Center for Crop Diversification Crop Profile
CCD-CPA-CP-6, CCD-WVU-CP-1, ANR-Hort-23-001

Commercial Production of Elderberry

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Introduction

The American elderberry (*Sambucus nigra* subsp. *canadensis*) is a large shrub or small tree native to Kentucky, Tennessee, and West Virginia. Wild stands are found growing from Florida to Quebec and west to the Rocky Mountains. It is closely related to the European elderberry (*Sambucus nigra*), which exhibits very similar morphological characteristics. Elderberries produce attractive white flowers in cymes followed by large clusters of small fruit. While elderberries are not normally eaten fresh due to their tartness and reported toxic effects, wild and cultivated elderberries can be processed, either alone or with other fruit. Significant elderberry research has been conducted by the Center for Agroforestry at the University of Missouri. Kentucky, Tennessee, and West Virginia producers considering an elderberry enterprise can review research-based publications about elderberry at the Center for Agroforestry website, http://www.centerforagroforestry.org/. Research is also being conducted at West Virginia University as part of a Northeast Sustainable Agriculture Research & Education project.

Photo by Patrick Byers, University of Missouri.
The best soils for elderberries are loams, sandy loams, or clay loams that are well-drained and moderately acidic.

Marketing and Market Outlook

Most commercially grown elderberries are sold to processors for wines, juices, jellies, jams, syrups, and baked goods. Both the fruit and flowers are used in winemaking. Additionally, there is increasing popularity and market demand for elderberries in the health supplement and tonic industry. With the lack of processing facilities for elderberries and similar fruits in the southeast, many small-scale elderberry producers market direct to consumers through on-farm stands, you-pick operations, and farmers markets. The majority of elderberry producers are small-scale and focus marketing efforts on educating and creating awareness of the elderberry and common uses to consumers. As consumer awareness and demand continues to increase, and with supply of locally produced elderberries being limited, elderberry producers are often able to capture a premium price and have product sold in advance of harvest. Producers interested in wholesale market channels should arrange for a market contract prior to crop establishment.

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May 2023

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Commercial elderberry production and market development efforts in the United States are currently focused in Missouri and in northern states. Efforts in Missouri are complemented by production research (variety trials, pest management and other production research, market research and economic analysis) by the University of Missouri and Missouri State University.

The Minnesota-based Midwest Elderberry Cooperative coordinates production and sourcing of elderberries from Illinois, Iowa, Minnesota, Missouri, Texas, and Wisconsin. Producers throughout the mid-south, south central and southeastern regions of the U.S. may find applicable industry development models and support from these efforts as the supply and demand for elderberries increases.

Production Considerations

Cultivar selection

Elderberry varieties differ in earliness, yield, hardiness, plant vigor, and disease susceptibility. Berry flavor, as well as cluster and berry size, can also vary among cultivars. Fruit color may be red to bluish-black to dark purple. Many of the improved cultivars currently available were developed in New York or Nova Scotia between the 1920s and 1960s. Growers should select only adapted varieties that have the qualities in demand for the intended market. Cultivars recommended for Appalachia and their intended uses include those listed in the table below.

Site selection, planting, and maintenance

Purchasing virus-free, tissue cultured bare-root plants from reputable nurseries is strongly recommended. While elderberries are easy to propagate from seed, cuttings, or suckers, those grown from seed may not have the same desirable characteristics as the parent and those propagated by vegetative means may perpetuate problems existing in the parent plant, such as viruses. One-year-old nursery stock plants should be transplanted to a well-tilled site in early spring. Plants are somewhat tolerant of wet or poor sites; however, repeated flooding during active growth will reduce productivity. Elderberries have a shallow, fibrous root system, making them relatively drought intolerant. Therefore, sandy soils are not recommended. The best soils, loams, sandy loams, or clay loams, are well-drained and moderately acidic (pH 5.5-6.5). Likewise, the fibrous root system can be damaged if the soil is cultivated too deeply for weed control; mulches, mowing, or landscape fabric for weed exclusion are better control practices. According to production research in Missouri, elderberry can benefit from a light (less than 10 pounds per acre) nitrogen application one to two months after planting. Mature plantings can benefit from annual applications of 60 to 80 pounds of nitrogen per acre and other nutrient applications according to soil tests.

Fruit is borne at the tips of the current year's growth, as well as on older wood. While second-year canes with several lateral branches are generally the most productive, fruit clusters are largest on new vegetative canes arising from the crown. Elderberry plants are partially self-fruitful and will require more than one variety in a planting to ensure cross-pollination. Row spacing for newer Midwest plantings is usually 10-12 feet, with plants spaced 4 feet apart.

Cultivar	Hardiness Zones	Size	Fruit Ripens	Uses	Comments
Adams No. 1 & No. 2	3-9	6-10 ft. tall, 6-8 ft. wide	August	Flowers used for tea and wine; ripe berries used for juice, jellies, wine, or drying	Among the most productive cultivars; large fruit
Bob Gordon	3-9	6-8 ft. tall & wide	Late July-early August	Pie, jam, wine, and syrup	Pendulous cymes resist bird predation; will produce fruit on primocanes
Johns	3-9	8-10 ft. tall, 6-8 ft. wide	Mid-August	Wine, juices, jellies, jams, and pies	Extremely vigorous upright growth
Wyldewood	3-9	5-8 ft. tall and wide	August	Jam, jelly, or wine	Tolerates wide range of soils
York	4-8	6-10 ft. high, 6-8 ft. wide	Mid- to late August	Wine, pies, jam, and jelly; also used as a natural dye	Mildly tart; among largest berries of all cultivars

Photo by John Strang, University of Kentucky

Elderberries produce large clusters of small fruit.

Photo by Rachel Painter, Center for Profitable Agriculture

Green June beetle on elderberry.

Elderberry should be pruned during dormancy to remove dead, damaged, and unproductive canes. Pruning is also beneficial for disease and insect management. Canes are removed at ground level, leaving equal numbers of 1, 2, and 3-year-old canes. Complete renewal of all canes annually or biannually is an alternative method. While this can reduce yield the year that it is performed, benefits of complete renewal over selective pruning may include larger, later ripening fruit clusters, a more concentrated harvest period with the possibility of greater harvest efficiency, a potential reduction in carry-over of diseases in older wood, and a greatly simplified pruning regime.

Pest management

Potential insect pests include cercropia caterpillars, eriophyid mites, Japanese beetles, elderberry longhorn beetles, green June beetles, cane or shoot borers, sawfly larvae, aphids, and fall webworms. Spotted wing drosophila (SWD) is possibly the most serious pest of elderberry fruit. Adult female SWD lay eggs inside elderberry fruit, and larvae feeding within the fruit results in crop loss. Traps baited with apple cider vinegar can be used to monitor for SWD. Growers should remove infested fruit, spray for adult SWD, and immediately cool or freeze fruit after harvest to control SWD. For detailed information on monitoring for SWD, visit https://fruit.cornell.edu/spotted-wing/monitoring/, https://www.canr.msu.edu/ipm/Invasive_species/spotted_wing_drosophila/monitoring, and https://ag.umass.edu/fruit/resources/spotted-wing-drosophila-monitoring.

Diseases such as tomato ringspot virus, cankers, leaf spot, rust, powdery mildew, and verticillium wilt may attack elderberry. Few pesticides are labeled for use on this crop, so growers will likely need to rely heavily on good cultural practices such as raking up leaves following defoliation in fall, removal of dead or infested canes, and cleaning up the ground beneath plants to aid in pest management. Beneficial mites can be used for control of eriophyid mites. Fine mesh netting is effective in protecting elderberries from SWD and may help in control of Japanese beetles (see section on protection from birds, below). Plants infected with tomato ringspot virus should be removed and burned, and tools should be sanitized. This virus is spread by nematodes and is found in alternate host plants, including dandelions. Soils should be checked for plant-parasitic nematodes that carry the virus before elderberries are planted.[1] Weed control is also important in helping prevent the spread of the virus. Removing infected leaves and pruning plants every year to remove infected shoots and buds will help manage powdery mildew. To control verticillium wilt, avoid planting elderberries in areas where tomatoes, egg-

Netting must go all the way to the ground to provide elderberry protection from birds. Frames need to be high enough to allow workers to harvest berries beneath the netting.

Photo by Gary Gao, The Ohio State University.

plants, potatoes, peppers, strawberries, or raspberries were previously planted, as these crops are susceptible to this soil-borne disease.

For more details on insect and disease management, see Elderberry – A New Old Crop (West Virginia University, 2022), Growing & Marketing Elderberries in Missouri (AF1016-2022, University of Missouri, 2022), and Growing Elderberries: A Production Manual and Enterprise Viability Guide for Vermont and the Northeast (University of Vermont Extension, 2016).

Protecting elderberry from birds

Birds can be a serious problem with elderberry, especially in small plantings near woods. Selections such as 'Bob Gordon,' in which the fruit clusters hang downward, are somewhat less attractive to birds. Netting is the best protection against birds. Growers should make sure to support netting above plants, using a simple frame made from wood, metal, or plastic. The netting must go all the way to the ground to prevent birds from slipping beneath it. Use weights or stakes to anchor it to the ground. The structure should be high enough to allow workers to harvest berries beneath it. Plants should be covered with netting when fruits begin to form. It should be removed after harvest for use in subsequent years. In addition to protecting berries from birds, netting that is less than 1 mm mesh will keep out SWD as well as Japanese beetles.

Harvest and storage

Elderberry comes into full production in the fourth to fifth year following planting. Fruit is hand-harvested in late July through August by cutting the cluster from the bush once all berries in a cluster have fully ripened. Because berries produced on different age canes will ripen at different times, fruit is generally harvested weekly over a period of approximately three weeks.

Several methods of destemming harvested fruit exist for smaller producers. Freezing will soften the berries, allowing for easier removal by stripping, shaking, or knocking off the fruit. The harvested fruit is either refrozen for later processing or thawed for immediate processing. Fresh fruit can be separated from the cluster by knocking against a bucket, rigid harvest container, or by rubbing against a hardware cloth frame. Mechanical destemming machines exist for larger commercial production.

Harvested fruit is very perishable and requires prompt refrigeration and/or freezing to preserve quality. Due to the rapid degradation of the fresh fruit, commercial elderberry producers should have the ability to refrig-

erate the berries at 32-40 degrees F soon after harvest, process, or sell immediately. Heating during processing will reduce the cyanogenic glycosides present in the flesh. Concentration is generally low enough that fresh fruit eaten in reasonable quantities will not produce a reaction, though some consumers are more sensitive than others and may experience nausea.

With good growing conditions, an average yield of 3 to 4 tons of fruit per acre can be expected. According to researchers in Missouri, elderberry plants "will likely remain productive for at least five years, but the full productive life of an elderberry planting is not known."

Labor requirements

Elderberry production is labor-intensive since the berries must be removed from the cluster after field harvest. Labor needs per 1/4-acre are approximately 20 hours for production, 40 hours for hand harvest, and up to 60 additional hours for postharvest processing. Labor needs vary depending on harvest method and use of stem separation equipment. Machine harvest can significantly reduce harvest labor time. Equipment must be used to harvest enough elderberry acreage to justify purchasing elderberry harvesting equipment.

Elderberry Economics

Producers considering a perennial crop should carefully develop a production budget projection that includes costs of establishment, labor time required, costs of producing elderberries from maturing and mature plants, and the value of potential sales through viable markets. A budget projection will help you to think step-by-step through each production variable and assign a realistic cost, which can help prevent future financial surprises. Estimating costs will also help you determine if you can profitably produce a perennial crop such as elderberries.

Establishment Costs

Establishment costs during Years 1 to 4 of a ¼-acre planting are summarized in Table 1. Hired labor values assume half of the required labor is hired during these years. Estimated values have been rounded to the nearest $5 for ease of presentation.

Annual Production Costs

Cash flows for a full-bearing elderberry planting are presented in Table 2, including a column for your own estimated production costs. These estimates are based on a ¼-acre planting with 200 plants. The main production costs for elderberries under these assump-

Table 1. Elderberry Establishment Estimated Cash Flow, Preplanting to Full Bearing (1/4-acre, 200 plants)*

	Preplant & Planting	Year 2	Year 3	Year 4	Four-year totals
Costs					
Plants (@ $10 per plant)	2000				2000
Fertilizer, cover crop, and mulch	260	60	65	65	450
Irrigation	400	50	50	50	550
Bird netting system		850			850
Weed control and plot maintenance	60	165	165	165	555
Insect and disease control	70	60	90	90	310
Machine costs	140	15	25	30	210
Marketing, insurance, and miscellaneous	105	100	170	245	620
Hired labor	250	265	160	235	910
Harvest containers		25	40	75	140
Total annual cash costs	3285	1590	765	955	6595
Total cash income at @ $4 per lb.		400	1500	3000	4900
Cash inflow (outflow)	-3285	-1190	735	2045	1695

*Values rounded to nearest $5.

Note: Growers wishing to use certified organic practices should consider physical exclusion for SWD. Fine mesh netting to exclude SWD would add about $1,500 to the netting cost assumed in the budget. There would need to be a clear price premium for that kind of investment per ¼-acre of elderberries.

tions are hired labor: harvest, winter pruning, weed control and bird netting installation and removal, and irrigation costs. Elderberry harvest labor is assumed at one hour to harvest 40 pounds, with half of total harvest labor hired. Winter pruning and plot maintenance labor is assumed at 10 hours per year, with half of that hired.

These production costs assume the planting is established. Table 2 does not account for the upfront cost incurred when purchasing bird netting, irrigation supplies, and plants – the most significant economic costs in elderberry production.

Table 2. Full-bearing year cash flows, ¼-acre elderberry plot

	Year 5 (Full Bearing)	Your estimate
Costs		
Fertilizer, mulch	65	
Insect and disease control	90	
Irrigation supplies/power	50	
Harvest containers (reusable)	25	
Machinery and miscellaneous costs	80	
Hired labor: weeding, plot maintenance	165	
Hired labor: harvest	310	
Hired labor: pruning	80	
Marketing costs	300	
Total annual cash costs	1165	
Gross income 1500 lbs. @ $4 per lb.	6000	
Cash inflow (outflow)	4835	

Economic returns

Economic returns account for cash costs incurred in elderberry production as well as the value of non-cash costs such as unpaid operator labor and depreciation on machinery and equipment. Variable costs are those that may change based on the quantity of production, including an annual interest expense. Fixed costs are those costs that remain constant no matter the quantity of production — including "non-cash" costs like the operator's management time and depreciation on equipment. By accounting for all costs, an estimate of economic costs and returns helps calculate the economic return on the investment made in a perennial crop. Table 3 lists the estimated variable and fixed costs for Years 1-6. Returns in subsequent years would be the same as Year 6.

These returns assume 100 pounds sold in Year 2, 375 pounds in Year 3, 750 pounds in Year 4 and 1,500 pounds in Year 5 and subsequent years. The price assumed here is $4 per pound. Elderberry production is highly sensitive to yields and prices. Table 4 lists potential returns above variable and total costs at various yields and pounds in a full production year (Year 6 forward). These returns are based on a marketing charge of 5 percent of gross sales. Obtaining higher prices may involve greater marketing costs or pairing elderberries with complementary products. For example, relatively high elderberry prices are reported at some farmers markets; however, producers usually must be selling other products and maintain the mar-

Table 3. Costs and returns, ¼-acre elderberries (200 plants, $4 per pound)

	Variable costs*	Fixed costs	Total costs	Return above variable costs	Return above total costs
Preplant & Planting	3423	478	3901	-3901	-3901
Year 2	1628	233	1861	-1228	-1461
Year 3	750	340	1090	750	410
Year 4	954	427	1381	2046	1619
Year 5	1367	582	1949	4633	4051
Year 6	1234	582	1816	4766	4184

*Variable costs are higher in Year 5 than in Year 6 because of the purchase of additional harvest lugs. Year 6 and forward will have a smaller harvest container cost because only replacement lugs are being purchased.

ket booth for a certain amount of time to obtain those elderberry prices. This may result in a marketing cost greater than 5 percent of gross sales.

Table 4. Returns above costs at various prices (1,500 pounds production)

Price per pound	Return above variable costs	Return above total costs
$2.00	1925	1314
$3.00	3345	2763
$4.00	4766	4184
$5.00	6186	5604
$6.00	7607	7025
$7.00	9027	8445

Selected Resources

• Elderberry – A New Old Crop (West Virginia University, 2022) https://extension.wvu.edu/agriculture/horticulture/elderberry
• Growing & Marketing Elderberries in Missouri (University of Missouri, 2022) https://extension.missouri.edu/media/wysiwyg/Extensiondata/Pub/pdf/agguides/agroforestry/af1017.pdf
• Elderberry Market Research (University of Missouri, 2011) http://128.206.25.160/profit/elderberrymarketreport.pdf
• The First International Symposium on Elderberry (University of Missouri, 2013) https://centerforagroforestry.org/wp-content/uploads/2021/05/ElderberrySymposiumGuide.pdf
• Economic Budgeting for Agroforestry Practices (University of Missouri, 2010) 1 MB file https://centerforagroforestry.org/wp-content/uploads/2021/05/af1006.pdf
• Elderberry Production in Ohio (The Ohio State University, 2023) https://ohioline.osu.edu/factsheet/anr-0110
• Agroforestry on the Farm: Elderberry (Iowa State University, 2016) https://www.extension.iastate.edu/smallfarms/agroforestry-farm-elderberry
• Organic Practices for Elderberry Production (University of Vermont Extension, 2016) https://www.uvm.edu/sites/default/files/media/elderorganichandoutaug16.pdf
• Growing Elderberries: A production manual and enterprise viability guide for Vermont and the Northeast (University of Vermont Extension, 2016) http://www.rosaliewilson.com/wp-content/uploads/2017/01/ElderberryGuideComplete.pdf

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[1]Nematode testing availability includes:

North Carolina Department of Agriculture Nematode Lab https://www.ncagr.gov/agronomi/

*Waters Agricultural Laboratories, Inc. https://watersag.com/service/nematode-analysis/

University of Tennessee Plant and Pest Diagnostic Center https://www.shelbycountytn.gov/DocumentCenter/View/1249/Plant-and-Diagnostic-Center?bidId=

WVU Nematode Diagnostic Lab https://www.thescncoalition.com/state-information/university-coalition-experts/west-virginia-university/

*Please note that some laboratories do not identity nematodes down to species.

Photo by Patrick Byers, University of Missouri.

An elderberry planting in Missouri. Research-based publications about elderberry are available at the University of Missouri's Center for Agroforestry website, http://www.centerforagroforestry.org/.

Suggested Citation:

Ernst, M., and R. Painter (2023). *Commercial Production of Elderberry*. CCD-CPA-CP-6, CCD-WVU-CP-1, ANR-Hort-23-001. Lexington, KY: Center for Crop Diversification, University of Kentucky College of Agriculture, Food and Environment. Available: https://www.uky.edu/ccd/sites/www.uky.edu.ccd/files/elderberry.pdf

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For additional information, contact your local County Extension agent (Kentucky), (Tennessee), or West Virginia