



Starting a High Tunnel

Oluwaseun Mofikoya, Research & Extension Associate for Organic Agriculture

Theoneste Nzaramyimana, PhD, Assistant Professor for Urban Agriculture

Introduction

- High tunnels, also known as hoop houses, are greenhouse-like structures made of metal frames covered with a layer of clear plastic that provide a protected environment for growing crops (Kaiser and Ernst, 2021).
- They are similar to greenhouses in their appearance and function, and primarily used for growing vegetables, cut flowers, and small fruit crops.
- The main purpose of the high tunnel is to extend the growing season for various crops such as leafy greens, tomatoes, and peppers. By protecting plants from harsh weather (such as wind and frost), high tunnels create a more controlled environment which can lead to an earlier start in the spring and a later end in the fall compared to field cultivation (USDA-NRSC, 2024).
- Unlike greenhouses, high tunnels do not have climate control systems such as heating or automated ventilation. High tunnels rely on solar radiation for heat and ventilation which can be achieved by rolling up the sides of the tunnel or opening end doors.

Site Selection

It is important to select the right site and construction materials before purchasing any high tunnel. The site selected can have an impact on the structure's use and performance. The following are key factors to consider when choosing a site for installation:

- Choose a site that is level or slightly sloped for proper drainage.
- Avoid shaded areas, especially those shaded during the winter months. A south-facing orientation often provides optimal sunlight exposure.
- Choose a site with fertile and well-drained soil. Conduct soil tests to assess nutrient levels, pH, and texture.
- Proximity to a reliable water source is required all year round.

Cost Analysis

- High tunnel cost (excluding labor): \$1.50-\$5.00 per square foot, depending on materials.
- Medium-sized high tunnel (30'×96'): Estimated cost \$4,320-\$14,400.
- Simple drip irrigation can cost \$300 and over.
- Advanced systems: Over \$1,000.
- Annual maintenance (plastic covering, irrigation repairs): \$100-\$1,000.

Crop selection and Rotation

- Warm Season Crops: Tomatoes, peppers, eggplant, cucumbers, and melons.
- Cool Season Crops (Fall & Winter): Lettuce, spinach, kale, radishes, and carrots.
- Choose crops based on market demand and projected returns per unit of production area.
- Choose determinant or compact cultivars for easier management, pest control, and harvesting in confined tunnel spaces.
- Avoid continuous cultivation of high-value crops from the same botanical family to prevent soil health issues.
- Implement a crop rotation schedule tailored to the specific needs of each crop family in high tunnel production.



Photo Credit: KSU High Tunnel under construction. (Photo by Jonathan Palmer, Media Specialist, Kentucky State University)

Construction

❖ Planning & Material Selection:

- Choose durable, weather-resistant materials (UV resistant, impact-resistant).
- Ensure the structure can withstand snow, wind, and rain.
- Steel tubing or fence pipes are used for frame construction. Posts should be driven into soil to support the hoops.
- Pressure-treated lumber baseboard should be bolted to posts for frame rigidity.
- Frame poles sunk 2-3 feet into the ground and set with concrete for stability.
- Movable high tunnels require an anchor post for attachment.
- Follow manufactures instructions to assemble frame

❖ Covering & Light Management:

- Use greenhouse-grade polyethylene for cost-effective coverage.
- Properly secure the polyethylene to prevent wind damage.
- Replace plastic covering every 4-5 years as light transmission decreases.
- For summer cool-season crop production, use shade cloth to reduce light intensity and temperature.

❖ Regulations & Permits:

- Check with local authorities for required permits and regulations before construction.

EQIP Seasonal High Tunnel Initiative:

USDA NRCS funding supports season extension for high-value crops. Contact your local NRCS for additional information.

Eligibility Requirements:

- High tunnel must be 6 feet tall, covered with 6-mil greenhouse film, and unheated.
- Grower must provide crop production data.
- Must have \$1,000 in annual agricultural sales or submit a business plan to meet the requirements.

Sources

Bartok, J.W. (2007). High Tunnels - Low-Cost Seasonal Growth Space. University of Massachusetts Amherst Center for Agriculture, Food and the Environment <https://ag.umass.edu/greenhouse-floriculture/fact-sheets/high-tunnels-low-cost-seasonal-growth-space>

Dunn, B., Vinson, M., Brandenberger, L. (2017). High Tunnels. Oklahoma State University Press. <https://extension.okstate.edu/fact-sheets/hightunnels.html#:~:text=High%20tunnels%20are%20unheated%2C%20plastic,as%20leafy%20greens%20and%20tomatoes.>

EQIP High Tunnel System Initiative. <https://www.nrcs.usda.gov/programs-initiatives/eqip-high-tunnel-initiative>

Harper, J.K., Ford, T., Kime, L., Bogash, S. (2023). High Tunnel Production. Penn State Extension. <https://extension.psu.edu/high-tunnel-production>

Natural Resources Conservation Service (2024). Growing All Seasons: High Tunnels. U.S Department of Agriculture. <https://www.nrcs.usda.gov/getting-assistance/other-topics/organic/nrcs-assistance-for-organic-farmers/growing-all-seasons-high-tunnels>

Kaiser, C., Ernst, M. (2021). High Tunnel Overview. University of Kentucky College of Agriculture, Food and Environment, Cooperative Extension Service. <https://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/hightunneloverview.pdf>