
AGRICULTURAL ALTERNATIVES

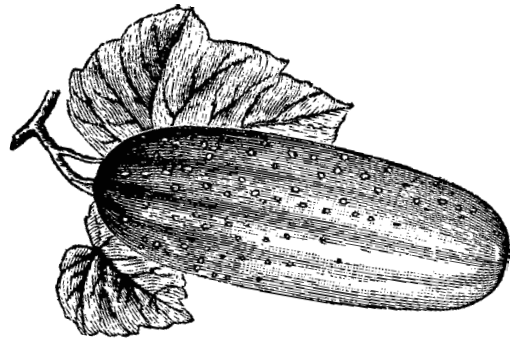
Cucumber Production

Cucumbers are a crop that lend themselves well to small-scale and part-time farming operations. Multiple markets exist for growers with five acres or less, and many field operations, such as land preparation, planting, and harvesting, can be custom hired.

Cucumbers (*Cucumis sativas*) are a member of the cucurbitaceae family, which also includes squashes, pumpkins, muskmelons, watermelons, and gourds. Normally, cucumber plants are monoecious—they produce both male and female flowers on the same plant. Male flowers appear on the main stem earlier and in much larger numbers than female flowers. New, modern hybrids are gynoecious—plants produce only female flowers and are referred to as all-female varieties.

Cucumbers are native to India and were introduced into China 2,000 years ago. They were then brought to Europe, most likely first into Greece, from which their cultivation spread into Italy, Germany, and France. Pliny the Great stated that cucumbers were grown in Africa as well as Italy in his time, and that the Emperor Tiberius (14-37 A.D.) had cucumbers at his table every day. Cucumbers were grown by Columbus in Haiti in 1494. In 1539, De Soto found varieties of cucumbers in Florida that were better than those grown in Spain, and cucumbers were also reported to be grown in Virginia in 1609. Early cucumber varieties were not as smooth or symmetrical as current varieties, and breeding work to produce hybrids did not begin until 1880.

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The United States harvested cucumbers for two basic purposes: processing and fresh marketing. In 1998, the U.S. produced 102,000 acres of processed cucumbers with a value of \$140 million and produced 58,000 acres of fresh-market cucumbers, valued at \$244 million. (USDA Statistical Services bases value of production on total acres harvested times average price.) Pennsylvania produced 800 acres of fresh-market cucumbers with a value of \$6 million.

Marketing

Fresh market cucumbers are usually available in Pennsylvania from the end of June to the end of November. They traditionally are sold in 47 to 55 pound wooden crates or cardboard boxes. Five basic marketing alternatives are available to the cucumber grower: wholesale marketing, cooperatives, local retailers, roadside stands, and pick-your-own operations.

In wholesale marketing, producers often contract with shippers to market and ship the cucumbers for a predetermined price. If you do not use a contractor and ship your cucumbers to a wholesale market yourself, your product will be subject to the greatest price fluctuations. Marketing cooperatives generally use a daily pooled cost and price, which spreads price fluctuations over all participating

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producers. Local retailers are another possible market, but you must take the time to contact produce managers and provide good-quality cucumbers when stores require them. Roadside stands (either your own or another grower's) and pick-your-own operations provide opportunities to receive higher than wholesale prices for your cucumbers, but you may have some additional expenses for advertising, building and maintaining a facility, and providing service to your customers. With pick-your-own operations, you save on harvest costs, but you must be willing to accept some waste. Depending on your location, processors may or may not be a marketing option. Processors are less likely to contract with small-acreage growers (those with less than 5 acres). For more information on marketing, consult *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-Scale and Part-Time Growers*.

Site Selection

Cucumbers should be grown on soils that have good water-infiltration rates and good moisture-holding capacity. The soil should not be compacted and the pH should be 5.8 to 6.6. Cucumbers are very sensitive to cold, and the plants as well as the fruit can be injured by even a slight frost. The best average temperature range for cucumber production during the growing season is between 65° to 95°F; temperatures above 95°F or below 50°F slow the growth and maturity of the crop. Cucumbers require a constant supply of moisture during the growing season. Moisture fluctuation, especially soil water depletion, will cause growth deformity, which can reduce both the yield and the quality of the crop.

Planting and Fertilization

Cucumbers generally are seeded when soil temperatures exceed 60°F and air temperatures do not fall below 50°F at night. In cooler parts of the state, cucumbers can be grown as transplants in the greenhouse 18 to 24 days prior to planting in the field. Because they are a warm season crop, they should not be transplanted until the soil temperature reaches 60°F three inches beneath the soil surface. They should be grown on raised beds with black, blue or silver plastic mulch and drip irrigation for optimum plant growth and yields. Drip irrigation can be used for fertilizer application during the growing season.

Slicing cucumbers generally are planted in single rows on plastic beds with 9 to 12 inches between plants in the row and 4 to 5 feet between rows. Plant population at this spacing is approximately 8,400 to 10,500 plants per acre. Pickling cucumbers are normally planted on three row beds where rows are 26 to 28 inches apart and plants are 2 to 3 inches apart in the row. This spacing would provide approximately 65,000 plants per acre.

Fertilizer recommendations should be based on annual soil test results. In absence of soil test results, the recom-

mended N-P-K application rates for slicing cucumbers would be 30-50-50 pounds per acre banded at planting and 30-50-50 pounds per acre injected through the drip irrigation system during the growing season. For pickling cucumbers, the recommended N-P-K application rate would be 40-50-50 pounds per acre.

Table 1. Recommended cucumber varieties for Pennsylvania.

VARIETY
<i>Slicing: gynoecious</i>
Encore ^a (ALSR, DMR, PMR, SMR)
Raider ^a (SMR)
Speedway ^a (ALSR, AR, DMR, PMR, SMR)
Dasher II ^a (ALSR, AR, DMR, PMR, SMR)
Thunder ^a (DMR, PMR, SMR, ZYMVR)
Turbo ^a (ALSR, AR, DMR, PMR, SMR)
Striker ^a (ALSR, AR, DMR, PMR, SMR)
<i>Slicing: monoecious</i>
Cyclone ^a (AR, DMR, PMR, SMR)
High Mark II ^a (SMR, DMR)
Marketmore 76 (SMR)

^aIndicates hybrid variety.

AR = Anthracnose resistant

ALSR = Angular leaf spot resistant

PMR = Resistance to powdery mildew

DMR = Resistance to downy mildew

SMR = Scab and mosaic resistance

ZYMVR = Zucchini yellow mosaic virus resistant

Pollination

Honeybees are necessary to ensure proper, complete pollination and fruit set. One hive per acre is recommended for maximum production. Populations of pollinating insects, including honeybees, may be adversely affected by insecticides applied to flowers or weeds in bloom.

Pest Control

Weed control can be achieved with a good crop rotation system, herbicides, and plastic mulch in the case of slicing cucumbers. Several preplant and post emergence herbicides are available for cucumbers, depending on the specific weed problem and the stage of cucumber growth. If infestation levels are mild, early cultivation (prior to vine running) can help minimize weed problems.

Insects can be a major problem in cucumber production. Cucumber beetle, aphids, cutworms, seed corn maggot, leafminers, and mites all can cause crop losses. Monitoring insect populations will help you determine when you should use pesticides and how often you should spray.

Several cucumber diseases can reduce crop yields, especially bacterial wilt, viruses such as cucumber mosaic (CMV), zucchini yellow mosaic (ZYMV), and watermelon mosaic (WMV-1,2), as well as powdery mildew, downy mildew, angular leaf spot, anthracnose, and phytophthora blight. Many of these diseases can be prevented by having a good crop rotation system, soil with good water and air drainage, and by using disease-resistant varieties.

Harvest and Storage

For best taste and texture, slicing cucumbers should be harvested when they are between 1.25 to 2 inches in diameter and 6 to 8 inches in length. Because cucumbers are pollinated at different times, multiple hand harvests over the field are quite common, usually every other day. To ensure marketing a high-quality product, you should grade cucumbers by size and maturity and check them for insect damage. Pickling cucumbers are generally harvested by machine and under contract with a local processor.

Removing field heat from cucumbers is critical for extending their shelf life and maintaining a good appearance. Refrigeration immediately after harvest will help guarantee high quality. Cucumbers that are maintained at 55°F and 95 percent relative humidity will retain good quality for approximately 10 to 14 days.

Sample Budget

Included in this publication is a sample fresh-market cucumber production budget. This budget utilizes custom hire for most of the field work, which could be more economical for a smaller acreage. Farmers who have their own equipment should substitute their costs for the custom hire. The budget summarizes the receipts, costs, and net returns of a cucumber enterprise. This sample budget should help ensure that all costs and receipts are included in your calculations. Costs and returns are often difficult to estimate in budget preparation because they are numerous and variable. Therefore, you should think of this budget as an approximation and make appropriate adjustments in the "Your Estimate" column to reflect your specific production and resource situation. More information on the use of crop budgets can be found in *Agricultural Alternatives: Enterprise Budget Analysis*.

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For More Information

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Seelig, R.A. *Cucumbers: Vegetable Facts and Pointers*. Alexandria, Va.: United Fresh Fruit and Vegetable Association, 1972.

Initial resource requirements

- Land: 1 acre
- Labor: 19 hours
- Harvesting and grading: \$225 per acre
- Capital: \$6,000
- Depreciation on equipment: \$600

Fresh Market Cucumber Budget

Summary of estimated costs and returns per acre.

Item	Quantity or number of operations	Unit	Price	Total	Your Estimate
Variable costs					
Custom					
Applying calcium lime	0.5	ton	\$20.00	\$10.00	_____
Bee hive rental	1	acre	\$25.00	\$25.00	_____
Pest scouting	8	acre	\$10.00	\$80.00	_____
Fertilizer (postapplication)					
Nitrogen	40	pound	\$0.22	\$8.80	_____
Phosphorus	50	pound	\$0.28	\$14.00	_____
Potassium	50	pound	\$0.15	\$7.50	_____
Herbicide					
Gramoxone extra	0.125	gallon	\$83.00	\$10.40	_____
Curbit	0.15	gallon	\$93.90	\$14.09	_____
Fungicide					
Ridomil MZ58	4	pound	\$10.40	\$41.60	_____
Benlate 50WP	1	pound	\$16.99	\$16.99	_____
Bravo weather STIK	2	gallons	\$53.50	\$107.00	_____
Bayleton DF	0.25	pound	\$64.00	\$16.00	_____
Insecticide					
Agri-Mek	12	oz	\$5.52	\$66.19	_____
Asana XL	9	oz	\$0.87	\$7.80	_____
Lannate	3	pint	\$12.30	\$36.80	_____
Admire	0.18	pound	\$561.00	\$100.98	_____
Other variable costs					
Preapplied fertilizer (10-10-10)	0.2	tons	\$180.00	\$36.00	_____
Disk plowing	1	acre	\$9.40	\$9.40	_____
Harrowing and row conditioning	1	acre	\$15.00	\$15.00	_____
Cultivation	2	acre	\$8.30	\$16.60	_____
Black, embossed, or silver mulch	1	acre	\$250.00	\$250.00	_____
Drip irrigation (tape and labor)	1	acre	\$150.00	\$150.00	_____
Cucumber transplants	10	thsd	\$40.00	\$400.00	_____
Labor	48	hour	\$10.00	\$480.00	_____
Marketing and advertising	1	acre	\$25.00	\$25.00	_____
Hand harvesting	1	acre	\$700.00	\$700.00	_____
Packing and grading	1	acre	\$180.00	\$180.00	_____
Cartons (50 lbs.)	500	cartons	\$0.90	\$450.00	_____
Fuel	10.21	gallon	\$0.93	\$9.50	_____
Pesticide spraying	1	acre	\$150.00	\$150.00	_____
Repair and maintenance					
Tractors and implements	1	acre	\$15.00	\$15.00	_____
Irrigation labor	1	acre	\$30.00	\$30.00	_____
Interest charge	1	acre	9.5%	\$81.93	_____
<i>Total variable cost</i>				\$3,561.49	_____
Fixed costs					
Tractors	1	acre	\$15.86	\$15.86	_____
Implements	1	acre	\$12.32	\$12.32	_____
Drip irrigation	1	acre	\$500.00	\$500.00	_____
<i>Total fixed cost</i>				\$528.18	_____
Total cost				\$4,089.67	_____

Net returns for five different yields and prices.

Price	Yield (50 lb cartons)				
	450	500	550	600	750
\$7.00	-\$940	-\$590	-\$240	\$110	\$1,160
\$8.00	-\$490	-\$90	\$310	\$710	\$1,910
\$9.00	-\$40	\$410	\$860	\$1,310	\$2,660
\$10.00	\$410	\$910	\$1,410	\$1,910	\$3,410
\$11.00	\$860	\$1,410	\$1,960	\$2,510	\$4,160

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