

## Profitable Winter Greens in Ground-heated Tunnels

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Slack Hollow Farm is a market farm growing mixed vegetable on 15 acres in Washington County, NY. As a market farm our crops are grown for specific markets we have developed. Our crops are also driven by the changing market conditions we experience. Unlike commodity farming our growing is entirely linked to our markets.

For years we farmed as many market growers in New England have done- growing and selling enough on 10-15 acres in the 5 months from June through October to generate an income to cover the entire year. We have marketed in several ways, including CSA, bulk storage vegetable sales in the fall, retail at markets, and wholesale. For the last 10 years we have settled on a mix direct retail at farmers markets and wholesale to a medium sized natural food store in Albany, NY. To stay profitable at our scale of production we have found we need to keep wholesale marketing down to about 1/3 of total sales.

While our climate and soils certainly allow for the creation of enough value in the five month growing season, this style of growing makes for a very busy growing season, with a labor force that must fluctuate a lot over the year, and income that when plotted over the year looks like a classic extreme bell curve. It also creates a basic disharmony in our lives at this point. We are now raising two young children, and during their summer break we are too busy to spend much time with them.

The decision about 10 years ago of our retail Farmer's Markets to stay open year round has had a big impact on our business. We began supplying this winter market with crops grown in the summer and stored over the winter- onions, potatoes, carrots, beets, and shallots. To this we added fresh spinach, which was and still is grown in an unheated high tunnel which was built for in season tomato cultivation. This was our start in growing greens in the winter.

This winter we will have just over 10,000 sq feet of growing area under cover, in three high tunnels. . Two of those tunnels have a ground heating system. We will grow baby spinach, a mild and spicy mesclun, baby bok choy, and arugula. Our goal is to generate nearly a third of our income from November to May. The story of how we got to this point on our farm is about markets primarily, and about our preferences and skills as growers.

Our strategy for this first winter market went something like this: We had some experience with season extension under row covers, and we had built our first high tunnel which was a Ledgewood model, 21' X120'. This was a simple structure, no heat, single layer poly, and manual roll up sides. We built this tunnel for tomato production, and had had success with that crop because it gave us a one month jump on the season, and eliminated many disease issues.

We also much preferred the permanent overhead support provided by the structure of the house- we find it makes supporting the tomato plants much simpler. We also used this house for early greens production in the spring, and squeezed in some crops, basil and greens, in between the tomatoes before they grew too large. For this first winter market we planted this house to spinach.

The spinach production has gone something like this: We fertilize with heavy applications of compost. We fill the house in two plantings, the dates we use at our latitude is just before and just after the 1<sup>st</sup> of October- say Sept 25<sup>th</sup> and October 5<sup>th</sup>. We plant close and densely, using resistant varieties is important. The first planting is ready by the middle of November, and the spinach continues to grow until late December. The second planting is ready by mid December, and is “stockpiled” fully grown for harvesting during the part of winter when there is no growth in this unheated house. Growth restarts in February- early or late depending on the severity of the winter. The amazing thing about spinach is that it seems able withstand any low temperature. This unheated house obviously gets quite cold at night, though the ground never freezes more than an inch or two down. When frozen the spinach cannot be harvested, but once it thaws it looks great. During a cold (or cloudy and cold) spell we will use row covers to keep it from freezing ahead of that week's harvest. We have been able to cut this spinach once or twice again in February and March. Often some of this spring crop is wholesaled, as growth rates at that time exceed the capacity of our retail markets. The total yields have been very impressive from this low input, unheated house.

The availability of fresh spinach at our first winter market was very well received by our customers, That first year the market quickly grew to the point where we could sell more spinach than at a busy summer market, which makes sense given that we were the only game in town in the fresh local greens department. For the next few years we perfected this spinach production method, and grew and stored enough root crops and squash to supply this ever-growing market. We saw that the economics of the spinach in this low input system were quite good.

### **The Next Step**

As the Market grew demand exceeded supply, so we built another high tunnel, this one a larger Rimol brand, 30' X 120', with automatic roll up sides, also unheated. That first year in this house, we also planted some of our mesclun and arugula in the fall, and with the use of row covers kept production up until mid December. What happened next is when things really got interesting for us. Some of the row cover was left on the ground where it had last been put when the arugula was uncovered the last time in the fall. When we lifted this in the spring, there was a long row of Arugula that had survived the winter under multiple layers of row cover. It was at this point that we realized that perhaps with a small amount of additional heat, just enough to keep the ground from freezing, we might expand our production of winter greens. There is not much new under the sun in agriculture, it's all been done before, but this is when it occurred to us that a small amount of additional heat might work for our situation.

That spring we dug up the ground in the new house, and installed a ground heating system using basic radiant floor materials, and oil-fired hot water. We buried the pex tubing underground at 1' intervals 16-18 inches under, deep enough so that tractor tillage was still an option. The next

winter we planted a variety of winter greens- but not lettuce. We used wire hoops and 3 layers of row covers to cover the whole house at night. We maintained a soil temperature of 47 degrees 6 inches under the surface, and found that under the row covers at night the temperature never dropped below 27 degrees. We burned 400 gallons of oil, 90% of it between November 15<sup>th</sup> and February 1<sup>st</sup>. We have found that by February, no matter how cold the nighttime temperatures, if the weather is sunny there is enough solar gain during the day (5 degrees of soil temp rise) that no additional heat is necessary.

The next two years we worked on our growing techniques for all these new (to us) winter crops. Many of the mix ingredients are the same as in the warm season, with a few changes made to accommodate the different light levels and temperatures. The planting schedule is critical for continuous production. Succession planting begins the first of October, and proceeds weekly. Unlike in the spring, when plantings need to be stretched out for continuous harvest, at this time of year 3 days apart in the seeding schedule can translate into 3 week intervals in the harvest. Most crops are harvested 2-3 times before renewing the beds with new seedlings later in the winter. Productivity really jumps in the late winter and early spring, when light levels, temperature, and day length are up. In February and March, production is way up, and in late March, April, and early May, which are usually considered the lean times for local food around here, the production from these established, well rooted crops, many of which were planted in January and February, is off the charts, and in addition to all the mixes our market table is full of lots of large greens, which have grown too large for mixes, and are sold on their own.

Regarding spinach: As mentioned, spinach production from the unheated house was very good, but when we planted spinach in the heated house the results were even more impressive. In March and April spinach planted in January can be cut every other week, with high very quality and quantity.

### **Final Notes**

Needless to say, the addition of a wider variety of fresh greens in midwinter was met with great enthusiasm by our customers at market. We can sell 2-3 times as many greens at a winter market vs. a summer market. Prices are slightly higher then as well. Demand has again exceeded our supply, so we just completed our third and largest tunnel, a Rimol 34' X 120', also heated. We enjoy gardening in the winter, the greenhouses are a cheerful place to be. The type of work now being done in the winter is all for the highest value crops- greens! We have cut back on our fall root crops- fewer carrots and no potatoes- eliminating these large crops during the growing season means we need less labor then. Our winter labor now will be less washing of roots and more work in the greenhouses. Our labor force is more oriented towards year round full time workers. By offering year round work we can keep more experienced and committed people.

As oil prices rise by large percentages, we will have to keep an eye on costs. We could add supplemental wood heat, or increase nighttime insulation. Covering the earth inside these houses at night is critical. Oil use would be 3 or 4 times as much without a covering system. As soon as solar gain stops as the sun goes down, which around the solstice can be as early as 3:30pm, the covers need to be in place. Currently we use 3 layers of row cover, and have developed a system to roll the covers on and off; as we expand covering and uncovering becomes a bigger chore.

No doubt our farm will continue to change, we'll see how all this plays out this year. We definitely feel less pressure to produce this summer, and are glad to concentrate on the crops we grow best, and have more time for family activities. Our hope is that even during the winter we can earn enough to pay off debt incurred building these rather expensive high tunnels and heating systems.