

Case Study: Slack Hollow Farm

Twenty-five years ago, Seth Jacobs and Martha Johnson started Slack Hollow Farm in the Taconic foothills in Argyle, New York, located a little over an hour Northeast of Albany. In their early years, they did all their fieldwork with horses and depended heavily on hand tools. Today, with 15 acres in vegetable production, the farm claims three small tractors, numerous implements, a box truck, a greenhouse, and two high tunnels. Seth and Martha grow a wide range of vegetables and salad greens that they sell at two substantial producer-only farmers' markets and to wholesale accounts. Their primary high tunnel crops are spinach and other salad greens, produced in the late fall through spring, and tomatoes and basil, grown in the warmer months.

The first of their two tunnels is a 21' x 120' gothic-shaped structure manufactured by Ledgewood Greenhouses. They built it in 1995 from a kit and estimate that it cost between \$6,000 and \$8,000. This relatively simple tunnel does not have electricity, heat, or fans, and uses roll-up sides for ventilation. It has an East-West orientation. In this structure, they utilize a two-crop rotation. They grow tomatoes and basil from early May through late September or early October, and spinach from mid-October through early April.

Seth and Martha stopped growing tomatoes in the field about ten years ago because the yield and quality of their tunnel-raised tomatoes is so much better. Their farm in Argyle is in Zone 4, providing relatively little time to for a field-raised crop to develop. Also disease pressure in field-grown tomatoes is high, reducing marketable yields and profitability.

Seth and Martha have been growing spinach during the winter for four years and the system they have developed works well for them.

As a certified organic farm, compost has been the basis of Slack Hollow Farm's fertility program. In the past, they added farm-made manure-based compost at the rate of 10 tons per acre by running their manure spreader down the middle of the tunnel. New organic regulations require long intervals before harvest, so now they only apply compost in April, prior to planting the tomato crop. (A foliar spray of Epsom salts for magnesium on tomatoes is their only other nutrient input.)

After removing the tomato vines and trellises at the end of September, they roto-till the soil with a tractor-mounted tiller to prepare a good seedbed. Time permitting, they will flame-weed before seeding, but even when they can't get to it, weeds appear to be under control. Martha direct-seeds the spinach using a one-row Planet Junior seeder, producing remarkably straight rows. She aims for 12 to 16 seeds per foot, with rows four inches apart.

'Space' is the variety they prefer because of its leaf type, eating qualities, yield, and cold-hardiness. Spinach is very winter-hardy. "No temperature can kill it," Seth says.

Protecting the spinach plants with floating row cover is essential. They use up to four layers of mid-weight spun polyester row cover to buffer the crop from sub zero temperatures. The aim is to manage the freezing of the crop and soil during very cold periods, as this would interfere with or prevent harvest.

In the unheated tunnel, they get at least three harvests of spinach during

the winter, taking cuttings on a given section about 60 days apart, depending on the amount and length of sunshine and the temperature. For plants harvested on December 20, the shortest day of the year, a second harvest will be ready during the last week of February. Production all but ceases between December 20 and January 30, so spinach is stockpiled for that period. A bed cut at the end of February will be ready for another cutting in early April. At this point, they take their last harvest, so they can renovate the tunnel in preparation for tomato planting.

They cut most of the spinach plant, leaving one or two new leaves behind, harvesting by holding the prostrate leaves up with one hand, and cutting with the other.

The first cutting of the winter spinach is of the highest quality, and the sugar levels seem to be higher. Customers notice that it is sweeter than outdoor in season. Leaf quality goes down with each cutting, but the taste remains unsurpassed. And it is still superior to what is found in grocery stores at that time of year.

Their markets for winter spinach and other greens include a large food co-op in Albany, with which they have had a very long relationship, and a large farmers' market that operates throughout the winter. If they expand their winter production, they would add more markets, or perhaps start a winter CSA. Currently, retail spinach prices are in the range of \$10 to 12 per pound. They expect to harvest a total of 1,000 to 1,500 pounds of spinach from the unheated 21' x 120' tunnel, generating sales of \$10,000 to \$15,000 during the winter.

In 2004, Seth and Martha constructed a second high tunnel which some might consider more a soil-based

greenhouse. Its North-South orientation was determined by their existing field layout. The 30' x 120' gothic-shaped structure was made by Rimol, a company that provides valuable technical assistance. Unlike their first high tunnel, they had this one built by professional contractors. It cost about \$25,000 to build, including the structural steel, the heating and venting systems, cover materials, and labor.

For ventilation, they outfitted the structure with thermostatically controlled automatic roll-up side curtains and gable-end vents. These features cost only a few hundred dollars more than a big exhaust fan and there is no power bill. Four standard greenhouse fans improve interior air circulation during warm weather and for fall germination. Access is provided by large tractor doors and, in winter, by a small people door that opens inward so snow shoveling or plowing is not required.

They covered the structure with a single layer of plastic. On the end-walls and roll-ups they used a woven poly with 90% light transmission which is much more durable and long-lasting than normal greenhouse film. They opted for extra-heavy bows spaced 5' on center, rather than the standard 4' spacing because the cost was lower. In-ground heat tubes circulate hot water to warm the soil and root zone.

Several other growers now produce spinach for winter farmers' markets in their area, and competition has increased. To take full advantage of their winter marketing opportunities and to more fully satisfy their customers, they decided to expand their crop mix to include a range of less hardy salad greens. Building a new structure has made this diversity more possible. Seth said, "We would like to increase production during a

time of year when competition from other local producers is lower." They have been using their new tunnel to grow a variety of cold-hardy greens including arugula, Tatsoi, Mizuna, kale, radishes, turnips, beets, Swiss chard, and Bok Choy, as well as spinach. Some of these crops are seeded with a pinpoint seeder. Between the lateral beds (not raised) wooden boards focus foot traffic in very narrow paths. (They grow the tomato crop in rows running the long way.) They use the same production techniques here as in the unheated tunnel as well as the same general rotation. The addition of heat in this structure gives them more flexibility with planting dates.

This new heated high tunnel has benefited their spinach crop in several ways. While growing winter spinach in the original high tunnel, Seth and Martha found that they could not harvest early in the morning or during very cold days because the leaves would be frozen and quite wilted. The addition of a small amount of ground heat enables them to harvest spinach during these cold periods.

During a very high wind event in late February 2006, they lost the plastic on their older high tunnel. The plastic film on this house needed replacing and the pine hip boards had rotted, Seth noted. (Now all wooden parts in Slack Hollow Farm high tunnels are made of Eastern white cedar.) The loss of the plastic occurred right after they had finished the first cutting of their winter spinach. This crop was lost to cold burning.

At the same time, two beds of spinach planted around December 15 were maturing in the new, ground-heated tunnel. "We got astounding yields," said Seth. They cut these spinach beds on alternate weeks from the end of February until the last week in April and were able to supply their farmers' market from a much smaller planting.

"Production far surpassed the unheated high tunnel," Seth said.

Even with the in-ground heating system, row cover remains an essential element of winter growing at Slack Hollow Farm. In the heated high tunnel, daily covering and uncovering with medium-weight floating row cover is required to prevent overheating during the day. To streamline the application and removal of the row cover, this winter they plan to construct a hand-cranked roll-across covering system within the high tunnel. (*See inner coverings section, page 52.*)

At Slack Hollow Farm, the decision to equip a new high tunnel with ground heat was intuitive. (*See heating section, page 49.*) Seth felt that for a tunnel covered with a single layer of poly, such an in-ground heating system would be significantly less expensive to run than heating the air.

Seth and Martha have always used a single layer of plastic because they believe it has a smaller environmental footprint or impact than two layers. (*For a different view, see Single vs. Double Layer in Selecting Your Structure section, page 31.*) It transmits more light, results in half as much plastic to dispose of, and averts the need for electricity to power an inflator blower. It is less resource-intensive to use lightweight row covers inside—which lasts for many years. Seth stressed that they do not use high tunnels to grow a warm weather crop out of season. They also do not use plastic mulch.

Seth estimates that a quarter to a third of the farm's revenues come from their two high tunnels. He expects that the new (more costly) tunnel will pay for itself within two to three years. It is very inexpensive to operate, requires no machinery except for tractor tillage twice a year, and takes only about 12 hours per week of labor, yet produces very high yields.

He anticipates \$25 to \$30 in sales per square foot.

Seth and Martha attribute much of their initial interest in winter production to their desire to offer year-round employment to their farm manager, Colleen Converse. She is, in turn, responsible for most of the winter harvesting and marketing.

“Our expansion into winter production has been employee-driven,” Seth said. They are able to travel in the winter because the manager can handle the farm, and they can also cut back in summer by placing more emphasis on winter markets. And year-round high tunnel production has also evened out the farm’s income.

Seth and Martha like tunnels so much that they actually have a third tunnel, 30' x 48', that they use as their washing and packing shed. With the wash station end covered with three layers of shade cloth in the warmer months, it is comfortable all summer, and far more pleasant than a dark barn. An added benefit is no property taxes as assessed on this temporary structure.

Enterprise Budget for Winter Spinach Crop in an Unheated 2,500 sq-ft High Tunnel at Slack Hollow Farm			
Fixed Costs			
Construction Costs			
	Materials	Labor	
Site preparation, bulldozer			\$1,000
High tunnel construction			\$2,100
High tunnel frame	\$5,000		
Lumber and hardware	\$500		
Endwall finishing	\$400		
Water service			\$850
Irrigation	\$700		
Bed preparation	\$240		
	Subtotals	\$6,840	\$3,950
	Total Construction Costs		\$10,790
Fixed Costs			
High tunnel construction (divided by 15 years)			\$719
Interest (construction financed at 7% for 15 years)			\$378
Taxes, land, office expenses, fees			\$1,377
	Total Fixed Costs		\$2,474
	Total Fixed Costs (six-month winter season)		\$1,237
Variable Costs (six-month winter season)			
Materials and Machinery			
			Cost
Seeds			\$50
Compost			\$200
Irrigation supplies			\$50
Row Cover			\$100
Poly covering (divided by 4 years)			\$90
Packaging			\$30
Delivery costs			\$560
	Subtotal		\$1,080
Labor Costs			
Bed preparation and fertilization			\$500
Seeding			\$48
Irrigating			\$100
Harvesting, grading, packing			\$1,500
Sales and delivery			\$1,500
High tunnel clean-up			\$100
	Subtotal		\$3,748
	Total Variable Costs		\$4,828
	Total Costs		\$6,065
	Revenues*		\$12,000
	Net Returns		\$5,935

*Revenues are based on a spinach yield of 1,000 lb in a 21 X 120' high tunnel. The spinach was sold at \$12/lb. Yields were reduced this season because a severe storm damaged the plastic cover. Revenues the previous year were \$15,500 on yields of 1,550 lb and a selling price of \$10/lb.