



Organic Blueberries

Cheryl Kaiser¹ and Matt Ernst²

Introduction

The highbush blueberry (*Vaccinium corymbosum*) is a perennial shrub that will do well in most areas of Kentucky as long as the soil pH is in the proper range. Organic production requires the use of pest management and fertilization methods that do not include synthetic compounds. Growers producing and selling their berries with an organic label must be certified by a USDA-approved state or private agency and follow production standards regulated by the National Organic Program (NOP).

Marketing

Profitable organic blueberry production requires buyers willing to pay a price that will result in positive returns to the enterprise. Organic berry production quite often requires more operator management and labor and, frequently, higher costs for certain inputs. These realities make it important for producers to identify markets willing to pay the price premiums necessary for farm profitability.

Blueberries are strong sellers when offered at Kentucky's farmers markets, roadside stands or other direct markets. U-Pick is one of the most desirable ways to market blueberries in Kentucky because it eliminates considerable harvest labor expense. Promotions for organic U-Pick operations could highlight the fact that customers would be picking and handling organically grown fruit. But growers should consider the challenges to U-Pick, including liability and risk management involved in having customers on the farm, and food safety concerns due to the possible spread of pathogens by customers picking their own produce. Meanwhile, farmers mar-



kets often draw customers that value locally grown organic produce; producers not interested in being a farmers market vendor may be able to supply organic blueberries for sale by an existing vendor, if permitted by the market's rules.

Restaurants, local grocers, and health food stores may be interested in Kentucky-grown organic products. Berries are also an attractive addition to a community supported agriculture (CSA) share. Produce auctions present yet another marketing opportunity, especially for well-packaged berries. There may be small in-state companies interested in purchasing organic fresh or frozen blueberries for processing into value-added products.

Market Outlook

Consumers continue demanding berries of all types, and retail sales of organic berries increased by more than 20 percent in 2017, according to national retail data.¹ Increased consumer interest



¹Cheryl Kaiser is a former Extension Associate with the Center for Crop Diversification.

²Matt Ernst is an independent contractor with the Center for Crop Diversification.

in organic berries, along with improved organic production techniques and imported organic blueberries, has contributed to higher consumption. In the past, the identification of antioxidant properties in blueberry fruit (along with other health benefits) helped increase consumer interest. Blueberry acreage increased in Kentucky between 2007 and 2012 before dropping slightly in 2017, and organic production could add more value to this already popular fruit.

In addition to local fresh market sales, organic blueberries appear to be an excellent prospect for value-added products. Growers may want to investigate supplying organic fruit to jam producers or manufacturing their own value-added items as part of their total marketing plan. Berry products (such as jams, juices, syrups and baked goods) are popular with consumers and can be a way to increase the profitability of the entire enterprise. Wholesale markets for blueberries, including organic berries, are highly competitive because of large-scale domestic and international producers. Price premiums over national wholesale prices for organic blueberries will likely be required for profitable production in Kentucky.

Production Considerations

Site selection and preparation

Only land that has been free of prohibited substances (e.g. synthetic pesticides and fertilizers) for three years can be certified for organic production. (For more information about organic certification, visit <https://www.ams.usda.gov/about-ams/programs-offices/national-organic-program> and <https://www.kyagr.com/marketing/organic-marketing.html>). A well-maintained blueberry planting can continue to produce for 40 years. Because of this crop's longevity, it is important to be very selective in choosing an appropriate planting site. This is especially true for organic production. It is also essential to devote the necessary time to prepare the site and soil prior to planting. Depending on existing soil conditions, this can take one to two (or more) seasons.

Select a high elevation site (a site with a higher elevation than much of the surrounding area) with good internal soil drainage and adequate air circulation. Blueberries thrive in a highly organic soil with a pH of 4.5 to 5.0. While most Kentucky soils do not meet these requirements, sites that have less than 2,500 pounds of calcium per acre can be amended to provide an

environment suitable for planting. Typically elemental sulfur, aluminum sulfate or iron sulfate is used to acidify the soil; however, organic growers should be conservative in their use of sulfur due to its potential negative effect on beneficial soil microbes. Sphagnum peat moss (without a wetting agent) and cottonseed meal (from non-GMO cotton), while more costly, can also be used to lower soil pH. Organic growers need to make sure that their soil pH is in the correct range before planting and preferably before ordering their plants. It is very difficult to lower the soil pH once plants have been planted and iron chelate materials used by conventional growers are not an option for organic growers to use to lower the soil pH.

A crop rotation plan designed to reduce weed pressure is a critical aspect of site preparation. Avoid planting in fields where aggressive perennial weeds have a history of being difficult to manage. Soil fertility is enhanced through cover crops, composts, green manure, animal manure, and approved fertilizers. Select green manure and cover crops that can be grown under acidic soil conditions, such as crimson clover, buckwheat, cereal rye and spring oats. Any cover crop, green manure or smother crop planted in a certified organic field must be grown from organic seed. Individual certifiers may permit the use of untreated conventional seed if attempts to acquire organic seed fail. For more information, please see Page 3 of the USDA's Guidelines for Organic Crop Certification at <https://www.ams.usda.gov/sites/default/files/media/Crop%20-%20Guidelines.pdf>.

Cultivar and stock selection

Organic production requires the use of certified organic planting stock that has not been treated with synthetic materials. Unfortunately, the availability of organic blueberry planting stock is limited. When organic stock cannot be obtained, growers will have to request approval from the certifier to use conventionally produced stock. According to NOP regulations, non-organic stock must be managed organically for at least one year after transplanting before the berries can be sold as certified organic produce. However, because blueberry bushes do not generally begin producing a crop until the third year after planting, there should not be a problem meeting the NOP's one-year restriction.

Blueberry cultivars differ as to when they mature;

however, they will normally supply ripe berries for a two- to three-week harvest period. Using careful cultivar selection, a continuous supply of fresh berries can be produced throughout the fruiting season. Select cultivars that produce large, firm, light blue fruit with good aroma and flavor. Other desirable characteristics include resistance to cracking and good keeping quality. Disease resistance will also be an important factor for organic producers to consider. Consult the UK publication *Growing Highbush Blueberries in Kentucky* and/or your county Extension agent for recommended cultivars.

Planting and crop maintenance

Once you have made your cultivar selection, 2-year-old virus-free plants, either bare-rooted or potted, should be planted in late fall once plants are dormant, or early spring before growth starts. Blueberries should be planted on raised beds to improve soil drainage and avoid *Phytophthora* root rot. Planting rows in a north-south orientation is preferred. Apply organic mulch (such as untreated sawdust or woodchips) after planting. It is important that growers avoid wood products that come from oaks or walnuts unless they have been aged for several years to leach organic acids from the wood that will impact blueberry growth. Commercial blueberry production should be considered only if large amounts of organic mulching material are available.

At least two cultivars should be planted for cross pollination. Although bumblebees are more effective pollinators of blueberries than honeybees, their populations fluctuate too much from year to year to be dependable. Therefore growers must rely on honeybees to aid pollination, and two hives per acre are recommended. No cultivar should be separated by more than two rows from a cultivar with similar bloom or fruit maturity period.

Alleyways or row middles are normally managed by planting a non-aggressive grass. Tall fescue or perennial ryegrass will tolerate low soil pH and are compatible with blueberry production. Sodded middles will need to be mowed several times during the year.

Blueberries should be grown with irrigation; UK tests show that irrigation more than doubles blueberry yields. Soil moisture needs to be closely monitored when trickle irrigation is used so that the soil is

kept damp, but not wet. Any liquid fertilizer applied via drip irrigation lines must be approved for organic production. Supplemental organic nutrient choices include compost, bloodmeal, fishmeal, cottonseed meal, soybean meal and many others. NOP regulations regarding the use of composted and raw (non-composted) manure must be followed. Overhead irrigation is not recommended for blueberry production.

Pruning

On sites where plants are growing well, commercial growers will maintain bushes at a maximum height of 6 feet for ease of harvest. Annual pruning, which may be done from February to bud break in the spring, is necessary to help establish and develop vigorous plants, as well as increase fruit size and assure good production the following season. Pruning is also essential for removing dead and diseased canes. The most productive canes are typically 2-6 years old.

Pest management

Pest management in organic plantings emphasizes prevention through good production practices. Healthy, fast growing plants are better able to tolerate or outgrow pest problems. Following good integrated pest management (IPM) principles is essential for producing a high quality organic crop. This includes careful site and cultivar selection, proper soil preparation, and following good cultural practices. Monitoring diseases and pests with frequent crop inspections and accurate identification are critical to keeping ahead of and/or managing potential problems. The goal is not necessarily the complete elimination of a pest, but rather to manage pests and diseases so that crop damage is kept within acceptable economic levels.

Prior to 2013, few diseases or insect pests were reported on blueberries in Kentucky. However, in 2013 the spotted wing drosophila, an invasive insect, became established across Kentucky. Unfortunately, blueberries are one of the crops that this insect infests. Female flies lay eggs beneath the fruit skin when fruit begin to color. Under ideal conditions eggs hatch and become larvae within the fruit in eight days. Once this pest is trapped in a planting a spray program is initiated on a weekly schedule. There are few effective organic spray options for spotted wing drosophila. Earlier maturing varieties are expected to have less of a problem with this insect than later maturing varieties. More information is available in UK Entomology Extension pub-

lications [EntFact-229 Spotted Wing Drosophila, Biology, Identification and Monitoring](#) and [EntFact-230 Spotted Wing Drosophila Management](#). Across most of Kentucky, SWD is trapped by the first week in July. The brown marmorated stink bug is another invasive pest that is moving into Kentucky that causes serious damage to blueberry fruit. Organic control options for this pest are also very limited.

Other insect pests include Japanese beetles, bagworms, plum curculio and occasionally blueberry maggot. Pruning, sanitation, weed control and some organically approved insecticides may aid in pest control. Hand picking, exclusion and trapping are some of the techniques used to manage Japanese beetles. There is also a newer bacterial product that has been reported to be effective on adult Japanese Beetles.

Diseases such as twig blights and stem cankers can cause some losses, especially if allowed to spread into larger branches and the crown. Phytophthora root rot may be a problem for plants grown in poorly drained or heavy clay soils. Berry diseases include anthracnose and mummy berry. Iron chlorosis commonly occurs on sites with a pH level above 5.2. Planting disease-free, resistant/tolerant planting stock in the best possible growing site is an important first step in reducing the threat of disease losses. Other disease management techniques include sanitation, proper pruning and good moisture management. Timely harvests that minimize the number of overripe berries on bushes, along with encouraging good air circulation, can help lessen the incidence of fruit rots.

Birds pose a serious threat to blueberries, particularly in small plantings. Visual and auditory repellents have been used with varying success. The most effective method of protecting plants from birds is to cover bushes with netting just before berries begin to color and then removing it after harvest is complete. Netting needs to be placed on a frame above the bushes and not resting on the bushes to be effective. Other wildlife pests can include wild turkeys, voles, rabbits and deer. Rodents may be more of a problem in mulched plantings and where row middles are not kept closely mowed.

The main challenge to organic growers, however, is often weed control. If left unchecked, weeds compete with plants for water and nutrients, harbor insect and



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disease pests, and reduce air circulation. Since NOP-approved herbicides are limited, organic growers will need to implement alternative measures. An important first step is to avoid planting in sites with high populations of noxious perennial weeds. Along with site selection, site preparation should be aimed at making sure existing weeds are under control prior to planting. Strategies include tillage, the use of smother crops or solarization with clear plastic. Managing weeds during plant establishment is especially important. A thick layer of mulch around plants will aid in controlling weeds within the row while sodded middles and mowing can minimize weeds in the alleyways. Weed control in established plantings includes mowing and hand weeding.

Harvest and storage

Only those crops that have met NOP production and certification standards, including the three-year minimum transition period, can be marketed and sold as certified organic or organic. Harvest equipment, storage areas and packing materials must comply with NOP standards. Growers producing both conventional and organic crops (referred to as a split operation) must either use separate equipment and facilities for these operations or decontamination protocols must be followed before use in the organic side of the enterprise. Packaging materials must be protected against potential contamination from prohibited substances. In split operations, separate picking containers and storage areas are required.

Blueberries should be allowed to ripen to a uniform blue color on the plant before handpicking. Unlike most fruit, blueberries ripen from the blossom end back to the stem, so it is important to make sure the whole berry is ripe. Fruit flavor and sugar content will not improve after harvest. Berries need to be picked at least twice per week during the harvest period, beginning in early to mid-June and ending in early August. Blueberries can remain on the plant for up to 10 days without a loss in quality. Freshly harvested berries may be stored for up to one week with proper refrigeration. Blueberries keep best at 32°F and 85% relative humidity.



Labor requirements

Organic systems are more labor-intensive than conventional systems. This is largely the result of increased labor times required for monitoring and managing pests, as well as more labor for weed control. Organic growers may spend 10% to 20% (or more) additional owner labor hours than conventional growers. More hired labor hours are likely to be required for weed control in organic blueberry systems.

Production labor needs per acre for a mature organic planting are about 350 to 400 hours for a farm retail operation. Ten to 15 pickers are needed per acre for hand harvesting. U-Pick farms may require 40 to 120 hours per acre in labor, depending on how much management is involved while visitors are on the farm. Illinois data indicates that it takes roughly 450 U-Pick customers to harvest an acre of blueberries, with the average customer picking 11.7 pounds of berries (about 15 pints).

Economic Considerations

The major investments in establishing blueberries include the cost of plants, land preparation, labor required for plant establishment, and installation of an irrigation system. A major expense and labor requirement for organic blueberry production is weed control by hand labor, mechanical cultivation, and/or mulch-

ing. Producers who choose to sell their blueberries at retail or wholesale markets may incur a significant expense in purchasing some type of cold storage. Pest control, such as erecting netting systems to prevent bird damage to blueberry crops, can also be a significant expense.

Because it takes three years for plants to become established, blueberries will not usually begin to generate economic returns toward their establishment cost until the fourth season. However, blueberry plants can remain productive for as long as 40 to 50 years with proper management. Five-year establishment

costs per acre (including the value of operator labor and management) for an organic system were estimated at \$7,000 to \$11,000 (farm retail) and \$7,000 to \$10,000 (U-Pick) for 2017. At these returns, the payback period is five to six years. Annual returns to owner capital and management for an established planting were estimated at \$6,600 per acre for farm retail and \$7,100 per acre for U-Pick. These returns account for hired labor costs at \$12.50 per hour. Returns can vary greatly according to blueberry yields and prices.

These profitability estimates assume an average price of \$2 per pint for certified organic blueberries. Organic blueberries typically sell for 10% to 20% more than conventionally grown berries. Generally, a 15% to 25% price premium for organic blueberries grown in Kentucky will be necessary for organic production systems to match potential profitability from conventionally grown blueberries. Producers should always identify the possibility of price premiums for organic products in their target market before investing labor and capital into a particular production system.

¹Nigh, Veronica. "Organic Produce Sales, Movin' On Up." American Farm Bureau Federation. <https://www.fb.org/market-intel/organic-produce-sales-movin-on-up>

Selected Resources

- Crop Budgets: Berries (University of Kentucky, 2019) Three blueberry budget files <http://www.uky.edu/ccd/tools/budgets>

- 2019 Blueberry Cost and Return Estimates (CCD-BG-2, University of Kentucky, 2019) https://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/2019blueberry_cost&return.pdf
- Highbush Blueberries, Kentucky – Wholesale/Retail Marketing (CCD-BG-4, University of Kentucky, 2019) https://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/2019blueberrybudget_wholesale_retail.pdf
- Highbush Blueberries, Kentucky – Pick Your Own Marketing (CCD-BG-3, University of Kentucky, 2019) https://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/2019blueberrybudget_PYO.pdf
- Growing Highbush Blueberries in Kentucky, HO-60 (University of Kentucky, 2003) <http://www.ca.uky.edu/agc/pubs/ho/ho60/HO60.PDF>
- Preparing Blueberry Sites for Planting, HortFact-3009 (University of Kentucky, 2014) http://www.uky.edu/hort/sites/www.uky.edu/hort/files/documents/HortFact-3009_0.pdf
- Spotted Wing Drosophila, Biology, Identification and Monitoring, EntFact-229 (University of Kentucky) <http://entomology.ca.uky.edu/files/efpdf1/ef229.pdf>
- Spotted Wing Drosophila Management, EntFact-230 (University of Kentucky) <http://entomology.ca.uky.edu/files/efpdf1/ef230.pdf>
- Bird Netting Photos and Ideas for Bramble and Blueberry Plantings (University of Kentucky, 2015) http://www.uky.edu/hort/bird_netting_pics#overlay-context=People
- Midwest Blueberry Production Guide, ID-210 (University of Kentucky et al., 2013) <http://www2.ca.uky.edu/agc/pubs/ID/ID210/ID210.pdf>
- 2019-2020 Midwest Fruit Pest Management Guide, ID-232 (University of Kentucky et al.) https://ag.purdue.edu/hla/Hort/Pages/sfg_sprayguide.aspx
- Blueberries: Organic Production (ATTRA, 2004) <https://attra.ncat.org/attra-pub/summaries/summary.php?pub=14>
- 2016 Organic Production and IPM Guide for Blueberries (Cornell University, 2016) 2 MB file <https://ecommons.cornell.edu/handle/1813/42887>
- Highbush Blueberry Production (Penn State Extension, 2017) <http://extension.psu.edu/business/ag-alternatives/horticulture/fruits/highbush-blueberry-production>

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Reviewed by Rachel Rudolph UK Extension Specialist, and Shawn Wright, UK Horticulture Specialist
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