

Site Considerations

It is a good idea to give careful consideration to where a high tunnel will be built. Success with the structure is highly dependent on its location. The high tunnel should be conveniently accessible, where water and electricity (if desired) can be supplied without excessive cost. A well-drained site is essential, and the site should be graded to divert water. The site should offer full sun and protection from the wind.

Check local zoning ordinances and permit requirements before you proceed. Under most local zoning ordinances, high tunnels are viewed as “temporary” structures that do not require a building permit. Similarly in most jurisdictions, high tunnels are not assessed as a property improvement and therefore are not taxed.

Utilities

Clean water that is free of sediment and chemical contamination must be reliably available in sufficient volume throughout the year—or at least during those months when plants will be growing. “Dirty” water may spread pathogens, blocks emitters in drip irrigation tape, and can even stain the high tunnel’s poly covering.

Electricity is not a requirement for high tunnels as they are strictly defined. Most are covered with a single layer of plastic and therefore do not need an inflation fan to create the airspace between double layers of film. Similarly, passive ventilation is generally adequate. If you decide that electricity is desirable, site the high tunnels close enough for an economical connection with the electrical grid or consider using solar panels (*see “Photovoltaic Inflation Systems” on page 48*).

If use of a backup heating system is anticipated, the tunnel should be

accessible to fuel delivery vehicles, and a fuel storage site should be identified.

Tunnel Access and Room for Expansion

High tunnels are relatively labor-intensive structures and require frequent access. In most situations, there is an advantage to locating high tunnels close to the farmhouse and established work patterns. Truck and tractor access is essential for moving product and supplies in and out. Proximity to the washing area, packing shed, and processing and distribution area will simplify the operation.

When considering where to locate your first high tunnel, keep in mind that you may want to add more tunnels in the future. As one grower put it, “High tunnels seem to like company.” Make sure that your layout provides a logical plan for expansion, while also accommodating farm traffic and snow removal.

With his array of six 14' wide high tunnels, Andy Jones suggests placing tunnels as far apart as they are wide. Ted Blomgren suggests leaving alleyways that are at least as wide as the high tunnel is tall to prevent the shadow from one structure from falling on the adjacent structure.

Air Movement and Orientation

An ideal high tunnel site allows the free flow of air in summer and provides protection from cold wind in winter. For both passive and mechanical ventilation systems to be effective, the site should be open. Adequate ventilation will help remove hot air from the high tunnel. It will also remove excess moisture, reducing leaf wetness and foliar diseases. Creating favorable environmental conditions will result in healthier

plants. Avoid cold pockets (i.e., the bottom of a hill) and areas of turbulence from adjacent hills or tree lines.

Good high tunnels are sturdier than they look. But a constant pounding and shaking from the wind can be hard on a structure (not to mention a farmer’s nerves). Orienting the gable end to face the prevailing wind helps limit the structure’s exposure. A windbreak is a good idea, especially for winter growing, as long as it doesn’t affect sun exposure.

Water Movement and Drainage

High tunnels are most successful when they are built on well-drained sites. Removing excess water from around the high tunnel is absolutely necessary. Run-off from a high tunnel roof and from rain and melting snow can be significant. An inch of rain falling on a 30' x 96' house, for example, works out to be 0.6 gallons per square foot, or 1,728 gallons over the entire structure. This water and ground water should be diverted by a swale around the high tunnel. If there is uphill runoff, it is wise to divert this water before it reaches the high tunnel. Ideally, the tunnel should be at least a foot above grade of the land around it. A high tunnel water plan should be designed for the worst-case scenario of frozen ground with lots of rain.

In addition to surface water, subterranean water and seasonal springs must be avoided or dealt with. Ground water will wreck havoc on your crops, potentially causing devastating problems such as disease, secondary insect infestations, denitrification of the soil, and heat loss, among other problems.

Level and Square

High tunnels need not be on a level site. A little slope is okay, and a very gradual slope from one end to the other can actually be advantageous. This allows better flow when using low-pressure drip tape (with the headers and manifolds at the top), and offers the ability (if needed) to blend the high tunnel into the existing terrain without as much excavation. This slope also facilitates the addition of gutters if you want to collect or facilitate the removal of rainwater.

Too great a slope, however, can compromise the structural integrity of the high tunnel. Heavy snow loads that bear asymmetrically on a structure may cause its collapse. And your structure should be square. Kit greenhouses with pre-drilled holes for purlins, for example, will not align properly if the structure is out of square.

Exposure and Orientation

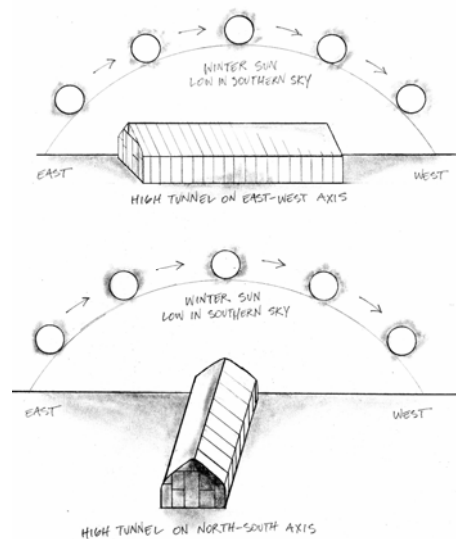
The site should be free from shade, as the first principle of high tunnel growing is ensuring full sun. Unless you are already attuned to the sun's movements, you'll be surprised to learn of the changes in its path across the sky over the course of a year. Hills, trees (even deciduous trees), and buildings can greatly restrict sunlight in the winter when sun is low on the horizon. Use a good sun chart such as the one in "The Passive Solar Energy Book" by Edward Mazria or at www.mysundial.ca/tsp/sun_charts.html.

Traditionally, greenhouses are oriented along a North-South axis to avoid shading. If you are certain that you will only be growing during the warmer months, this orientation will be acceptable. However, if you wish to maximize sunlight energy during the low light period of winter, it

makes sense to orient high tunnels along an East-West axis. The Zemelskys, who grow year round in five high tunnels in Connecticut, found that their newest structure—the only one oriented East-West—outperformed their four others which are on a North-South axis.

When the sun arcs low across the southern sky during the winter months, solar radiation strikes the plastic of a North-South house at an oblique angle. When sunlight strikes at an oblique angle, some of the radiation is reflected outward and is lost. Solar gains in a high tunnel are greatest when solar radiation strikes the cover at a 90 degree angle.

During the winter and early spring, an East-West orientation improves this angle of incidence, more effectively capturing solar radiation. And a gothic-shaped structure captures this incoming radiation better than a Quonset structure except when the sun is high overhead, as it is during summer.



True South is different from magnetic South. In southeast Pennsylvania, for instance, it is 7 degrees West of magnetic South. It is better to orient a

little East (i.e., 10 degrees) to facilitate more solar energy earlier in the day and warm up the high tunnel quicker.

Capacity of Soil to Support the Structure

Most greenhouses and high tunnels use ground posts that are installed into the ground two to four feet deep. Ledge, boulders, coarse stone, or other obstructions can hamper installation. If rock cannot be removed, holes must be bored with a rock drill as Ed Weaver did in constructing his multi-bay high tunnels.

A firm base is needed, especially at the bottom of the ground pins and concrete. Extensive excavating and/or previous fill must be completely settled or the ground pins will need to be placed to an undisturbed depth to avoid settling of the high tunnels.

Agricultural Capacity of the Soil

As a base, any coarsely textured, well-drained soil should be appropriate for high tunnel production. Clay soils are the least desirable base for high tunnels because they don't drain well, thus remaining colder, and because they are more prone to the build-up of salts (*see salinity discussion on page 56*). However, growers have been able to make do with a wide variety of soils, amending and improving them as they are able, in order to successfully grow in these special environments (*See "Soil Management" on page 54*). It is more economical to enrich soil in existing high tunnels to boost yields and enhance plant resilience than to add more high tunnels.