Penn State **Extension**

AGRICULTURAL ALTERNATIVES

Pepper Production

Peppers lend themselves well to small-scale and part-time farming operations. Various markets exist for growers with small-acreage farms (those with fewer than 5 acres), and the multiple mature fruit colors (green, red, yellow, orange, purple, and brown), shapes, and varying hotness (from sweet to very hot) make it easier for growers to find niche markets. Many field operations, such as land preparation, planting, and harvesting, can be custom hired, and any equipment owned by the grower can be used for other crops.

Peppers (*Capsicum annuum* and *Capsicum frutescens*), both sweet and hot, originated in Central and South America. Christopher Columbus found them growing in the West Indies, but they were not introduced in Europe until the sixteenth century. Jamaican farmers cultivated four types of hot peppers (cherry, scotch bonnet, bell, and finger) before 1770. According to U.S. Department of Agriculture records, commercial bell peppers were first produced in the southern United States in 1925. Today, seed companies distribute several hundred varieties of both sweet and hot peppers.

Most of the peppers harvested in the United States are sold as fresh produce. In 2009, the United States produced 52,100 acres of bell peppers with a value of $556 million and 28,500 acres of chili peppers with a value of $129 million. Pennsylvania produced 1,200 acres of all types.

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Marketing

Fresh-market peppers are produced in Pennsylvania from the first of June to the end of October. Pepper cultivars recommended for Pennsylvania are listed in Table 1. Fresh-market peppers usually are sold loose in bulk containers. Several basic marketing alternatives are available to the pepper grower: wholesale markets, cooperatives, local retailers (grocery stores), roadside stands, pick-your-own operations, and processing firms. When planning production, first consider your ability to market. You should conduct some market research because growers often overestimate their ability to sell in a given market. Production of less than one acre of many vegetable crops is typical for most growers.

In wholesale marketing, producers often contract with shippers to market and ship the peppers for a predetermined price. If you do not use a contractor and ship your peppers to a wholesale market yourself, your product will be subject to the greatest price fluctuations. Produce auctions are

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an outlet that operate weekly; however, you must deliver the peppers to the auction. Marketing cooperatives generally use a daily pooled cost and price, which spreads price fluctuations over all participating producers. Local retailers are another possible market, but you must take the time to contact produce managers and provide good-quality peppers when stores require them. 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 fewer than 5 acres). For more information on marketing, consult *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-Scale and Part-Time Growers*.

Retail marketing options include roadside stands (either your own or another grower's) and pick-your-own operations, which provide opportunities to receive higher-than-wholesale prices for your peppers, 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. Farmer's markets are another retail option, but you should contact the markets well in advance of the marketing season to be sure space is available and to find out what requirements you must follow. For more information about roadside markets, see *Agricultural Alternatives: Developing a Roadside Farm Market*.

Table 1. Recommended pepper cultivars for Pennsylvania.

SWEET TYPES	
Bell	*Nonbell*
Aristotle* (PT, BLSR 1, 2, 3)	Aruba* (PR)
Hunter* (TEV, TMV, BLSR 1–5)	Sweet Cherry
Karisma* (TMV)	Key Largo*
King Arthur* (BLSR 2)	
Vidi* (PVY, TEV, TMV—long fruit)	
Paladin* (BLSR and PR)	
Revolution* (PT, BLSR 1–5, CMV)	
Admiral* (TMV, PVY, BLSR 1, 2, and green to yellow fruit)	
Renegade (BLSR)	
HOT TYPES	
Surefire* (yellow)	
Hungarian Wax (yellow)	
Super Chili*	
Valor* (BLSR 1, 3, jalapeno)	
Zavory (very mild habanero type)	

Note: All cultivars are listed in order of maturity (early to late).
*Hybrid variety
BLSR = resistant to bacterial leaf spot
1–5 = races of bacterial leaf spot
PVY = resistant to potato virus Y
TEV = resistant to tobacco etch virus
PR = resistant to *Phytophora*

Production Considerations

Peppers grow best on well-drained soils that have good water-holding characteristics and a pH of 5.8–6.6. Peppers are started as transplants in the greenhouse six to eight weeks prior to planting in the field. Because peppers are a warm season crop, they should not be transplanted until the soil temperature 3 inches beneath the soil surface reaches 60°F. Peppers grow well on raised beds covered with black or silver plastic mulch. Providing the plants with drip irrigation ensures optimum plant growth and yields and allows growers to apply injection-based fertilizer during the growing season. For more information on crop irrigation, consult *Agricultural Alternatives: Drip Irrigation for Vegetable Production*.

Growers generally plant approximately 10,000–14,000 plants per acre in double rows 14–18 inches apart on plastic-mulched beds with 16–24 inches between plants in the row and with the beds spaced 5.0–6.5 feet apart from their centers. A single row of peppers also can be planted on each bed (5,000–6,500 plants per acre).

Fertilizer rates should be based on annual soil test results. If you are unable to conduct a test, the recommended N-P-K (nitrogen, phosphorus, potassium) application rates are 40-40-80 pounds per acre banded at planting, and a total of 40-40-70 pounds per acre injected through the drip-irrigation system over the growing season.

Pest Management

Weed control can be achieved with herbicides, plastic mulch, and a good crop-rotation system. Several preplant and postemergence herbicides are available for peppers, depending on the specific weed problem and pepper growth stage. If infestation levels are mild, early cultivation can minimize weed problems.

Insects are a major problem in pepper production. Aphids, flea beetles, pepper maggots, thrips, and European corn borers can all cause crop losses. Monitoring insect populations with traps and scouting will help you determine when you should use pesticides and how often you should spray.

Several pepper diseases can cause crop losses, including bacterial leaf spot, phytophora blight, anthracnose fruit rot, and bacterial soft rot, and viruses such as potato virus y, and tobacco mosaic virus. These diseases can be controlled by using disease-resistant varieties and by having a good crop-rotation system and soils with good air and water infiltration.

Many of the pesticides required for pepper production are restricted-use pesticides and require a pesticide license to purchase. Pesticide applicators tests are usually adminis-

tered at county extension offices, so you should contact your local office for dates and times of these examinations. When using any pesticides in your enterprise, remember to follow all label recommendations regarding application rates and personal protection equipment (PPE) requirements. Also remember that any Worker Protection Standards (WPS) apply to the owner as well as to employees.

Harvest and Storage

Most peppers are hand-harvested two to four times during the growing season. Mechanical harvesters are available for harvesting hot peppers (jalapeno, chilies, and hot cherries) with a once-over harvest. You will need to grade peppers for size and color and check for worms and insect damage to ensure that you are marketing a high-quality product.

Cooling the peppers after harvest will remove field heat, which improves shelf life. You should refrigerate the peppers immediately after harvest to maintain quality.

Peppers will retain good quality for approximately 14–21 days if stored at 90–95 percent humidity and 47–55°F.

Environmental Regulations

All agricultural operations in Pennsylvania, including small and part-time farming enterprises, operate under the Pennsylvania Clean Streams Law. A specific part of this law is the Nutrient Management Act. Depending on whether you have livestock on your farm, portions of the act may or may not pertain to your operation. However, all operations may be a source of surface or groundwater pollution. Because of this possibility, you should contact your local Soil and Water Conservation District to determine what regulations may pertain to your operation.

Risk Management

You may wish to consider several risk-management strategies for your operation. First, you should insure your facilities and equipment. This may be accomplished by consulting your insurance agent or broker. Second, you may want to insure your income through a crop insurance program called AGR-Lite.

To use AGR-Lite you must have 5 years of Internal Revenue Service (IRS) Schedule F forms. If your business structure is either a C or an S corporation, the necessary information can be entered into a Schedule F for crop insurance purposes. You can then contact an agent who sells crop insurance and insure the income of your operation. For more on agricultural business insurance, see *Agricultural Alternatives: Agricultural Business Insurance*. For more information concerning crop insurance, contact a crop insurance agent or check the Pennsylvania crop insurance education website at **extension.psu.edu/business/crop-insurance**.

Good Agricultural Practices and Good Handling Practices

Good agricultural practices (GAPs) and good handling practices (GHPs) are voluntary programs that you may wish to consider for your operation. The idea behind these programs is to ensure a safer food system by reducing the chances for foodborne illnesses resulting from contaminated products reaching consumers. Also, several major food distribution chains are beginning to require GAPs- and GHPs-certified products from their producers. These programs set standards for worker hygiene, use of manure, and water supply quality.

These handling practices require an inspection from your state Department of Agriculture and there are fees associated with the inspection. Prior to an inspection, you will need to develop and implement a food safety plan and designate a member of your team to oversee this plan. You will need to have any water supply used by your workers or for crop irrigation and pesticide application checked at least twice each year. A checklist of the questions to be asked during the inspection can be found at **www.ams.usda.gov/fv/gapghp.htm**. For more information about GAPs and GHPs, contact your local extension office or your Department of Agriculture.

Sample Budget

Included in this publication is an annual fresh-market pepper production budget. This budget utilizes custom hire for most of the field work, which could be more economical for small-acreage growers. Farmers who own equipment should substitute equipment costs for custom-hire costs. The budget summarizes the receipts, costs, and net returns of a pepper 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. These budgets are developed for one acre; however, your scale of production should be based on market considerations. More information on the use of crop budgets can be found in Agricultural *Alternatives: Enterprise Budget Analysis*.

Fresh-Market Bell-Type Pepper Budget

Summary of estimated costs and returns per acre

Item	Number of operations	Unit	Price	Total	Your Estimate
Variable costs					
Custom hire*	1	acre	$80.50	$80.50	
Fertilizer	1	acre	$162.36	$162.36	
Fungicides	1	acre	$149.98	$149.98	
Herbicides	1	acre	$92.93	$92.93	
Insecticides	1	acre	$90.53	$90.53	
Black plastic mulch	7,920	feet	$0.04	$316.80	
Drip tape	15,840	feet	$0.03	$475.20	
Stakes	2.38	thousand	$100.00	$238.00	
Twine	16,000	feet	$0.001	$16.00	
Trickle operating	18	inch	$20.00	$360.00	
Transplants	11910	each	$0.10	$1,191.00	
Labor					
Seasonal labor	10	hours	$12.00	$120.00	
Operator labor	8.63	hours	$15.00	$129.45	
Equipment labor	0.573	hours	$13.50	$7.74	
Hand harvesting	80	hours	$12.00	$960.00	
Packing and grading	30	hours	$12.00	$360.00	
Marketing and advertising	1	acre	$1,560.00	$1,560.00	
Cartons	1,300	cartons	$1.61	$2,093.00	
Fuel	12.9	gallon	$3.10	$39.99	
Pest scouting	1	acre	$15.00	$15.00	
Repair and maintenance					
Tractors and implements	1	acre	$24.62	$24.62	
Interest charge	1	acre	7.0%	$126.38	
Total variable costs				*$8,528.98*	
Fixed costs					
Tractors	1	acre	$15.86	$15.86	
Implements	1	acre	$12.32	$12.32	
Land charge	1	acre	$200.00	$200.00	
Drip irrigation**	1	acre	$150.00	$150.00	
Total fixed costs				*$378.18*	
Total costs				**$8,907.16**	

These budgets are developed for one acre; however, your scale of production should be based on market considerations.

*Custom-hire expenses include soil testing, lime application, land preparation, and bee rental.

**Irrigation installation includes filter and mainline to the drip line and is calculated to have a 7-year useful life.

Net Returns for Five Different Yields and Prices

	Yield (25-pound cartons)				
Price	**1,150**	**1,200**	**1,300**	**1,350**	**1,400**
$6.00	$(1,433.35)	$(1,324.62)	$(1,107.16)	$(998.42)	$(889.69)
$8.00	$866.65	$1,075.38	$1,492.84	$1,701.58	$1,910.31
$10.00	$3,166.65	$3,475.38	$4,092.84	$4,401.58	$4,710.31
$12.00	$5,466.65	$5,875.38	$6,692.84	$7,101.58	$7,510.31
$14.00	$7,766.65	$8,275.38	$9,292.84	$9,801.58	$10,310.31

For More Information

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Association

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Initial Resource Requirements for Fresh-Market Bell Peppers

- Land: 1 acre
- Production labor: 20 hours
- Harvest labor: 80 hours
- Grading and packing labor: 30 hours
- Capital: $8,500–$9,500
- Equipment: Tractor (40–75 hp)
  Vegetable transplanter
  Plastic mulch layer
  Boom sprayer

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