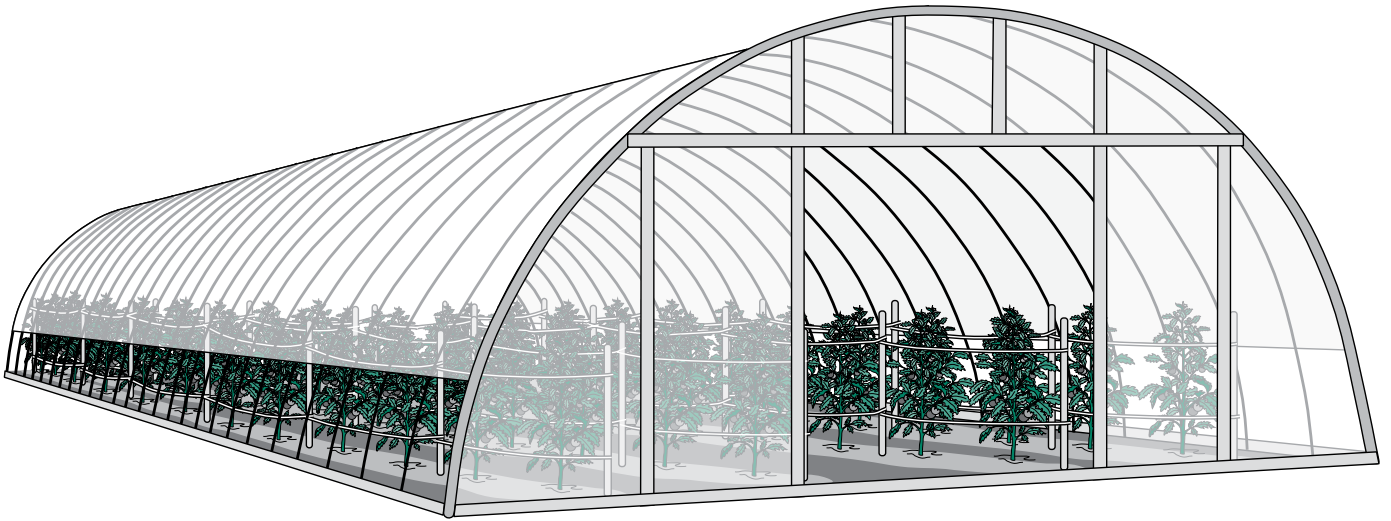


# Vegetable Production Budgets for a High Tunnel



## Introduction

High tunnels, also referred to as “hoop houses,” are simple, plastic-covered, passive solar-heated structures in which crops are grown in the ground. They have become an important tool in commercial vegetable and small fruit production in the Midwest. High tunnels enable growers to increase their profitability in several ways:

- They extend the growing season in the spring and fall allowing earlier and later production of cool and warm-season crops.
- Crop quality and yields can be improved through better climate, water, and nutrient management and a reduced incidence of plant diseases.
- They allow for better labor efficiency because planting, maintenance, and harvest can be performed without being affected by weather.
- Growers often receive higher prices for out-of-season crops.

## Season Extension

Extending the season four or more weeks earlier in the spring and six or more weeks in the fall creates production opportunities in a high tunnel that field production may not. For example, late season production of leafy greens, which tolerate cooler temperatures and reduced day length, can extend your market season and increase revenue and profitability.

Early production of crops before the beginning of average market season not only strengthens your customer base, but the early crops typically command a higher price at the market place.

Growers say high tunnels create an environment one hardiness zone warmer than the field. This not only allows growers to produce crops earlier, but also allows growers to produce greater yields and improved quality of high value crops such as blackberries and red raspberries because they have fewer disease problems and are not subjected to late spring cold temperatures, hail, and high wind.

## Crops and Cropping Systems

Although almost anything can be grown in a high tunnel, the crops you grow and the cropping systems you use should be determined by your market needs, available labor, and what is profitable for you. The advantages of growing crops in high tunnels make the limited space in the high tunnel valuable farm “real estate.” It is important for growers to maintain good production and market records to make informed decisions about how to maximize production and revenue. For example, a mono-crop system, such as only tomatoes, with succession plantings and different varieties for extended harvest, may be the most efficient, profitable system for wholesale markets, such as institutions and grocery stores that require large, continuous volumes of a particular crop.

A multi-crop system may be necessary if you market through farmer's markets, roadside stands, or Community Supported Agriculture (CSA) and need a variety of produce items, but not particularly in large quantities.

By optimizing the use of the space in the high tunnel through succession planting and intercropping, a grower can maintain continuous production throughout the market and CSA distribution season. These planting systems may improve productivity in a high tunnel with more than 100 percent of the area used for crop production in a growing season.

High tunnels are a benefit to growers who market their crops through shares in CSA. Since the crops are all pre-sold and there are no market variables, the specific amount of crop needed can be planted and timed so one crop is completely harvested and another one is planted in that area for later production. The high tunnel also provides some assurance to CSA growers that they will have a crop for their pre-paid customers. An Iowa CSA vegetable grower said that one year her high tunnel saved her spring CSA because the early crops in the field failed due to a late, cold, wet spring.

**Succession planting** for extended harvest periods can be accomplished in three ways.

1. After one crop is harvested, another is planted in the same space. For example, a cool season crop could be followed by a warm season crop.
2. The same crop is planted at timed intervals so they mature at different times.
3. Varieties of the same crop with different maturity dates are planted at the same time.

**Intercropping** is when a crop of a fast-maturing crop, such as lettuce, is planted between rows of a slower-maturing crop, such as tomatoes or peppers. The lettuce is harvested before the larger, later maturing crop requires that space.

## Enterprise Budget

The enterprise budgets included in this publication are intended to be used as examples. They can help vegetable growers **estimate** the costs and returns to produce a crop or crops in their high tunnel. Enterprise budgets for a high tunnel can help growers allocate valuable space, labor, and capital to the most appropriate use. The most appropriate use may be to maximize profits, meet customer needs, or any other goal defined by the grower.

The estimated costs and returns presented in this publication are based on farm data received from five high tunnels on different farms between April and October in a single growing season. The original farm-derived budgets were adjusted slightly to make them more uniform with respect to ownership and fertilizer costs and other inputs and expenses. Because the high tunnels in the study varied in size, the budgets were developed on a per square foot basis. The various planting and cropping systems in a high tunnel, planting seasons, and management strategies used by the growers, also resulted in a wide range of profit potential. The examples given show a profit potential if the entire marketable crop is sold. It does not reflect losses incurred due to unsold products. Also all products were sold at the average price listed.

Lastly, as expected, this study found that a moveable high tunnel was able to add available covered production space through the season as compared to fixed tunnels, resulting in increased profitability.

## Budget Format and Assumptions

Enterprise budget formats vary in format. Some are complex. Others are quite simple. Note that the budgets included in this publication are divided into four sections. The first section indicates the crop or crops budgeted, the size of the high tunnel, the approximate original cost, and the percent of the high tunnel utilized. Four enterprise budgets are illustrated in this publication; one multiple crop budget and three single crop budgets (bell peppers; thin-skinned, seedless cucumbers; and tomatoes).

The size of the high tunnel for all budgets was 30 ft. x 72 ft. or 2,160 square feet. The approximate original cost does not take into consideration any rebates or

cost-share programs. The percent utilization represents the amount of square footage planted and harvested as a percentage of the total square footage of the high tunnel. If multiple crops are planted and harvested within a single season (March – September on the same square footage area, it is possible to incur a utilization percentage greater than 100 percent. The 84 percent utilization for the multiple crop budget was close to the average of the five farms. It is assumed that a single crop enterprise would utilize all available space other than alleyways. For that reason, single crop enterprises were assumed to have a 94 percent utilization.

The second section illustrates the total receipts the high tunnel enterprise provides on a set unit(s). Records should be kept on both sales unit and land unit (square foot) basis. Prices for single crop budgets are assumed to reflect institutional or larger buyer prices (non-retail). The use of a single crop would indicate a larger supply available over a designated number of weeks. Prices for the multiple-crop budget were more reflective of a retail (direct-to-consumer) price. Yields were estimated based on what occurred on the five farms over an 8 to 12 week harvest period. The length of harvest was dependent upon the crop and variety. Not all crops were grown on all farms.

The third section is the cost of planting and growing the product. These costs are segmented for two reasons. First, these costs are incurred whether a product is sold or not. Once the seed is planted or watering is completed, it is a sunk cost and needs to be covered from some source. The second reason is the time delay between pre-harvest expenses and the time the product is sold. These expenses may have to be covered by borrowing, savings, or some other source. Estimated transplant and seed needs were based on a transplant price of \$12 per 48 plants. Fertilizer expense was averaged over the five farms and came to \$0.05 per square foot. Miscellaneous supplies were averaged over the five farms. An additional \$50 was charged to the all-tunnel tomato enterprise to reflect additional costs for stakes and twine. Miscellaneous supplies do not take into account the initial costs of stakes, trellises, header lines, fitting, etc. Rather, they reflect a replacement value for those supplies. Water was charged at \$0.04 per square foot and a water test was \$17. Water estimates do not include any water usage fees charged by rural water companies or others. Irrigation supplies averaged \$50 for the five farms.

An additional charge of \$72 was made to cover 6 hours of labor at \$12 per hour to replace and/or fix any of the drip irrigation lines.

The fourth section is the labor component. Labor is divided into five activities: bed preparation, general maintenance (weeding, staking, pruning, etc.), planting, pest management, and harvest. Bed preparation time was less for single-crop enterprises. General maintenance, planting, and harvesting varied by the needs of the crop and were estimated based on what information was available from the five farms and experience. Labor wage rate was assumed to be \$12 per hour. The wage rate does not include employment taxes, insurance, or other employee benefits.

The fifth section relates to the ownership costs. Each producer owns or controls assets that are used to produce the income, such as land, high tunnel, machinery, irrigation equipment, and other items. Ownership costs are an allocation to realize some return for the use of those assets. It is assumed that the high tunnel has an 8-year and the plastic covering a 4-year life span. The total ownership costs are estimated at approximately \$0.46/square foot base on an approximate total high tunnel construction cost of \$7,000 and a plastic cover replacement cost of \$0.21 per square foot of tunnel (\$454 for a 30 ft. x 72 ft. tunnel). Land rental and depreciation on machinery and equipment (tiller, plastic mulch layer, tractor, etc.) are not included.

The last section is the summary of total costs and returns. Total costs include the annual operating expenses (fertilizer, etc.), labor, and ownership. The return over total costs would be total receipts minus total costs. Annual returns can be analyzed as an overall number or by the square foot. Because space is a constraint in a high tunnel (there is only so much room), it makes sense to review annual returns using both units. Annual returns over total costs varied substantially by farm and enterprise. The differences in annual returns were influenced by a variety of factors. First, the annual return over total cost differed substantially by individual crop. Tomatoes, lettuce, herbs, and eggplant resulted in a much higher return than cucumbers (thin-skinned, seedless varieties) and bell peppers (see the multi-crop enterprise budget example).

Second, the annual return over total cost varied among producers. Yields received by producers varied based upon experience with certain crops and the varieties chosen. Third, overall profitability of the high tunnel varied substantially by the percent utilization. Overall, the potential annual returns for a high tunnel (excluding marketing costs) based on the findings of the five farms would indicate that a multi-crop or tomato high tunnel enterprise could be approximately \$3.00 per square foot or \$6,480 for a 2,160 square foot tunnel (30 ft. x 72 ft.). Assuming an initial investment of around \$7,000, this level of return would indicate about a 1-year payback, which is unusual in agriculture.

### Limitations

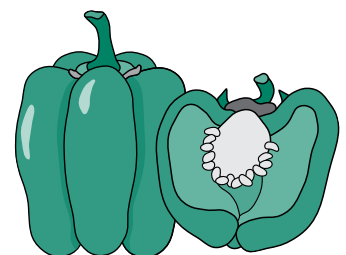
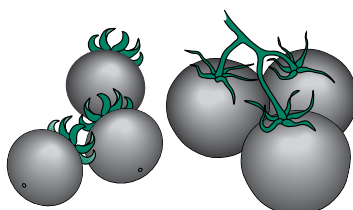
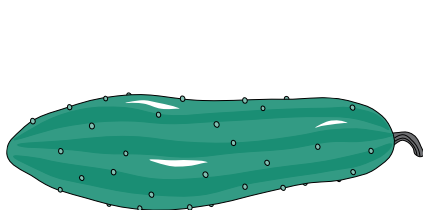
The illustrated budgets are to be used as an indication of what a particular crop could average over time and location. Individual farm results will vary from these numbers based on crop varieties selected, location to markets, and managerial ability, among other considerations. Note the budgets include receipts but not the costs associated with handling and marketing.

Post-harvest handling of high tunnel crops is often done at the same time as field-harvested crops and thus the cost cannot accurately be traced. Also, marketing costs vary tremendously based on whether products are distributed through a CSA, wholesaler, or direct through a farmer's market or other outlet. For this reason, they have not been included in the budgets. Marketing costs should, however, be included to determine crop profitability because, in some cases, costs can shift annual returns from a positive to a negative number.

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## Iowa Multiple Product Vegetable Farm Budget Example

High Tunnel Size (sq. ft.) (30 x 72) 2,160 ft.

Utilization 84%

Approximate Original High Tunnel Cost \$7,000.00

Receipts	Yield	Sq. Ft.	\$/Lb.	Total	Yield Per Sq. Ft.	Gross Per Sq. Ft.
Cucumbers	567.0	454	2.00	\$1,134.00	1.25	\$2.50
Eggplant	204.1	45	2.00	408.24	4.50	\$9.00
Greens	166.9	363	7.00	1,168.47	0.46	\$3.22
Herbs	14.5	9	16.00	232.24	1.60	\$25.60
Lettuce	208.7	181	7.00	1,460.59	1.15	\$8.05
Peppers - Bell	290.3	181	2.00	580.61	1.60	\$3.20
Tomatoes - Slicers	1,315.4	454	2.50	3,288.60	2.90	\$7.25
Tomatoes - Grape	342.9	127	4.00	\$1,371.69	2.70	\$10.80
<b>Total Receipts</b>		<b>1,814</b>		<b>\$9,644.44</b>		<b>\$5.32</b>

Annual Expenses	Total
Seeds/Transplants	135.00
Fertilizers	108.00
Miscellaneous Supplies	125.00
Water	86.40
Water Test	17.00
Irrigation Supplies	122.00
<b>Total Annual Expenses</b>	<b>\$593.40</b>

### March - September

Labor Costs	Hours	\$/Unit	Total
Bed Preparation	17.00	12.00	\$204.00
General Maintenance	23.00	12.00	\$276.00
Planting	10.50	12.00	\$126.00
Pest Management	0.00	12.00	\$0.00
Harvest	48.80	12.00	\$585.60
<b>Total Hours</b>	<b>99.30</b>		<b>\$1,191.60</b>

Ownership Costs	Annual
Depreciation - Tunnel	\$875.00
Depreciation - Plastic Cover	113.40
<b>Total Ownership</b>	<b>\$988.40</b>

Total Costs	
Tunnel	\$2,773.40
Per Square Foot	\$1.28
<b>Annual Returns Over Total Costs</b>	
Tunnel	\$6,871.04
Per Square Foot	\$3.18

### Iowa Vegetable Farm - Bell Pepper Budget Example

High Tunnel Size (sq. ft.) (30 x 72) 2,160 ft.

Utilization 94%

Approximate Original High Tunnel Cost \$7,000.00

Receipts	Yield	Sq. Ft.	\$/lb	Total
Peppers - Bell (520 plants)	3,248.6	2030	1.30	4,223.23
<b>Total Receipts</b>				<b>\$4,223.23</b>

Annual Expenses	Total
Seeds/Transplants	175.00
Fertilizers	108.00
Miscellaneous Supplies	125.00
Water	86.40
Water Test	17.00
Irrigation Supplies	122.00
<b>Total Annual Expenses</b>	<b>\$633.40</b>

### March - September

Labor Costs	Hours	\$/Unit	Total
Bed Preparation	10.00	12.00	\$120.00
General Maintenance	10.00	12.00	\$120.00
Planting	9.00	12.00	\$108.00
Pest Management	0.00	12.00	\$0.00
Harvest	30.00	12.00	\$360.00
<b>Total Hours</b>	<b>59.00</b>		<b>\$708.00</b>

Ownership Costs	Annual
Depreciation - Tunnel	\$875.00
Depreciation - Plastic Cover	113.40
<b>Total Ownership</b>	<b>\$988.40</b>

Total Costs	
Tunnel	\$2,329.80
Per Square Foot	\$1.08
<b>Annual Returns Over Total Costs</b>	
Tunnel	\$1,893.43
Per Square Foot	\$0.88

### Iowa Vegetable Farm - Cucumber Budget Example

High Tunnel Size (sq. ft.) (30 x 72) 2,160 ft.

Utilization 94%

Approximate Original High Tunnel Cost \$7,000.00

Receipts	Yield	Sq. Ft.	\$/lb	Total
Cucumbers (390 plants)	2,538.0	2030	1.25	3,172.50
<b>Total Receipts</b>				<b>\$3,172.50</b>

Annual Expenses	Total
Seeds/Transplants	70.00
Fertilizers	108.00
Miscellaneous Supplies	125.00
Water	86.40
Water Test	17.00
Irrigation Supplies	122.00
<b>Total Annual Expenses</b>	<b>\$528.40</b>

### March - September

Labor Costs	Hours	\$/Unit	Total
Bed Preparation	10.00	12.00	\$120.00
General Maintenance	15.00	12.00	\$180.00
Planting	5.00	12.00	\$60.00
Pest Management	0.00	12.00	\$0.00
Harvest	40.00	12.00	\$480.00
<b>Total Hours</b>	<b>70.00</b>		<b>\$840.00</b>

Ownership Costs	Annual
Depreciation - Tunnel	\$875.00
Depreciation - Plastic Cover	113.40
<b>Total Ownership</b>	<b>\$988.40</b>

Total Costs	
Tunnel	\$2,356.80
Per Square Foot	\$1.09
<b>Annual Returns Over Total Costs</b>	
Tunnel	\$815.70
Per Square Foot	\$0.38

## Iowa Vegetable Farm - Tomato Budget Example

High Tunnel Size (sq. ft.) (30 x 72) 2,160 ft.  
 Utilization 94%  
 Approximate Original High Tunnel Cost \$7,000.00

Receipts	Yield	Sq. Ft.	\$/lb	Total
Tomatoes - Slicers (195 plants)	5888.2	2030	1.60	9,421.06
<b>Total Receipts</b>				<b>\$9,421.06</b>

Annual Expenses	Total
Seeds/Transplants	80.00
Fertilizers	108.00
Miscellaneous Supplies	175.00
Water	86.40
Water Test	17.00
Irrigation Supplies	122.00
<b>Total Annual Expenses</b>	<b>\$588.40</b>

### March - September

Labor Costs	Hours	\$/Unit	Total
Bed Preparation	10.00	12.00	\$120.00
General Maintenance	25.00	12.00	\$300.00
Planting	5.00	12.00	\$60.00
Pest Management	0.00	12.00	\$0.00
Harvest	49.00	12.00	\$588.00
<b>Total Hours</b>	<b>89.00</b>		<b>\$1,068.00</b>

Ownership Costs	Annual
Depreciation - Tunnel	\$875.00
Depreciation - Plastic Cover	113.40
<b>Total Ownership</b>	<b>\$988.40</b>

Total Costs	
Tunnel	\$2,644.80
Per Square Foot	\$1.22
<b>Annual Returns Over Total Costs</b>	
Tunnel	\$6,776.26
Per Square Foot	\$3.14

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