

Case Study: Weaver's Orchard

Weaver's Orchard in Berks County, Pennsylvania is a third generation, 100-acre family farm. Like many tree fruit growers trying to survive in today's competitive environment, Ed Weaver believes in diversification and direct marketing. The farm grows a number of fruits and vegetables to complement the primary crop of apples. The farm's on-site market has become a primary sales outlet and the farm offers a pick-your-own option for small fruits (such as blueberries, strawberries, and brambles) and for peaches, apricots, plums, nectarines, cherries, apples, and pears. With these features to attract a good clientele to the farm, the business is able to sell half of its farm's production retail.

Ed's grandparents purchased the farm in the 1930s where they grew vegetables, fruits, and tobacco. Under Ed's management, the farm produced tree fruit, vegetables, and strawberries until ten or twelve years ago, when he added blueberries and brambles.

Sweet cherries have been an important crop on the Weaver Farm for three decades. In the late 1990s, frustrations with standard rootstocks convinced Ed to expand their acreage with new dwarfing rootstocks. The dwarf trees come into full production much more quickly and are easier to manage. But when his first dwarf trees began producing, cherry yields were hurt by frost, rain, and birds. The damage was so great that Ed decided he had to find a way to protect the crop or else remove the trees.

Searching for a way to protect the trees led the Weavers to discover Haygrove multi-bay high tunnels at a spring 2003 trade show. Subsequently, Ed took a growers' tour to England to see how these tunnels are used on another continent. Full of enthusiasm, that spring the Weavers constructed their

first multi-bay tunnel over seven-year-old dwarf sweet cherry trees. The three-bay tunnel covered 0.6 acre; each bay is 28' x 300'. In 2004, the Weavers constructed a 0.9 acre Haygrove over five-year-old cherry trees. These tunnels were longer, with two 28' x 450' bays and one 20' x 450' bay. Each bay accommodates two rows of trees, spaced 9' apart in the row and 15' between rows.

In two years, the Weavers had put almost one-third of their sweet cherries under plastic. Later, they added more Haygrove tunnels for growing tabletop strawberries, brambles, blueberries, and 1/3 acre of tomatoes.

During some years, Haygrove tunnels can mean the difference between an abundant high quality crop and virtually no crop. On this southeastern Pennsylvania farm, losses might reach as high as 90% in the uncovered orchard blocks, while only 2 or 3% of the crop is lost on trees protected by the Haygroves.

Cherries remain one of Ed's most promising crops under plastic. Beyond affording protection from adverse weather and birds, they offer other significant benefits. For a number of reasons, cherries grown under Haygroves tend to have higher fruit quality. Their quality also lengthens shelf life.

The Haygroves' minimal frost protection has been enough to protect the earliest varieties, which flower when temperatures can still drop below freezing. These structures can advance the ripening of early cherry varieties up to one week. And earliness can raise the price 30 or 40 cents a pound or more.

Rain is an important risk factor for a delicate fruit crop like cherries. Excess rain at or near harvest time is a

major cause of crop loss in the uncovered cherry blocks. Rain-induced cracking and disease makes cherries unmarketable. Rain at the wrong time also causes other problems in the field.

Keeping rain out with the tunnels and using drip irrigation to even out moisture levels has been an effective solution. High tunnel coverage provides insurance that the orchard will provide a consistent supply year after year, which is no small matter when it comes to retaining its place in the market.

The multi-bay tunnels make it possible to leave cherries on the tree longer, so they can reach optimal size and maturity. For uncovered cherry plantings, a grower's only defense against the threat of rain has been to pick early. Staying on the tree longer makes the cherries sweeter and bigger. Ed Weaver estimates as much as a 20% potential weight gain in the tunnel-grown cherries harvested. This enhanced yield helps pay for the costs of the tunnels. On the other hand, increased heat under cover around harvest time can soften cherries and reduce their quality, so proper venting of the tunnels is crucial.

Bad weather ordinarily prevents farm tasks from being performed in a timely fashion and interrupts harvest. However, inside the Haygroves, farm employees can work even when it is raining or wet. Similarly, the rain is less of a deterrent for U-pick customers when they can harvest cherries under cover.

In addition to protecting the fruit from disease by keeping off precipitation and preventing lingering wetness, Haygroves have also reduced bacterial canker at Weaver's Orchard. This disease organism can enter pruning wounds. The Weavers prune their

trees following the cherry harvest and leave the Haygroves covered until late August, after the wounds have healed.

Plastic bird netting around the perimeter of each tunnel—to close off the sides and ends—is sufficient to keep birds out of the trees. Bird damage and consumption in an average year destroys about 15 to 20% of the cherry crop outside of the tunnels and, in a dry year, bird damage can be greater.

Counter to these benefits are the ways that Haygrove structures complicate cherry production. Much of the work relates to the plastic itself. The structures must be covered each spring and uncovered in late summer. And the down side of keeping rain off a crop is the need to irrigate.

The Weavers use bumblebees to ensure pollination. Early flowering can occur when it is still too cold for honeybees to be active. And these bees can become disoriented in high tunnels. Honeybees fly repeatedly to and from their hive, while bumblebees spend the entire day away from their colony. Advance (six weeks) notice is required to order bumblebees and the timing of an order can be changed if blooms are slower than anticipated.

Erratic weather conditions call for more intensive tunnel management. Venting is fairly easy, but requires vigilance. If it gets hot or if a thunderstorm threatens, the Haygroves must be vented. When rain is forecast, the tunnels must be closed down.

It can be inconvenient to work around and inside the Haygrove structure and for a tree fruit grower, this disadvantage is magnified. Because the tunnels are 14' or 15' high at the peak, the cherry trees must be pruned back to 12'. Putting up Haygroves over existing trees is awkward, though doable.

The tunnels are spacious enough to drive a tractor inside for fertilizer

application, spraying, and mowing. At Weaver's Orchard, a granular fertilizer is applied in early March, before the tunnels are skinned, so that precipitation will water it in. Growing season fertility is provided with fertigation. All watering is done with drip irrigation.

Weaver's Orchard is situated on rocky soil and the terrain is uneven. The soil and topography make erecting Haygroves or any other type of tunnel a challenge.

None-the-less, Ed Weaver believes that the Haygroves are paying for themselves. More importantly, these structures are allowing the farm to lessen the risk of crop loss and have profitable, high quality cherry harvest every year. He estimates that an increase in the value of the crop by just \$0.40 per pound will pay for the annual cost of the tunnel over its lifetime.

Given the investment, Ed counsels other growers to maximize the efficient use of space in Haygroves. He was unable to do so with his first Haygrove structure as it was constructed over an existing cherry planting and that orchard block was not spaced at the optimal high density.

They have almost doubled tree density in the new blocks they are planting with the intention of covering them with Haygroves. Ed noted that new studies have demonstrated how cherry growers can intensify production by increasing the fruiting to vegetative wood ratio. They hope to develop more fruiting wood in each tree by paying more attention to tree training.

Yields depend a great deal on the variety. Rainier, a superior tasting variety, has performed at the top. It also commands a higher price and Weaver's Orchard sells pre-picked Rainiers for \$4.99 per pound, a dollar per pound more than dark cherries. They have 100 producing Rainier trees in their Haygrove (and none in

the field). At 30 pounds of production per tree and 400 trees per acre, Ed extrapolated a yield of 12,000 pounds per acre and a \$30,000 gross income at the pick-your-own price of \$2.50 per pound. Ed estimates that this is about twice the outdoor yield of varieties that produce consistently. However, accurate comparisons with outside production are difficult, given differences in age and varieties.

On the other hand, about half of the Weavers' trees in the 2004 Haygrove tunnels are varieties that are especially challenging to pollinate. Even outside of the tunnels, these varieties characteristically produce a good crop only two years out of three. But in the Haygroves, their production was down a surprising 85% in 2005. By bringing in more bees and planting more varieties as pollinators in the block, they are trying to address this problem. Recent releases of self-fertile varieties are also relevant. The shortfall in fruiting reduced yields by about \$5,000 an acre (wholesale gross revenues) and cut net income by at least \$3,500 per acre.

Despite some disappointing yields in the 2004 block, Ed remains optimistic about growing cherries in these multi-bay high tunnels. They have solved some otherwise intractable problems—most significantly those caused by rain and birds. And with several years of experience and investigation, he has good ideas about approaches to cultural practices, varietal selection, and planting density to overcome other snags in his plan.

Ed also is exploring the value of Haygrove production for other crops. Berries are important in the crop mix at Weaver's Orchard, though the Weavers are new to growing berries in Haygroves. Their protection from birds and rain has reduced damage and disease and improved quality for all types of berries. In the high tunnels, both the blueberries and brambles also produced "super

vigorous” canes heavy with fruit that required either temporary or additional trellising, respectively. Ed calls this “a good problem!”

Blueberries ripened earlier (three to four days to a week or more) than field grown berries, but the farm did not gain much added value with earliness for this crop.

The Weavers have the least experience with bramble production in the Haygroves as their first crops under plastic were harvested in 2005. Summer and fall bearing bramble crops—Black Raspberry, Primacane Red Raspberry, and Floricane Red Raspberry—were successful. The biggest benefit is that the cover keeps the canes and fruit dry. Pickers don’t have to wait until the dew has dried, and with fewer blemishes, the fruits are easier to pick. Shelf life has increased, with no mold evident a day after picking. Ed wonders, though, if the lower productivity of black raspberries, compared to reds, justifies the cost of planting in the Haygroves.

Ed has experimented with several strawberry production systems, including day-neutral varieties and June-bearing varieties in tabletop production. He is optimistic about growing tabletop strawberries, which are common in the United Kingdom. This system gives the grower flexibility in timing the fruiting of the crop. Plants are started in trays on pallets in another hoop house. At blossom, they are moved to the Haygrove. After production ends, they are returned to the other hoop house. Planting date, pinching primary buds, temperature, and the date the plants are moved to the Haygrove are among the factors the grower can manipulate to alter the harvest date.

By keeping rain off the plants with the tabletop system, the Weavers have been able to grow a June-bearing strawberry crop with a longer shelf life and no pesticide application. They retailed their crop for \$1 more per

Enterprise Budget for Sweet Cherries in a One-Acre Haygrove Tunnel at Weaver's Orchard

Fixed Costs

Tunnel Construction Costs	Materials	Labor
High tunnel construction (220 hrs. x \$10/hr)		\$2,200
High tunnel frame	\$25,000	
Irrigation	\$630	
Subtotals	\$25,630	\$2,200
Total Tunnel Construction Costs		\$27,830

Cherry Tree Establishment Costs	Materials	Labor
Trees (@ \$10.25)	\$4,100	\$2,300
Stakes and guards	\$1,312	
Fertilizer, pesticides, etc.	\$237	
Subtotals	\$5,649	\$2,300
Total Cherry Tree Establishment Costs		\$7,949

Summary of Annual Fixed Costs

High tunnel construction (divided by 15 years)	\$1,855
Interest (construction financed at 7% for 15 years)	\$974
Taxes, land, office expenses, fees	\$295
Cherry tree establishment (divided by 15 years)	\$530
Total Fixed Costs	\$3,654

Variable Costs

Materials and Machinery

Fertilizer and lime	\$47
Bees for pollination	\$220
Pesticides	\$244
Poly cover (divided by 4 years)	\$1,000
Marketing Costs	\$800
Subtotal	\$2,311

Labor Costs (\$8 to \$12/hr)

Poly cover installation, removal, venting	\$1,200
Pruning, irrigating, spraying	\$158
Harvesting, grading, packing	\$3,706
Sales and delivery	\$880
Subtotal	\$5,944
Total Variable Costs	\$8,255

Total Costs \$11,909

Revenues* \$17,780

Net Returns \$5,871

*Revenues are based on yields of 5,760 lb/acre and an average wholesale price of about \$2.10/lb. The Weavers wholesale nearly half the total crop to their own farmstand, and then retail the cherries for an average of \$4/lb, increasing their revenues by \$1.90/lb, or by just over \$4,200 (after marketing costs) in profits per acre. Because not all the cherry trees produced a full crop, yields were reduced by about 50%, having a large impact on net returns.

quart. The Weavers’ experience with ever-bearing (day-neutral) strawberries grown in the ground was less promising, as they were afflicted

with disease problems. Ed Weaver is eager to experiment with growing strawberries that ripen out of season, in May, and in the Fall.