

Low Tunnel Basics

What is a Low Tunnel?

Low tunnels are essentially miniature versions of high tunnels, usually two to four feet tall at their peak and four to six feet wide. Length varies, but less than 50 feet is recommended for windy areas. Unlike high tunnels, low tunnels are moved seasonally, lack much of the structural support offered by high tunnels, and have plastic weighted down to the ground or buried (rather than attached to the structure). They may be used within high tunnels (decreasing or negating the issue of wind), or on their own out in the field.

Low tunnels can provide a low-cost, cost-effective investment option for those seeking an entry point to polytunnel production or for those wishing to enhance their current polytunnel production capacity. Low tunnels offer an alternative form of crop protection and season extension that may work even better than a high tunnel for some growers and in certain situations.

As with high tunnels, appropriate crops for winter production in low tunnels include: spinach, kale, collards, chard, leeks, scallions, carrots, parsnips, cabbage, Asian greens, parsley and arugula. Many other crops may not survive the entire winter in a low tunnel, but they can be pushed well beyond the first frost, often all the way to the New Year and their season can begin much earlier than traditional planting.

Potential Benefits and Challenges of Low Tunnels

Low tunnels put to work the same simple technology as high tunnels, at a fraction of the cost. Whereas high tunnels cost two to three dollars per square foot, heavy duty low tunnels with ½" metal pipes and 6 mil. greenhouse-grade plastic cost just 30 to 60 cents per square foot. The cost drops to as little as five cents per square foot if metal wire and row cover (a breathable poly-spun fabric) are used instead.

Unlike high tunnels, these low cost structures can be disassembled, moved throughout the farm, and work with the contours of the land. Similar to high tunnels, plastic covered low tunnels provide crops with several degrees of cold protection at night, but due to their smaller stature low tunnels heat up rapidly on sunny days, even if outdoor temperatures remain low.

Low tunnels have their own unique set of challenges. Because you can't stand-up in low tunnels, you must partially remove the covering to access your crops which can make it difficult to harvest or weed in high wind, rain, snow, or sub-zero temperatures. Low tunnel construction and dismantling must be done annually and is labor intensive. Low tunnels are, of course, lighter, so Kansas farmers must take extra measures to ensure their low tunnel doesn't end up in the neighbor's tree line. According to Johnny's Selected Seeds, a company that sells low tunnel supplies and has done a lot to promote and advance the technology, growers in high wind areas need more than just sand bags to keep their low tunnel structures secure. Burying the edges is effective, but Johnny's also recommends putting in stakes on each side of the tunnel, offset, and crisscrossing rope over the length of the structure.

In Kansas's climate, low tunnels may remain covered from late October or early November through late February or early March. Similar to high tunnels, low tunnels need to be manually ventilated if temperatures reach 60 degrees, as they occasionally do in late fall and early spring.

Low Tunnel Options for Kansans

There are many options for low tunnels configurations. They may be constructed using standard metal hoops, galvanized metal wire (9 gauge wire is most common, but 3/16" round stock is alleged to bounce back after heavy snow loads melt), or PVC (not advisable, due to short lifespan and degradation to plastic covering). Several different cover-options exist, including shade cloth, different thicknesses of row cover, or different types of plastic than the standard greenhouse plastic found on high tunnels. As is explained below, each configuration offers its own unique benefits.

Shade cloth can be used without plastic on low tunnels, to extend the season of cool season crops into the warmer months. This can be especially effective when combined with misters set on timers (used to decrease the temperature through 'evaporative cooling').

Low tunnels covered with poly-spun row cover allow air and water to penetrate while providing several degrees of frost protection. Though row cover does not offer the daytime temperature increase that plastic covered low tunnels can provide, on sunny days it can be beneficial that no ventilation is required. Using thick row cover (1.5 oz.) and/or a double layer of row cover on low tunnels can help give warm season crops a jump start in the spring and can help extend the growing season past the first frost, perhaps as late as winter solstice (but not for overwintering most crops). Thick row cover also protects crops from the wind, though additional measures must be taken in high wind areas to keep the row cover attached. Note: The thicker the row cover or the more layers of row cover, the less light penetration. To offset this effect, growers can remove row cover on warm, sunny days to allow maximum light penetration.

Thinner row covers (0.5 oz.) offer little cold protection, but instead serve as physical barriers to insects - preventing pests like squash bugs and cucumber beetles from reaching the crop. However, many tunnel crops require pollination. In these cases, the row cover is removed for pollination once the plants start flowering, at which time the plants are established enough to deal with some pest pressure.

Perforated plastic provides about as much frost protection as row cover, but also provides much higher daytime temperatures - similar to those of greenhouse plastic. However, unlike greenhouse plastic, perforated plastic self-ventilates when temperatures reach a certain point and the slits in the plastic walls contract, allowing heat to escape.

Further Reading

One of the best resource for low tunnel production, and season extension in general, is Eliot Coleman's *The Winter Harvest Handbook*, as well as Coleman's other books. He has decades of experience and is largely responsible for the progression of this technology. Johnny's Selected Seeds sells many of the supplies required for low tunnels, including the Eliot Coleman designed pipe bender. For detailed information on the construction process and the necessary materials Johnny's Low Tunnel Bender Instruction Manual is available online at: http://www.johnnyseeds.com/assets/information/9377_9520_quickhoops-low-tunnel_benders_instruction-manual.pdf