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56. High tunnels can extend your production season. Bridgen, M. Greenhouse Management and Production 27(5):27-29. 2007.

High tunnels are protected growing systems that lengthen the production season, produce higher yields, improve product quality and possibly reduce pesticide use.

High tunnels can extend your production seasons

HIGH TUNNELS ARE low-cost, simplified growing structures that enhance crop growth, yield and quality. They are used to extend the growing season in spring and fall and to protect crops from the environment and pests.

Benefits of high tunnels

Season extenders. High tunnels are an inexpensive way to minimize adverse effects of the environment. They resemble a traditional plastic-covered greenhouse but use a completely different technology. Although they are quonset-shaped, plastic-covered structures, they are not greenhouses. Ventilation is provided by manually raising the tunnel's side walls each morning. Heat is provided by solar radiation that is entrapped for the nights by lowering the side walls in early evening. The only external connection to the tunnel is water for trickle irrigation. Tunnels are high enough to use field tractors for planting, cultivating and harvesting.

Tax breaks. With no electrical service, automated ventilation, permanent foundation or heating system, tunnels are considered to be nonpermanent (removable) structures. As such, they are affordable, easy to construct in a field and simple to use. In most areas, these structures are not taxed as permanent buildings and often they



High tunnels can be easily constructed, dismantled and moved.

Obtain more information on high tunnels

Ohio State University Extension released an audio CD and reference packet based on a high tunnels workshop conducted in November 2006 featuring speakers from the Midwest and East.

The CD contains six hours of discussion on design, construction and management. The packet compiles visuals and resource materials used during the workshop. The CD and packet contain different but complementary information.

Cost is \$10 for the CD; \$20 for the packet or \$25 for both.

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do not require building permits.

Weather protection. Because high tunnels create a greenhouse effect, their primary function is temperature modification. For most practical purposes, season extension in spring and fall is their primary function.

They may be used in winter to protect plants from weather extremes. High tunnels provide protection from the wind, excessive sun and damaging hail and rains. Any high-value crop that can be seriously affected by weather is likely to benefit from high

tunnel protection.

Crop protection. High tunnels may help to control insects, disease and predators such as birds and deer.

Airflow. The construction of tunnels provides beneficial airflow. The large air volume maintains a more stable climate and an improved production environment. There is lower humidity in mornings, which prevents water condensation on the plants.

Affordability. High tunnels are low cost. They can be easily constructed, dismantled and moved. Growers can extend production for early- and late-season markets and capture more profit. Tunnels may allow growers to produce certain crops year-round.

High tunnel management

High tunnels are not automated. Consequently, for maximum efficiency,

Did you know?

The terms "hoop house" and "high tunnel" are often used interchangeably. Europeans often call a single-bay high tunnel a French tunnel. High tunnels may have two or more bays connected at the gutter. Americans would call these "gutter connected high tunnels," but some Europeans call them Spanish tunnels.

they require daily attention, especially in the morning and evening and during periods of heavy wind or rain. Temperature and humidity are the two critical factors that should be controlled as much as feasible. Humidity is important to monitor and control because of the role it can play in disease management.

Early each morning, based on weather conditions, the sides of the high tunnels should be rolled up to decrease humidity and to keep temperatures within designated ranges. The temperature in a closed high tunnel rises very rapidly on

High tunnel construction

In the April 2007 GMPRO on Technology column (Pages 59-61), John Bartok Jr. discussed some of the basics of tunnel construction. A pdf of the article can be found on the Green Beam Web site at www.greenbeam.com/irs/gm_pdfs/18352_o59.pdf.

Cut flowers benefit from high tunnels

The benefits of using high tunnels for cut flower production have been consistent. Studies have shown that plants grown inside high tunnels:

- Flower earlier.
- Produce longer stems.
- Experience less disease.
- Have less wind damage.
- Produce higher-grade cut flowers.
- Have a longer production season.

sunny mornings, so ventilation is important to monitor.

In early evening or at the end of the day, the sides need to be rolled down to hold in as much heat as possible. Soil warming during the day allows the inside air to remain warmer at night.

The sides of the tunnels should continue to be closed each evening if the ambient night temperature is less than 65°F. When summer temperatures are consistent, the sides should remain rolled up.

Tunnel-grown cut flowers

Scientists at Cornell University are conducting research with field-grown cut flowers in high tunnels in Ithaca and on Long Island. At the Long Island Horticultural Research and Extension Center in Riverhead, N.Y., research is done with four high tunnels. Each one is 46 feet long by 26 feet wide and supplied with trickle irrigation down the length of the tunnel.

Cut flowers benefit from the season extension and weather protection provided by high tunnels. Studies at Cornell University have compared plants protected by high tunnels to plants grown outside of the structures. Measurements collected include height differences, incidence of disease, extended time of flower production and marketing, watering frequency, stem length and grade, number of stems harvested, planting and harvesting dates and mode of support.

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