



# Low Tunnel Economics

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## Introduction

Low tunnels have long been used to extend the vegetable production season and to protect specialty crops from damaging frosts. Low tunnels can improve productivity, especially when used in combination with high tunnels and other season extension practices. However, the proper use of low tunnels – especially in variable temperature conditions – can also require considerable management time and expertise.

This fact sheet summarizes important economic considerations when using low tunnels in vegetable and fruit production in Kentucky. This is not a production guide; it is best used as a resource to inform a grower's own cost and return estimates for using low tunnels. Consult other reliable resources to design and choose tunnel design and materials, making production decisions appropriate to each individual farm setting.

## Understanding and Estimating Low Tunnel Material Costs

Low tunnels are plastic or metal hoops covered by plastic material. They are usually about 2 feet high; some may be up to 4 feet or higher. Spun-bonded fabric, plastic film, and insect nets are the most common materials used in low tunnel coverings. Spun-bonded fabric and plastic film are used for season-extension, and insect net row covers are used for pest management.



material in place.

Material costs and labor for installation are the main expenses when establishing low tunnels. The main material costs are the hoops and covering material. Some equipment and supplies may also be needed, like specialized anchors for keeping the



Row cover costs will be determined by the crop and the desired level of frost protection or light penetration. Freight costs for the row cover material are another important consideration; freight may add considerable cost per square yard.

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**Table 1. Comparing Low Tunnel Cover Costs**

Material	Per foot cost (50-foot roll)	Per foot cost (500-foot roll)
Insect Cover (0.45 oz per yd <sup>2</sup> , 118" wide)	\$0.57	\$0.25
Spun-bonded (0.55 oz per yd <sup>2</sup> , 83" wide)	\$0.42 - \$0.57	\$0.16 - \$0.23
Spun-bonded (0.90 oz per yd <sup>2</sup> , 83" wide)	\$0.72	\$0.48 - \$0.50
Spun-bonded (1.5 oz per yd <sup>2</sup> , 83" wide)	\$0.88	\$0.43 - \$0.62
Spun-bonded (2.0 oz per yd <sup>2</sup> , 13' wide)	\$1.42 per foot, 13' x 100' roll	\$1.14 per foot, 300-foot roll
4.0 mil greenhouse film	\$0.94 per foot, 10' x 100'	

**Source:** Published prices from two major suppliers, March 2019. Freight and shipping add around 10 cents per foot. Additional freight charges of \$14 to \$50 or more, per roll, may apply.

Growers that can order row cover material for local pickup – or cooperate with other growers to purchase in bulk and reduce freight costs – can reduce materials expenses.

Table 1 lists sample cost ranges for low tunnel material in 2019. Spun-bonded fabric costs for a 50-foot long, 83-inch wide cover will typically run around \$0.50 to \$0.90, depending on the desired fabric weight. Purchasing the same material in 250-foot or 500-foot lengths can reduce the material cost by one-half or more. Shipping and/or freight costs add around \$0.10 per foot. Clear greenhouse film (4.0 mm) can approach \$1 per foot when purchased in 100-foot lengths.

#### *Support Hoops*

Low tunnel support hoops may be metal wire, plastic, or electrical conduit. Most producers using low tunnels to produce crops for sale use metal electrical conduit because of its comparable cost to wire hoops while offering better support, especially in snow. Electrical conduit costs less than \$4 per 10 feet. A long-lasting hoop bender costs \$50 to \$60, and clamps are less than \$1 each.

The most common wire hoops are #9 or #10 gauge wire. A 54-inch wire creates a 10- to 12-inch high hoop. A 76-inch wire creates a 16- to 18-inch high hoop. Garden supply companies sell pre-cut wire for hoops at costs around \$0.40 to \$0.50 per foot. Wire can be purchased locally in large rolls for half that cost, or less, per foot. There will be more labor required to cut, handle and shape the uncut wire.

## **Understanding Low Tunnel Labor Costs**

### *Construction*

Most growers using low tunnels will set up the tunnels themselves. There are obvious tradeoffs that can reduce the labor time needed, such as spending more to purchase pre-cut hoops. Less operator time, but more cash expense, will occur when hired labor is used.

### *Maintenance*

Low tunnels used to extend the season and protect overwintering crops from frost damage can require regular maintenance, especially during periods of fluctuating temperatures. Growers may need to ventilate the tunnel during the daytime to avoid overheating the crop. Options for ventilating include utilizing pre-cut slits in the covering material, a “seam” running down the center top of the tunnel that can be opened on hot days, or raising one side of the tunnel covering. The cover is returned to its original position to provide nighttime frost protection. These tasks require regular maintenance and management time. Although a grower may not be hiring someone to perform this task, the time required to manage the low tunnel must be counted as an economic cost of production.

## **Sample Low Tunnel Cost Estimate**

This list shows a sample estimate of the costs of construction for a 50-foot low tunnel, assuming the purchase of cover and accessories shipped to Kentucky from a national provider and local purchase of electrical conduits for hoops. This does not include the one-time purchase of a hoop bender (\$50 to \$60).

## Low Tunnel Cost Worksheet

	Quantity		Cost		Total
Conduit		10' lengths	\$		\$
Covering		Rolls	\$		\$
Clamps, Other Supplies			\$		\$
<b>Total Material Costs</b>				\$	
Value of Operator Labor		Hours	\$		\$
<b>Total Cost of Materials and Labor</b>				\$	

11 10-foot lengths conduit \$40 to \$50  
 50-ft row cover (0.9 oz per yd<sup>2</sup>)  
 \$35.50 (28.50 + \$7 shipping)  
 Clamps (reusable) \$30  
 Bending conduit and setting up tunnel  
 \$15 (One hour operator labor)

Total Cost - \$105.50 to \$115.50 materials  
 + \$15 labor = \$120.50 to \$130.50

The table above provides a worksheet for estimating low tunnel costs.

### Estimating Low Tunnel Return on Investment

Return on investment measures how much revenue is generated as the result of a particular investment. Estimating the potential return on investment helps determine whether the investment should be made.

To estimate the return on investment for a low tunnel, the grower will need to separate out *fixed* costs from *variable* costs. Fixed costs are those that do not change with the amount or time of production. The cost of the cover material, for example, is fixed. The costs of production inputs, like seed and fertilizer, vary with production.

Generally speaking, a low tunnel may be worth the investment if *the returns generated from the low tunnel are greater than the variable costs of producing with the low tunnel*. Consider the example on Page 5 for a 100-foot tunnel used to extend the season for salad greens.

### Example of Evaluating Return on Investment

A grower has the opportunity to extend her season for salad greens for two months past the end of her local farmers market. She surveyed her customers and found that there are eight customers interested in purchasing 1 pound of salad greens for \$8 weekly, a \$2 to \$3 premium above her in-season price. She would need to purchase and establish a 100-foot low tunnel to provide cold weather protection for the greens.

To determine whether or not this market opportunity would show returns to investment, the producer needs to:

1. Estimate the total revenue
2. Estimate the total production costs for low tunnel salad greens
3. Estimate the value of operator labor used
4. Estimate the cost of the low tunnel materials

Investing in the cost of the low tunnel is likely advisable if the total revenue is greater than the sum of total variable costs and the value of the labor necessary for low tunnel production. The following section walks through the details of this decision, as illustrated on the worksheet following. In this case, there is a positive return to the costs of the low tunnel supplies. Including the value of the operator labor, these supplies would be paid back in one to two years.

1. The total revenue can be estimated based on the actual responses of real customers. Her total revenue is estimated at \$8 per pound per customer per week, for eight customers. This is 64 pounds of salad greens

for a total of \$512.

2. The total production and harvest costs (variable costs), including some hired labor and the cost of getting greens to market, are estimated at \$249.20. This means that the enterprise will generate \$262.80 toward the value of the operator’s labor and the cost of the low tunnel supplies.

3. The operator labor needed to produce the greens is three hours. An hour is needed to set up the low tunnel, and nine hours are estimated to manage the low tunnel. The total value of the operator’s labor, at \$15 per hour, is \$195.

*This low tunnel enterprise will generate an estimated \$67.80 toward the cost of the low tunnel and other costs of ownership.*

4. The cost to purchase the low tunnel materials is estimated to be \$198. If the low tunnel materials are only used for the fall greens crop, the enterprise will pay for the low tunnel materials in about three seasons. The payback period for the low tunnel materials will be faster if some or all of the low tunnel materials can be used for more than one crop during the year.

Note this: if the operator chooses to value her labor at less than \$15 or considers it to be “sweat equity” for

enabling the low tunnel purchase, the enterprise will generate positive returns and cover the cost of all the low tunnel materials in Year 1.

### References and Additional Reading

- Low Tunnels in Vegetable Crops: Beyond Season Extension (Virginia Cooperative Extension, 2018) <http://digitalpubs.ext.vt.edu/vcedigitalpubs/1681181149499474/MobilePagedReplica.action?pm=2&folio=1 - pg1>
- Research Report: Using Low Tunnels for Overwintering Crops [https://extension.unh.edu/resources/files/Resource004419\\_Rep6301.pdf](https://extension.unh.edu/resources/files/Resource004419_Rep6301.pdf)
- Season Extension with Low Tunnels (West Virginia University Extension, 2018) <https://extension.wvu.edu/lawn-gardening-pests/news/2018/12/15/low-tunnel-season-extension>
- Low Tunnels A Low-Cost Protected Cultivation Option (Utah State University Extension, 2014) [https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1677&context=extension\\_curall](https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1677&context=extension_curall)

### Suggested Citation:

Ernst, M. (2019). *Low Tunnel Economics*. CCD-FS-13. Lexington, KY: Center for Crop Diversification, University of Kentucky College of Agriculture, Food and Environment. Available: <http://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/lowtunneleconomics.pdf>

### Low Tunnel Purchase Decision Worksheet

Total Revenue	
Production and Harvest Costs (Variable Costs)	
Return to Operator Labor and Ownership Costs (Revenue - Variable Costs)	
Value of Operator Labor	
Return to Labor and Ownership (Return to Labor & Ownership – Operator Labor)	
Low Tunnel Costs	



## Low Tunnel Production Budget Worksheet (100-foot row fall/winter greens)

RETURNS	Example	Actual	\$/unit	Actual \$/unit	Total	Actual Total
Salad greens	64 lbs	_____	8	_____	\$512.00	_____
<b>TOTAL RETURNS</b>					<b>\$512.00</b>	_____
<b>Costs – Preharvest</b>						
Seed	\$31	_____		_____		_____
Soil fertility (fertilizer, etc.)	\$10	_____		_____		_____
Irrigation supplies	\$10	_____		_____		_____
<b>TOTAL PREHARVEST COSTS</b>					<b>\$51.00</b>	_____
<b>Costs – Harvest &amp; Marketing</b>						
Harvest containers (bags)	64	_____	\$0.05	_____	\$3.20	_____
Hired Harvest Labor	5 hrs	_____	\$15	_____	\$75.00	_____
Marketing (Labor or mileage)	8 hrs	_____	\$15	_____	\$120.00	_____
<b>TOTAL HARVEST COSTS</b>					<b>\$198.20</b>	_____
<b>TOTAL VARIABLE COSTS</b>					<b>\$249.20</b>	_____
<b>Returns above variable costs</b>					<b>\$262.80</b>	_____
<b>Value of Operator Labor</b>						
Planting, Irrigation, Weeding	3 hrs	_____	\$15	_____	\$45.00	_____
Tunnel Setup (1 hr) and Management (0.15 hrs/day)	10 hrs	_____	\$15	_____	\$150.00	_____
<b>Returns above variable and labor costs</b>					<b>\$67.80</b>	_____
<b>LOW TUNNEL COSTS</b>						
Conduit (10')	22	_____	\$3.50	_____	\$77.00	_____
Covering	100 ft	_____	\$0.71	_____	\$71.00	_____
Reusable supplies (Hoop bender, clamps, etc.)			\$50.00	_____	\$50.00	_____
<b>TOTAL LOW TUNNEL COSTS</b>					<b>\$198.00</b>	_____

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 Photo courtesy of John Strang, UK Extension Specialist

January 2020

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