Profitable Production in Different Types of Tunnels

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Kilpatrick Family Farm was established in 2003 by brothers Philip and Michael Kilpatrick. In 2005, we put up our first hoop house and the cucumbers and tomatoes that came out of it were the best we had ever produced. That fall we put up our first greenhouse, a 17 x 48 propagation house. The next year we put up our first high tunnel, a 30 x 96 gothic house. Since then, our operation has grown to more than 15,000 sq. ft of covered space. Currently we produce for a 130+ member CSA (40 members year round), 4 weekly Farmers' Markets (2 year round), and various wholesale accounts, all on 8 acres of rotated land.

There are several types of tunnels we use to produce our vegetables: Mini tunnels, hoop houses, our transplant house, and our high tunnels. All have their purpose and function, and fit very well into all different sizes of farms.

Our mini tunnels are constructed out of ½ inch metal conduit bent in a greenhouse bow shape. They are covered first with rowcover and around late November, a single sheet of greenhouse plastic is used. These are the cheapest and easiest to set up but have the most management. They are mainly used for season extension and overwintering of very hardy crops like kale, spinach and chard. The cost is under $100 for a 6' by 150' tunnel if you are reusing old greenhouse plastic and rowcover. If you have to buy all materials new, it can cost around $300 per tunnel.

Our 15' x 150' hoop houses were purchased from Rimol greenhouses. Rimol allowed us to customize the houses to our specifications to keep the costs down. Our summer tunnels are Ted Blomgren's (farmer in NY) caterpillar style, while our winter houses are more of a traditional hoop house design with only duct tape and baling twine used to hold them together. The summer design allows us to vent and water much more easily. The winter design makes for a much tighter house and also doesn't suffer as much wind damage. We will put late fall lettuce/salad mix, spinach, kale, summer peppers, basil, okra and eggplant in these houses.

Our 17' x 48' transplant house is a double poly, heated hoop house with propane bench and air heat. We use this to start all our transplants for our 8 acres of vegetables and also we raise transplants in it for spring Farmers' Market sales. We have a misting system set up on the center bench which we use to start our annual bed strawberry tips and also for midseason lettuce and other crops so we can keep them moist.

We use our high tunnels (two which are 26' x 148') as intensively as we can because they cost the most per square foot and we can achieve the greatest atmosphere control through roll up sides, heaters and end vents. The first improvement we made on these houses was to extend the sidewalls higher as the coldest areas in a house are the edges and we want to be walking there, not growing there, so needed the head-room. We also added roll-up sides as we have found the best way to achieve fewer diseases in the crop is to vent. Peak end vents are used for mid-winter

ventilation and also to get the humid peak air out. We are using two types of heat: in-ground hot water hooked to a Takagi flash water heater and oil air heat which we only use for 6 weeks in the spring to heat the air for our early tomatoes and peppers. We try to keep our soil organic matter in our high tunnels between 5-7 %. Our larger house cost us between five and six dollars per square foot.

There are 8 crops that are both stellar producers in the various houses/tunnels and also crunch the numbers and give us a high return value: spinach, mesclun, basil, cucumbers, peppers, turnips, kale and early tomatoes. Some other crops that have high value didn't make our list to grow because they didn't fit well with our system or marketing. For example, fall tomatoes don't fit well for us because at that time of year we have 35 other crops vying for space on our table. We included financial information were we could.

Spinach is one of the greens that we try to have all winter long. We accomplish this through mini tunnels and hoop houses for our leaf spinach and high tunnels for our baby spinach. We seed the leaf spinach outside until September 10th, and then the house is place over it in early to mid November. The spinach in the mini tunnels is planned for harvesting until Christmas, and then when the ground thaws in mid-March, we can harvest it again. The spinach in the hoop house will be harvested for the 8-10 weeks that we can't get into the mini tunnels because of temps and snow. We prefer Space or Renegade varieties for green spinach in this winter set up. Our baby spinach is seeded up till October 10th in our high tunnels. We'll use either of the above varieties for green and the Bordeaux for red or Christmas spinach. Spinach grosses around $300,000 an acre for our winter systems.

Mesclun is grown in our high tunnels also. Unlike our salad mix, we only grow winter mesclun, as the summer markets already have an abundance of good quality mesclun. We seed with our 6-row seeder from Johnny's; after lubricating all the friction points with silicon spray, it is a tool we really like. We feel this seeder gives a better stand and smoother bed. For Arugula, we seed every other row; for all other crops, we seed every row and aim for around 12-18 seeds per foot. We don't look so much for winter hardiness in our mesclun but more re-growth speed and interesting leaf shape. We try to seed every 10 days starting October first and end up with a really big planting the end of October for our January and February sales as growth slows way down then. We will start replanting the end of January, planting every 10-14 days.

Basil is a very easy crop that we usually grow along the edges or just fit in where we can, as the demand is not great. We transplant 6 week old transplants into the tunnel at a 12" x 12" spacing in the late spring, and basically just come back and harvest them. One thing we learned is that you are harvesting the leaves and therefore it wants lots of nitrogen. Basil can gross around $250,000 per acre when extrapolated out.

Another crop we have specialized in for the high tunnel is early season cucumbers. We plant them when we plant our early season tomatoes along the sides of the greenhouse for early season (May) cash flow. These are grown on a raised, ground cloth covered bed. We use double drip tape as they love water. They are trellised up with hortanova fencing, and kept in the greenhouse until end of June when we replant the area with mid season basil. Although this crop only grosses $160,000 per acre we feel it is worth growing as a loss- leader.

Peppers are a big greenhouse crop for us. Although we have tried numerous varieties, we have found that the two that do really well for us are Carmen and Flavorburst, a red Italian and yellow bell, respectively. We plan on putting the transplants in the high tunnel April first, stake them May 1st and start harvesting Red peppers mid- July. The hoop house peppers we plan on putting out mid May or after all chance of frost is past in the house. The quality of these peppers is amazing, no sunscald and rot. Staking is key, as these plants will have up to 15 peppers on them each when in full production. Peppers net around 230,000 per acre after all labor and production costs are subtracted.

We do Hakurei turnips in the hoop house in the spring. Planted 4-5 seeds per cell in 200-cell speedling trays, they are transplanted out on 8" x 8" spacing. The turnips are ready in about 5-7 weeks (by mid May) and although they don't bring in a high value per acre, they are a welcome addition in the early spring as something different than all the winter and spring greens customers have seen week after week.

Kale is direct seeded in our mini tunnels around August 1st or planted into the hoop houses at the same time as transplants in 2 rows 28" apart in our standard 6' bed; the plastic coverings are then put on around late November. Our favorite kale varieties are Starbor, Redbor, and Red Russian. We will harvest all winter from these houses, planning our harvests on a sunny day to take advantage of the sun thawing the tunnel. With a value of about $90,000 per acre, the kale more than pays for itself in these tunnels.

Cherry tomatoes are another crop we really like in the high tunnel. We plant them 2' apart in a single row on a raised bed covered with ground cloth. The plants are trellised up and pruned to 2 leaders like our regular greenhouse tomatoes. This way we don't have to look for the fruit among a lot of foliage. We will get clusters of up to 60 fruits when pruned this way. Our favorite variety is Favorita, although we will also do some rainbow cherries this way also. This crop grosses us around $380,000 per acre.

Although we have uses for all of our tunnels, our favorites are the high tunnels. Over the years, we seemed to have upgraded every year. First we started with the simple hoop houses, then the high tunnels, and now fully automated tunnels. As our farm gets larger, it comes down to time versus money and not having to think about ventilation or watering is HUGE. Our point is, although you may only spend several thousand dollars on a hoop house, it is well worth spending twenty-five thousand on a high tunnel that you don't have to babysit all the time.