will use a complete fertilizer beginning soon after planting.

Steve sets his plants out during the third week in April, and harvests from the first week of July until early November. So far, he has been pleased with the variety, *Mt. Spring*, finding that it performs well for a much longer period inside the tunnel

than it does in the field, but also continues to trial other early varieties. In the future, Steve plans to use row covers inside the tunnel in early spring to extend the season even longer. He is also looking into options for supplemental heat as a means to prevent frost injury and to boost spring growth.

Steve has used bumblebees to get better pollination but questions if they are necessary, especially since he likes to occasionally vent on windy days to control plant growth and lower humidity.

In his first year, Steve had yields of 2,400 25-lb boxes (60,000 lb.) of #1s and #2s. In his second year—after fine-tuning crop spacing, fertilization, and irrigation—tomato yields increased to 3,400 boxes per acre, 70% of which were #1s. His four-year average annual yield for Haygrove-grown tomatoes was 71,531 pounds.

Steve's second season in the Haygrove tunnel was a particularly wet one, and yields of the same tomato variety in the field were only 1,200 boxes per acre. The three-fold increase in tomato yields was just one of the benefits of the tunnel. The quality of tunnel-grown fruit has been vastly superior to field-grown fruit. "We see it every time we bring high tunnel tomatoes into the grading room and compare them with field-grown tomatoes," says Steve.

Steve has found the effects of severe weather and disease pressure to be noticeably reduced inside the tunnel. He sprays occasionally, finding that he gets good coverage by using an air-blast sprayer from both ends. The natural movement of air inside the tunnel helps deliver the pesticide to plants in the middle of the structure. Last year, Steve struggled with a bacterial problem, and is re-evaluating

his use of the permanent ground cover and stakes that may harbor the pathogen over the winter. He has also struggled with spider mites, and is seeking an alternative to miticides for their control.

Although Steve is experimenting with raspberries in one bay of the tunnel, he is not planning on rotating out the tomatoes. He has considered relocating the tunnel if he finds that tomato pest populations increase to unfavorable levels, but he estimates that may cost up to \$4,000. He believes that the experience of erecting the tunnel the first time will enable him to reduce the time required to build the tunnel a second time from 250 hours to about 200 hours.

Since Haygrove tunnels are not designed to withstand more than a few inches of snow, they were a good choice for Cedar Meadow Farm as Steve wasn't looking for an over-wintering structure. He wanted to begin production after snowfall was no longer a threat, and finish the season before winter. To prepare for winter, he removes the sheets of plastic, placing them in the gutter of every other bay, a job that takes about 20 labor hours to complete. He wraps them in black plastic to prevent decay from ultraviolet radiation.

Installing the plastic in the spring is a big job. Six people can do it on a calm day, but eight is better, especially if it becomes breezy. Steve says that the key is to be prepared for that calm day when plastic installation will go smoothly. He estimates that installing the plastic cover and end-wall doors takes about 50 labor hours every spring.

Once the tomatoes are planted, it is important to ventilate the tunnel properly, which Steve describes as an art that comes from experience. "You have to make venting decisions based on temperature, wind speed and direction, and the stage of crop growth," he said. "During initial fruit-set—the most critical time—I look at the hourly forecast on the Internet. During that six-week period, I literally baby-sit the tunnel."

Like other high tunnels, multi-bay units are ventilated manually, but instead of rolling up the sides and ends, the plastic on a multi-bay is pushed up, and held in place by adjusting the tension on the ropes that hold the plastic down. During the early season, when days are warm and nights are cold, ventilation is time-consuming. Steve estimates that ventilation takes from 15 minutes to two hours of his time every day for the first six weeks of the season.

Beginning around June 15, Steve opens the tunnel and removes the doors for the rest of the season. If high winds are expected, Steve fully vents the tunnel, as Haygrove recommends, to avoid damage to the structure. When properly constructed, these tunnels are designed to withstand 70 mph winds. Steve had some experience with high winds—in the field, tomatoes and sweet corn had blown down but his tomatoes in the multi-bay tunnels remained unscathed.

Steve believes that he has realized his objectives with the Haygrove tunnel. He has found a cost-effective way to produce good yields of high-quality tomatoes in the early and late periods of the tomato season, when prices are at their peak. And, by being in the marketplace in the early part of the season, he is able to continue selling tomatoes from the field.

However, Steve cautions growers who are considering a purchase of this kind to do their homework. If winter production is one of your goals, choose another structure. If you have a particularly windy site, consider a different structure. But if you are looking for a three-season structure that is tractor-accessible and relatively inexpensive, the Haygrove may be a good choice for your farm.