



High Tunnel System

Iowa Job Sheet

Natural Resources Conservation Service (NRCS)
Des Moines, Iowa

Iowa Conservation Practice 325
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Definition

A high tunnel system is an enclosed polyethylene, polycarbonate, plastic, or fabric covered structure that is used to protect crops from sun, wind, excessive rainfall, or cold, to extend the growing season in an environmentally safe manner.

Purpose

High tunnel systems are designed to extend the cropping season and benefit natural resources by improving plant health and vigor.



Conditions Where Practice Applies

This practice applies to land capable of producing crops where sun or wind intensity may damage crops, or where an extension of the growing season is needed due to climatic conditions.

This practice only applies to crops grown in the natural soil profile. (This would exclude tables, benches, portable pots, hydroponically-grown vegetables, etc.)

Criteria

- » Plan supportive conservation practices to address all environmental concerns associated with the installation and use of the high tunnel systems,

such as erosion, irrigation, and runoff.

- » **Crops must be grown in the natural soil profile.** Raised beds may be installed to improve soil condition, fertility, and access. Raised beds are a maximum of 12 inches in depth.
- » The practice does not include greenhouses or low tunnel systems.
- » Do not use high tunnel systems to provide shelter or housing for any livestock, or to store supplies or equipment.
- » Locate the structure near a viable water source for irrigation.
- » The high tunnel frame must be constructed of metal, wood, or durable plastic; and be at least 6 feet in height at the peak of the structure. If required for enclosure, end wall covering may be greenhouse-grade plastic, polycarbonate, wood, or other.
- » Select high tunnel covering material to withstand the temperature changes for a 5-year minimum lifespan.
- » For organic producers, make sure all material specifications are consistent with USDA Agricultural Marketing Service National Organic Program, National Standards on Organic



Agricultural Production and Handling.

- » Construct high tunnels on level grade or the naturally occurring slope if the slope does not exceed five percent.
- » Remove or roll up the high tunnel cover at the end of the growing season to prevent snow damage, unless the structure is designed by the manufacturer to withstand expected snow loads.
- » In areas where wind may damage the structure, select a cover and structure designed by the manufacturer to withstand expected wind loads, or manage the tunnel system to limit wind damage.
- » Where the intensity or duration of sunlight can shorten the growing season, the appropriate thickness of shade cloth may be used in place of, or in addition to impervious plastic covers. When shade cloth is used alone, end walls are not required.
- » Direct runoff away from the high tunnel system to avoid ponding. Provide a detention basin, storage reservoir, or stable outlet when runoff from tunnel covers empty onto the ground surface with potential to cause erosion.
- » Outside the high tunnel, vegetate all exposed surfaces disturbed during construction in accordance with Conservation Practice 342 Critical Area Planting. If climatic conditions preclude the use of seed or sod, use Conservation Practice 484 Mulching.
- » Significant modifications to the high tunnel structure design must be verified and approved by the manufacturer prior to construction to ensure that any warranties remain in effect.
- » minimize soil disturbance, physical, chemical and biological
- » use plant diversity in the rotation to increase diversity below ground
- » keep a living root growing year round as much as possible
- » keep the soil covered with residue and grow plants year round
- » Locate the the high tunnel conveniently for ingress/ egress of plant materials, equipment, and other operation and maintenance activities.
- » Remove or manipulate side covers to control internal temperatures and humidity. Installing fans, vents, or heaters should be included in the manufacturer's design and recommendations.
- » Use heavier 12-14 gauge steel for end posts in concrete, and a double layer of plastic to increase integrity of the structure.
- » For snow removal and cover installation, consider a minimum clearance of 10 to 20 feet between side by side high tunnel installations.
- » The high tunnel could potentially be shaded by trees or other structures. Locate the system two times the height of the tree or structure.
- » Control weeds with soil fabrics, covers, or mulch.
- » Consider the following conservation practices where appropriate:
 - » crop rotation
 - » irrigation water management
 - » salinity management
 - » nutrient management
 - » integrated pest management
 - » critical area planting
 - » mulching
 - » roof runoff structure
 - » diversion
 - » underground outlets
 - » heavy use protection
 - » cover crop

Considerations

- » Runoff may be captured and used for irrigation, though runoff should not be relied on as the only source of irrigation water.
- » Surface or ground outlets such as rock pads, rock-filled trenches with subsurface drains, concrete and other erosion-resistant pads, or preformed channels may be used.
- » Follow a soil management system that creates a favorable habitat for soil microbes to maintain or improve soil health:

Plans and Specifications

At a minimum, the plans and specifications should include:

- » Identify the purpose
- » Document the planned growing season.
- » The layout and location.
- » Site preparations and required supporting practices for erosion control, runoff, and vegetative cover.
- » The planned width and length of the high tunnel.
- » Procedure and timing to remove or roll up the high tunnel cover prior to inclement weather conditions.
- » Procedure and timing to add or replace the shade cloth for protection from the sun.

Operation and maintenance

- » Prepare an operation and maintenance (O&M) plan and review it with the landowner and/or operator.
- » Periodically inspect the high tunnel and repair, re-install, or replace parts as needed.

- » Manage the structure to limit wind and/or snow damage. Close sides and ends before storm events. Close the structure prior to winter weather.
- » If the structure is at serious risk of collapse due to weather conditions, consider slashing the plastic cover to relieve pressure and save the framework.
- » Perform soil tests regularly to monitor nutrients and salt build-up. To remove salt build-up, remove the cover for a season to allow natural precipitation to infiltrate, or by artificially flooding the ground under cover.
- » If needed, seed all disturbed earth surfaces outside of the high tunnel and maintain the vegetation throughout the structure's life.
- » Plan for proper cover disposal at the end of its useful life.
- » Operation and equipment near and on the site should not compromise the intended purpose of the high tunnel structure or its cover.



High Tunnel System Job Sheet

Name _____ Farm # _____ Tract # _____

Assisted by _____ Field Office _____ Contract # _____

Tunnel information

Manufacturer _____ Model _____

Height (min 6') _____ Width _____ Length _____ Total square feet _____

Materials

Cover—Polyethylene a minimum of 6 mils thick

Ribs purlins, post and other components (size and type of materials)

Optional Systems Planned

Supplemental Heating System Mechanical Ventilation System Electrical System

Location and Tunnel Orientation (Show on site plan map)

Other required conservation practices planned (Show location on site plan map)

Diversion Grassed Waterway/Swale Critical Area Seeding

Infiltration Trench Irrigation Other

Seeding recommendations for erosion control on disturbed areas:

Species and rate to be planted _____

Lime _____ lbs/ac. Fertilizer _____ lbs of 5-10-10 /ac.

Certification

This structure was constructed and installed using all manufactures recommendations. I have read and understand the operation and maintenance requirements associated with this practice. I understand that electrical, heating and mechanical ventilation are not eligible for financial assistance.

Landowner Date _____

Technical Service Provider (if applicable) Date _____

REQUIRED: Attach a site plan map.

SUPPORTING PRACTICES MEET NRCS SPECIFICATIONS

NRCS Date _____

Attach Site Plan Map