

AGRICULTURAL ALTERNATIVES

agalternatives.aers.psu.edu

Highbush Blueberry Production

Blueberries are well suited for small-scale and part-time farm operations. However, blueberry production is not for everyone due to the specialized cultivation requirements of the plants and the relatively short shelf life of the fruit. The initial investment is high, primarily because of the cost of preparing the land, establishing plants, and installing an irrigation system. However, equipment needs for small plantings are minimal once the plants are established and healthy, well-tended plants can be expected to bear fruit for fifty years or more. Demand for blueberries has been strong in recent years, and fresh-market prices have been relatively high because per capita consumption of blueberries in the United States increased by about 50 percent in the last ten years.

To meet this growing consumer demand, commercial blueberry acreage and production has doubled in the past fifteen years. Major increases have occurred in the Pacific Northwest, California, and in the southeastern United States. Half of world's commercial production is from the United States, with considerable production also occurring in Canada and Poland.

Three species of blueberries are native to North America: highbush (used in commercial plantings in cooler climates), lowbush (wild fruit harvested commercially in New England), and rabbiteye (used in commercial plantings in the southern United States). This publication focuses on highbush blueberry production.

This publication was developed by the Small-scale and Part-time Farming Project at Penn State with support from the U.S. Department of Agriculture-Extension Service.



Marketing

Fresh-market blueberries usually are sold in plastic half-pint and pint containers covered with lids. Marketing options available to the blueberry grower are wholesale markets, auctions, marketing cooperatives, local retail markets (grocery stores), processors, and direct marketing, including farmers' markets, roadside stands (either your own or another grower's), and pick-your-own operations. With the wholesale option, either you or a shipper takes your crop to the market. Shippers generally sell and transport the blueberries for a predetermined price. This marketing alternative has the greatest price fluctuations. Marketing cooperatives generally use a daily pooled cost and price, which spreads price fluctuations over all participating producers. To sell directly to local retailers, you need to contact produce managers and provide consistent quality when the stores demand the berries. Direct marketing provides an opportunity for you to receive higher-than-wholesale prices for your fruit. However, you may have significant expenses for advertising, building and maintaining a facility, and employing someone to serve your customers. In a pick-your-own operation, you save harvest costs, but you must be willing to accept some waste.

PENNSTATE



College of Agricultural Sciences
Agricultural Research and Cooperative Extension

Depending on your location, you may be able to sell your crop to a processor, but processing prices are much more volatile than fresh-market prices. For more information on marketing, consult *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers* and *Agricultural Alternatives: Developing a Roadside Market*.

Because of increasing demand, prices for fresh-market blueberries have been relatively high, ranging from \$1.50 to \$4.00 per pint. Depending on the grower's location, processing prices have varied in recent years from less than \$0.65 per pint to as much as \$1.00 per pint.

At the present time, U.S. No. 1 (fruit of good average quality) is the only federally recognized blueberry grade. Federal inspectors check the berries primarily to determine the amount of diseased, soft, or leaky fruit. Fruit-marketing cooperatives often have additional criteria to judge berry quality, including flavor, ripeness, odor, and the presence of insects, foreign material, and stems.

Production Considerations

As with other small fruits, blueberries grow best in well-drained soils in full sun. It is often assumed that blueberries are easy to cultivate because they grow wild in poor soil or in wetland areas. Given the right soil conditions, blueberries can be easy to grow. However, most of Pennsylvania's agricultural soils are not naturally suitable for blueberry production. Well-drained soils with a low pH and high organic matter content, where native indicator plants such as wild blueberries, rhododendrons, and mountain laurel grow, are usually well suited to commercial blueberry production. Blueberries can also be grown on heavier soils with a high native pH, but special, well-planned measures must be taken if production is to be successful. When the soil type is too heavy (clays or clay loams) and/or the soil is of a limestone parent material, problems with nutrient availability and plant vigor are likely to occur, making close monitoring and frequent nutritional adjustments necessary.

The blueberry plant is a woody shrub with canes originating from the crown. The root system is shallow compared to the size of the plant. Highbush blueberries are usually 4 to 8 feet tall at maturity, but their root system rarely extends deeper than 24 inches. Irrigation is desirable to water the plants and provide frost protection, particularly in low areas. Trickle irrigation is most commonly used because it adds water to the root zone with little loss to the atmosphere and without wetting the fruit. However, plants requiring frost protection also need overhead irrigation.

Blueberries require a soil pH of 4.5 to 5.0. If the native pH of your soil is above 6.2, do not consider blueberries for commercial production. If the pH is 6.2 or lower, the soil pH can be lowered by adding sulfur. In mineral (clay) soils, adding organic matter in the planting hole as well as using organic mulch is necessary. Growers most often use rotted sawdust, although peat moss or other forms of composted

organic matter are suitable. Mushroom compost or other high-pH mulches and soil amendments should not be used.

To help control weeds, grow cover crops, such as rye or sudangrass, for at least one year before planting blueberries. Adding organic matter by plowing under cover crops is particularly beneficial to blueberries, which produce best in soils with high organic matter.

Growers usually plant blueberries 5 feet apart in rows spaced 8 to 12 feet apart. Use either potted or dormant plants purchased from a reputable nursery. Dormant plants should be planted in early spring, around April, but foliated, potted shrubs should not be planted until after the danger of frost has passed. Tender growth frequently found on these plants can be damaged by temperatures that are below freezing. Fall planting (mid- to late October) may also be used if growers wish to plant at a less busy time of the year; but success will vary depending on fall temperatures, and growers may find that some plants are heaved out of the ground by frost action. Mulching after planting reduces this problem. Plant availability in the fall is also limited so you may need to preorder your plants if fall planting is planned.

Apply a mulch of rotted sawdust or other nonalkaline organic mulch to a depth of 4 inches or more at planting, and maintain the mulch throughout the life of the planting. If it is unlikely that the mulch layer will be replenished, it may be better not to mulch at all, as roots will become exposed once the mulch decomposes. Remove flower blossoms for the first two years after planting, and remove about half of the buds in the third year. This practice allows the shrub to put its nutrients into plant establishment. Stunted plants may never recover. Since an established blueberry planting can produce fruit for fifty years or more, sacrificing a few pounds of fruit initially is well worth the cost.

Highbush blueberry plants require annual dormant pruning. Pruning controls crop load, which increases fruit quality. It also invigorates the plant by stimulating new growth from the plant's base. Pruning is usually done toward the end of the dormant season (usually March) when fruit buds are easily recognizable. Pruning involves the removal of small, spindly branches and canes lying on the ground and thinning of the centermost canes to increase light penetration inside the plant.

Highbush blueberries will produce a small crop, approximately 2,000 pints per acre, in the third year. Fruit production will increase until the plants are about five years old, with average yields of 6,000 pints per acre possible under optimum conditions. Most small blueberry operations harvest their fruit by hand. Mechanical harvesters are available, but you need a large planting to justify the expense.

Much more detailed information on plant establishment and care, including a list of recommended highbush blueberry cultivars, can be found in *The Mid-Atlantic Berry Guide*. By selecting a mix of cultivars, growers could harvest blueberries from July through mid-September in Pennsylvania.

Pest Management

Several insect pests and diseases can injure or destroy a blueberry crop, so you need to carefully monitor and treat pests. Some pests affect the fruit, while others attack the plant. Pesticide application is just one management option. You should use a combination of practices to reduce the potential for disease and insect damage, such as selecting a proper site and cultivar, planting disease-free shrubs, cultivating, and using soil amendments.

Birds are a serious problem on many blueberry farms, sometimes consuming over half the berries. In such cases, you may need to protect the crop with nets, chemical repellents, scare tactics, and noise devices. Of these, only netting results in complete protection year after year. Deer also can cause extensive damage by browsing and trampling the shrubs and eating the ripening berries. Hunting, fencing, and repellents are options for reducing deer damage.

Weeds are another problem that must be controlled in blueberry plantings. Because blueberry shrubs have shallow root systems without root hairs, they are at a disadvantage when competing with weeds for water and nutrients. By avoiding sites with persistent weeds and eliminating weeds before planting, you can greatly reduce many weed problems. Shallow cultivation, herbicide application, and sod maintenance between rows will help control weeds in established plantings.

Postharvest Handling

Proper postharvest handling of blueberries is critical to marketing success. You should cool the picked berries immediately after harvest to remove field heat and improve shelf life. Removing debris and underripe and overripe berries helps maintain quality and improves the appearance of the packaged fruit.

Regulations

All agricultural producers in Pennsylvania, including small and part-time farms, operate under Pennsylvania's Clean Streams Law. A specific part of this law is the Nutrient Management Act. There are portions of the Nutrient Management Act (Act 38) that may pertain to you depending on the mix of enterprises you have on your farm (in particular, animal operations). Because all farms are a potential source of surface or groundwater pollution, you should contact your local Soil and Water Conservation District to determine what regulations may pertain to your operation. You should also check your local zoning regulations to make sure that your intended business activities are permitted in your location.

Risk Management

There are several risk management strategies you may wish to employ for your farm. You should insure your facilities, and you also may want to insure your crops as well. Insuring your farm may be accomplished by consulting your insurance agent or broker. You may also insure your crops through traditional crop insurance policies and your income through a crop insurance program called AGR-Lite. To use AGR-Lite you need five years of Internal Revenue Service (IRS), Schedule F forms. If your business structure is either a C or 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, please see *Agricultural Alternatives: Agricultural Business Insurance*. For more information on crop insurance, contact a crop insurance agent or check the Penn State Crop Insurance Education Web site at cropins.aers.psu.edu.

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 Budgets

The sample budgets included in this publication summarize costs and returns for three phases of highbush blueberry production: land preparation, plant establishment, and fruit production from a mature (four years and older) blueberry planting. Land-preparation costs assume that major tillage and fertilizer application operations will be done either by a custom operator or with rented equipment. If you own the necessary equipment, costs for this equipment should be substituted for the custom costs included in the budget. Budgets for intermediate production years (one- to four-year-old plantings) are not included. They would have lower receipts and harvest costs than for the mature planting. The sample budgets should help ensure that you include all costs and receipts 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 these budgets as an approximation and make appropriate adjustments in the “Your estimate” column to reflect your specific production and resource situation. Additional highbush blueberry budgets can be found in *The Mid-Atlantic Berry Guide*. More information on the use of crop budgeting in farm management decision making can be found in *Agricultural Alternatives: Enterprise Budget Analysis*.

Initial Resource Requirements

- Land: 1 acre
- Labor
 - Establishment: 70 hours
 - Production for years 1–4: 16–32 hours
 - Production for mature planting: 43 hours
 - Custom harvest labor: \$4,000–4,200
- Capital
 - Blueberry plants: \$5,000–5,200
 - Irrigation system: \$800
- Equipment needed
 - Tractor: 40–50 horsepower
 - Airblast sprayer: 50-gal PTO
 - Herbicide sprayer with small (4 foot or shorter) boom

Sample Fresh-Market Highbush Blueberry Production Budget

Per-acre costs for land preparation, establishment, and mature production based on 6,000 pints (6,375 lbs) per acre

	Land preparation (year 0)	Your estimate	Planting establishment (year 1)	Your estimate	Mature planting (years 5+)	Your estimate
Variable costs						
Custom operations	\$125.70	_____	\$60.40	_____	\$7.25	_____
Fertilizer	\$287.00	_____	\$13.00	_____	\$42.25	_____
Herbicides	\$0.00	_____	\$97.45	_____	\$194.10	_____
Insecticides	\$0.00	_____	\$38.54	_____	\$68.92	_____
Fungicides	\$0.00	_____	\$0.00	_____	\$156.43	_____
Seed	\$36.60	_____	\$69.00	_____	\$0.00	_____
Plants	\$0.00	_____	\$5,002.50	_____	\$0.00	_____
Irrigation setup	\$0.00	_____	\$800.00	_____	\$0.00	_____
Irrigation operation	\$0.00	_____	\$300.00	_____	\$300.00	_____
Mulch	\$0.00	_____	\$250.00	_____	\$0.00	_____
Bee rental	\$0.00	_____	\$0.00	_____	\$65.00	_____
Plant analysis kit	\$0.00	_____	\$0.00	_____	\$24.00	_____
Personal protection equipment	\$0.00	_____	\$86.95	_____	\$100.05	_____
Labor						
Operator	\$0.00	_____	\$0.00	_____	\$0.00	_____
Hand labor	\$6.25	_____	\$893.64	_____	\$595.65	_____
Harvest labor	\$0.00	_____	\$0.00	_____	\$4,200.00	_____
Packaging supplies (clam shells and flats)	\$0.00	_____	\$0.00	_____	\$1,245.00	_____
Fuel	\$0.00	_____	\$11.09	_____	\$47.06	_____
Repairs and maintenance	\$0.00	_____	\$3.68	_____	\$22.19	_____
Interest	\$5.97	_____	\$279.16	_____	\$208.22	_____
<i>Total variable costs</i>	\$461.52	_____	\$7,905.41	_____	\$7,276.12	_____
Fixed costs						
Equipment	\$0.00	_____	\$10.74	_____	\$58.13	_____
Land	\$150.00	_____	\$150.00	_____	\$150.00	_____
<i>Total fixed costs</i>	\$150.00	_____	\$160.74	_____	\$208.13	_____
Total costs	\$611.52	_____	\$8,066.15	_____	\$7,484.25	_____

Due to the high volatility of prices and input costs, be sure to make necessary adjustments to the budget using the “Your estimate” column. You should monitor local markets and contact local suppliers to determine current prices for all items contained in this sample budget.

Returns above total costs for various price and yield combinations for fresh market production:

Price received (\$/pt)	Yield (pt/A)*						
	4,500	5,000	5,500	6,000	6,500	7,000	7,500
\$1.50	\$627.00	\$923.25	\$1,219.50	\$1,515.75	\$1,812.00	\$2,108.25	\$2,404.50
\$2.00	\$2,877.00	\$3,423.25	\$3,969.50	\$4,515.75	\$5,062.00	\$5,608.25	\$6,154.50
\$2.50	\$5,127.00	\$5,923.25	\$6,719.50	\$7,515.75	\$8,312.00	\$9,108.25	\$9,904.50
\$3.00	\$7,377.00	\$8,423.25	\$9,469.50	\$10,515.75	\$11,562.00	\$12,608.25	\$13,654.50
\$3.50	\$9,627.00	\$10,923.25	\$12,219.50	\$13,515.75	\$14,812.00	\$16,108.25	\$17,404.50
\$4.00	\$11,877.00	\$13,423.25	\$14,969.50	\$16,515.75	\$18,062.00	\$19,608.25	\$21,154.50

*A pint of blueberries is assumed to weigh 17 ounces.

For More Information

Crassweller, R., et al. *Fruit Production for the Home Gardener*. University Park: The Pennsylvania State University, 2006.

Demchak, K., et al. *Mid-Atlantic Berry Guide for Commercial Growers*. University Park: The Pennsylvania State University, 2008.

Dunn, J., J. Harper, and G. Greaser. *Agricultural Alternatives: Fruit and Vegetable Marketing for Small-scale and Part-time Growers*. University Park: Penn State Cooperative Extension, 2000.

Dunn, J., J. Berry, L. Kime, R. M. Harsh, and J. Harper. *Agricultural Alternatives: Developing a Roadside Farm Market*. University Park: Penn State Cooperative Extension, 2006.

Greaser, G., and J. Harper. *Agricultural Alternatives: Enterprise Budget Analysis*. University Park: Penn State Cooperative Extension, 1994.

Kime, L., J. Adamik, E. Gantz, and J. Harper. *Agricultural Alternatives: Agricultural Business Insurance*. University Park: Penn State Cooperative Extension, 2004.

Pritts, M., and J. Hancock, eds. *Highbush Blueberry Production Guide*. NRAES-55. Ithaca, N.Y.: Northeast Regional Agricultural Engineering Service, 1992.

Web Sites

Blueberry Science—Rutgers University
www.googleusercontent.com/u/rutgerz?hl=en&lr=&ie=ISO-8859-1&q=Blueberry+Science&sa=Search+Rutgers

The Berry Diagnostic Tool—Cornell University
www.cornell.edu/diagnostic

Associations

U.S. Highbush Blueberry Council
2390 East Bidwell Street, Suite 300
Folsom, California 95630-3873
www.blueberry.org

North American Fruit Explorers, Inc.
1716 Apples Road
Chapin, IL 62628
www.nafex.org

Pennsylvania Vegetable Growers Association
815 Middle Road
Richfield, Pennsylvania 17086-9205
www.pvga.org

Prepared by Kathleen Demchak, senior extension associate in horticulture, Jayson K. Harper, professor of agricultural economics, and Lynn F. Kime, senior extension associate in agricultural economics.

Visit Penn State's College of Agricultural Sciences on the Web: agsci.psu.edu

Penn State College of Agricultural Sciences research, extension, and resident education programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

This publication is available from the Publications Distribution Center, The Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802. For information telephone 814-865-6713.

Where trade names appear, no discrimination is intended, and no endorsement by Penn State Cooperative Extension is implied.

This publication is available in alternative media on request.

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal authorities. It is the policy of the University to maintain an academic and work environment free of discrimination, including harassment. The Pennsylvania State University prohibits discrimination and harassment against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sex, sexual orientation, gender identity, or veteran status. Discrimination or harassment against faculty, staff, or students will not be tolerated at The Pennsylvania State University. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Director, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-2801; Tel 814-865-4700/V, 814-863-1150/TTY.

Produced by Ag Communications and Marketing

© The Pennsylvania State University 2009

Code # **UA265** R1M3/10mpc3995k