

Introduction

High tunnels are inexpensive, passive solar structures designed to extend the growing season and intensify production. By protecting crops from potentially damaging weather conditions (frost, temperature fluctuations, precipitation, wind, or excess moisture that delays planting or cultivation), high tunnels also reduce risk and enhance the quality of the harvest. They enable farmers to tap discerning markets hungry for local products and thus become more profitable.

High tunnels have other benefits. They can help farmers better utilize labor by providing work in bad weather and potentially creating year-round positions. Due to the protected microclimate inside the structure, high tunnel crops tend to be of higher quality and produce higher yields than field-grown crops. As plants inside high tunnels tend to experience less disease and insect pressure, fewer pesticides are used.

High tunnels—simple, plastic-covered, tubular steel structures—rely mainly on the sun’s energy to warm the soil and air. Their name is derived from the fact that they are high enough in which to stand up. European and Asian farmers have used high tunnels for decades but this low cost growing environment is relatively new in North America. In recent years, more and more farmers are experimenting with their use.

Typically high tunnels forgo mechanical systems such as heaters, fans, and lights. Partially because of the absence of these amenities, high tunnels are less costly to build. Often, however, their frames are identical to more conventional greenhouses. Because high tunnels are far less capital intensive than greenhouses, it usually takes less time for them to pay for themselves. In addition, high tunnels are typically classified as temporary agricultural structures for purposes of property

assessment and taxation, since they lack a concrete foundation or footings.

Co-author and Pennsylvania farmer Steve Moore suggests several rules for high tunnel design:

- Capture as much natural solar energy as possible.
- Conserve as much energy as possible.
- Keep it simple, both mechanically and managerially.
- Design and operate for minimal economic risk and a quick payback.

Unlike greenhouse culture, where crops may be grown hydroponically or in flats or pots on benches, crops in high tunnels are almost always grown in the ground. High tunnels can be configured in a variety of shapes (i.e., Quonset or gothic) and sizes (narrow or wide, short or long, single bay or multi-bay), and can be semi-permanent, temporary or movable structures.

There are also differences between four-season high tunnels (also called “hoop houses” or “passive solar greenhouses”) and three-season high tunnels such as Haygroves. Four-season structures—the conventional single bay high tunnel—typically cost about \$2 to \$3/ft² compared to \$0.75 to \$1.25/ft² for a three-season high tunnel. The farmer case studies and text that follow will illuminate the differences between these two types of structures.

In the Northeast, high tunnels are well suited for the production of high value crops including salad mix, baby spinach, fresh market tomatoes, cucumbers, red peppers, basil, cut flowers, raspberries, strawberries, and more. And dwarf tree-crops like sweet cherries can be produced in larger multi-bay tunnels (like Haygroves). Farmers may construct high tunnels to complement their existing agricultural operations or turn to high tunnels as the centerpiece of a new stand-alone business.

While we want to demonstrate how high tunnels may be a reasonable option for farmers wanting to extend their growing and marketing seasons, high tunnels are not for everyone. They are tools, not ends in themselves. To be an appropriate investment, high tunnels must suit a farmer’s goals and resources. Each grower needs to critically examine the pros and cons of high tunnels in the context of their own situation.

Some farmers have no interest in extending the season. A couple farming at Persephone Farm in Oregon eloquently expressed this perspective (see the September 2006 issue of *Growing for Market*). They relish their off-season downtime and look forward to selling out and shutting down for the year. And they are cognizant and accepting of the trade-offs inherent in their decision.

This manual is intended to provide farmers, agricultural developers, and farm advisors with a realistic depiction of some of the applications for high tunnels in Northeastern agriculture. We aim to assist farmers and those who work with farmers in determining if and how to make use of high tunnels. As a decision-making aid, this publication provides both general principles and specific, in-depth examples as guidance. The manual should enable more farmers to use high tunnels effectively, enhancing productivity, net income, and quality of life, and avoiding some of the pitfalls of earlier adopters.

The information and concepts we have chosen to present are based largely on the observations and experimentation of farmers who grow in high tunnels in the Northeast from southern Pennsylvania to northern Vermont. We have profiled six farmers, and also have drawn from the experiences of several others. The extensive farming experience of two of the three authors has also provided much of the basis for this publication.