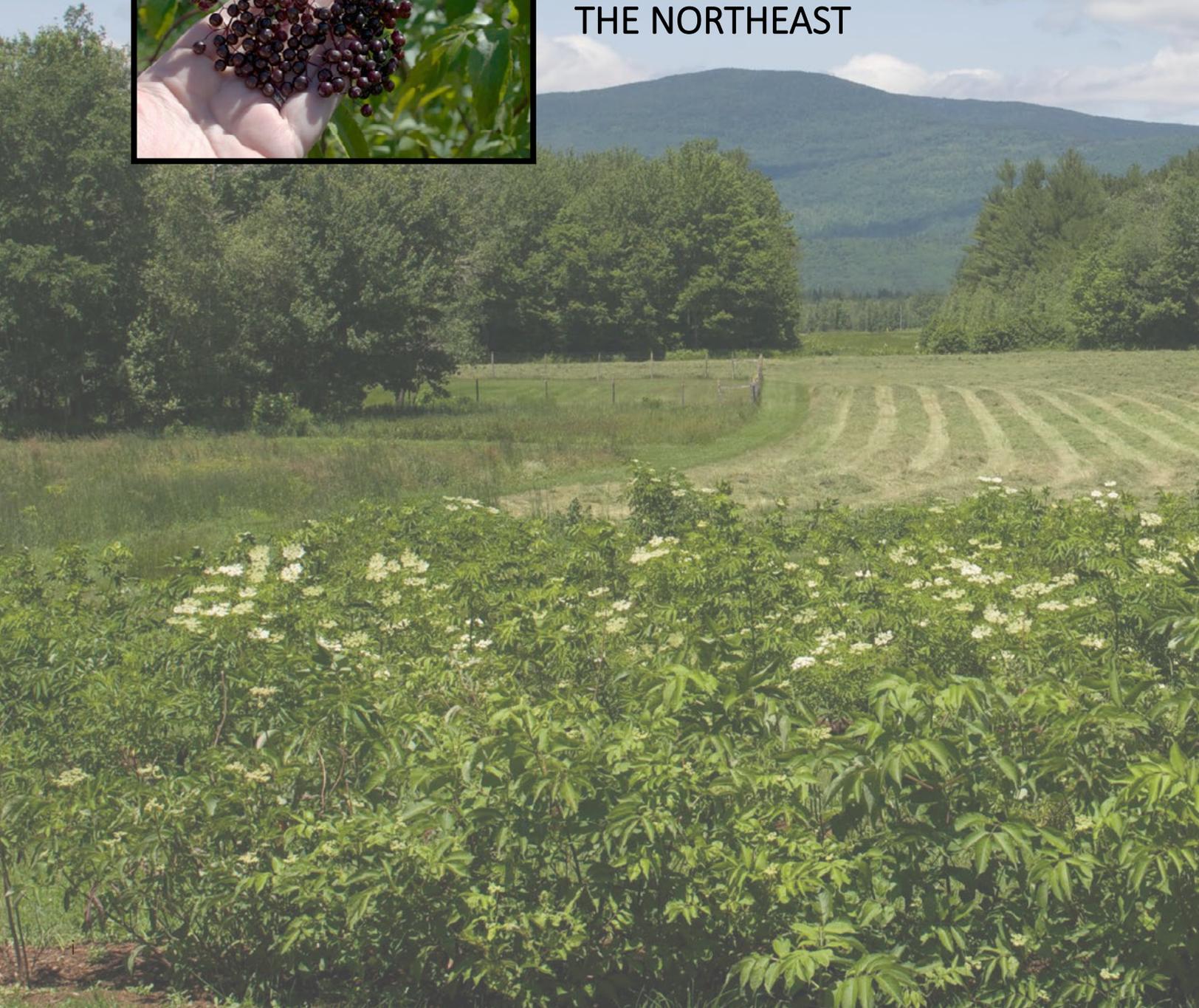




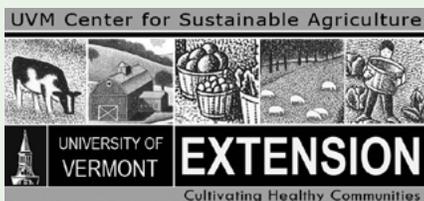
Growing Elderberries:

A PRODUCTION MANUAL
AND ENTERPRISE
VIABILITY GUIDE
FOR VERMONT AND
THE NORTHEAST



GROWING ELDERBERRIES: A PRODUCTION MANUAL AND ENTERPRISE VIABILITY GUIDE FOR VERMONT AND THE NORTHEAST

Funding for UVM Extension's Elderberry Project was provided in part by grants from the **Working Lands Enterprise Initiative** (<http://workinglands.vermont.gov/>), and with a **Rural Business Enterprise Grant from USDA Rural Development** through the **Vermont Housing and Conservation Board** and the **Northern Border Regional Commission** and **Northern Community Investment Corporation**.



Special thanks to: Patrick Byers of University of Missouri Extension for the use of photographs and previously published materials; Michelle Graziosi and Elizabeth Brownlee for the use of information on Multifunctional Riparian Buffers; Ben Waterman for photographs and review of selected sections; Cathy Yandow and Cheryl Herrick for editorial assistance; Tamara Smith for graphic design; and Tori Lee Jackson, Abbie Sewall, John Hayden, David Fried, Todd Hardie, Guido Masé and Jennifer Brown for the use of photographs.

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Cluster or cyme of green, ripening berries
(Tori Lee Jackson, University of Maine Extension)



Elderflowers
(Ginger Nickerson, UVM Extension)



Cluster of ripe elderberries
(Tori Lee Jackson, University of Maine)

Introduction

Purpose of Guide

This guide came about in response to farmers and landowners expressing interest in non-traditional specialty crops as a means of diversifying their enterprises, or as a potential source of income from marginal lands. The interest seems to follow the fruit's reputation for high levels of antioxidants and other beneficial nutritional properties, and its ability to grow in heavier soils and floodplains. With this in mind, this guide is directed towards people with an interest in growing elderberry for profit, and is intended to help them determine if elderberry is the right commercial crop for them. However, there is also much information that will be of use to backyard gardeners and people who want to make elderberry-based products for their friends and family.

Because elderberry has traditionally been harvested from the wild and not cultivated on a large scale, little is known about its potential as a commercial crop. We hope this guide will help share what is known about elderberry and may stimulate additional research on this interesting crop for the Northeast.

A Note about Organic and Biological Control Practices

We have chosen to promote cultural and biological controls for weed and pest management over chemical controls as much as possible. Since many consumers are consuming elderberry products because of health concerns, they frequently prefer berries and flowers grown without chemicals. We also believe that maximizing biodiversity is one of the most important tools for promoting a healthy farm ecosystem, and many broad spectrum pesticides (even those allowed under the organic certification programs) are toxic to beneficial insects such as bees and other pollinators. Finally, the long-term ecological impacts of many of the chemicals allowed under organic production are not yet well understood. Subsequently, this guide focuses on working with the ecological integrity of natural systems by starting with vigorous plants; managing for high soil organic matter; and promoting biodiversity to attract beneficial insects and soil microorganisms. Although occasionally we have included information about chemical management, pesticides should be used with caution and as a last resort.

Information Sources

Throughout the guide we have placed tips drawn from the following sources:

Grower and Processor Tips

The grower and processor advisers for this project have been growing and making products from elderberry for many years – they are some of the most experienced growers in Vermont. They have shared the tips that have saved them time and money, or improved yield and management.

Expert Opinions

Because American Elderberry or *Sambucus canadensis* is a relatively new commercial crop in the United States, especially in the Northeast, in many situations, there is no well-researched “right” way to address cultivation or processing issues. In these cases, we’ve shared a variety of opinions from our advisers, reviewers and other experts about what works for them. Growers can use this information to guide their decisions, and conduct their own research comparing different methods.

Research

In a few places throughout this guide we have shared excerpts and quotes from relevant research. Keep in mind that as more research is conducted, some of this information may become outdated. The [National Agricultural Library Catalog \(AGRICOLA\)](#) is a searchable database with citations for agricultural literature. While the full text of most of this research is only available through a library with a copy of the book or a subscription to the journal, the abstracts are available on the internet via Agricola. The [Agriculture Network Information Collaborative \(AgNIC\)](#) also maintains a searchable database of research on different crops and has a good list of elderberry related research.

THE ELDERBERRY SONG

*What’s that growing by the side of the road?
Big flower heads for bees and cool shade for the toad
With berries hanging down when the summer’s winding down
It’s the elderberry bush! Oh, get out of town!*

*How can something so prolific have a name like that?
How come we can eat its fruit all day and not get fat
Why do old time Vermonters say they never get a cold
When they sip the juice all winter, so why’d we call it “old”?*

*It’s our elder, our ancestor, our wise old shrub
Keeps us on our feet, brings us home from the pub
Its berries heal us deeply and it grows on all our hills
We get excited when we find it ‘cause it’s good for “what ills.”*

*Plant it brother, plant it
Sister, trim some flowers
Use them as an essence
Or toss them with some flour*

*The elderberry comes to us to smooth each daily rift
Sip this plant elixir and receive this purple gift!*

— David Fried, *Elmore Roots*



Elderflowers at different stages
(Ginger Nickerson, UVM Extension)



Elderbush in flower
(Tori Lee Jackson, University of Maine, Extension)

Elderberry Basics

What is in a name? European vs. American Elderberry

Elderberry (*Sambucus*) is a woody perennial native to both North America (*Sambucus canadensis*) and Europe (*Sambucus nigra*).¹ The two elderberry species in commercial use are *Sambucus nigra* or European elderberry and *Sambucus canadensis* or American Elderberry. Fossilized seeds of American Elderberry, *S. Canadensis*, have been traced back to eastern North America from as far back as 16,000 years ago (~14,000 BC) (Kneller and Peteet, 1999). Wild *S. canadensis* can be found growing from Florida to the Gaspé Peninsula in Quebec. It is hardy to zone 3 and has been found as far north as zone 2.²

The roots of elderberry are shallow and mat-like. While elderberry might not flourish in constantly wet soils, it can withstand occasional flooding. Both species compete poorly with more aggressive plants but if planted in sites with good drainage and access to sunlight, they can produce significant crop yields, and bear fruit for many years.³

The more tree-like European elderberry, *Sambucus nigra*, has long been grown commercially in Europe. Imported *S. nigra* has been the predominant elderberry available for sale in the United States. However, both species can be grown commercially in North America. Although the flowers and berries of *S. nigra* have a more pronounced flavor and aroma, and are sweeter and bigger than those of *S. Canadensis*, it is significantly less hardy in the northeastern U.S. than our native *S. canadensis* (Charlebois *et al.*, 2010).

This guide focuses on *S. canadensis*. As our native species, it is well-adapted to local conditions, is hardier in our climate, and is the variety most familiar to New England growers. That being said, manufacturers are accustomed to sourcing *S. nigra* from Europe and medicinal research to date has focused on *S. nigra*, thus demand for the two may not yet be interchangeable. *Sambucus canadensis* and *S. nigra* appear similar in their applications; however Vermont manufacturers and herbalists have expressed a preference for *S. Canadensis* because it is native and can be sourced locally.

1 One botanist, Bolli (1994) proposed that *S. nigra* and *S. canadensis* be considered subspecies, so both European elderberry *S. nigra ssp. nigra* and American elderberry can be referred to as *S. nigra ssp. canadensis* (Charlebois, et al., 2010). Most U.S. authors consider *S. nigra* and *S. canadensis* as two separate species, so we use *S. canadensis* for the common American elderberry throughout this guide.

2 Do not confuse *S. canadensis* with the other elderberry native to the northeast, *Sambucus racemosa*. *Sambucus racemosa*, or red elderberry, also grows wild throughout New England. Its mature fruits are bright red, and though enjoyed by birds and small mammals, but may be toxic to humans if eaten.

3 It is unknown how long Elderberry will be productive under commercial cultivation in the Northeast. Estimates from Missouri are that the bushes can be productive for 25 years.

Medicinal Properties

Elderberry is a prized medicinal herb and food in many cultures. It is rich in vitamins A and C, phosphorous, potassium and iron. It has demonstrated antiviral properties, making it especially effective in reducing the severity and duration of colds and flu (Zakay-Rones 1995, 2004). Berries from *S. nigra* have been found to increase production of infection-fighting cytokines. At the Bundesforschungsanstalt research center for food in Karlsruhe, Germany, scientists showed that anthocyanins in *S. nigra* enhance immune function by boosting the production of cytokines. These unique proteins act as messengers in the immune system to help regulate immune response, thus helping to defend the body against disease. Further research indicated that anthocyanins found in elderberries possess appreciably more antioxidant capacity than either vitamin E or vitamin C. The flowers are used to promote sweating, and elderflower tea is often taken to reduce fevers from cold and flu (Filière des plantes médicinales biologiques du Québec, 2010). Clinical research has been conducted on a proprietary berry extract (“Sambucol”) derived from *S. nigra*, and focused on the treatment of influenza (Zakay-Rones 1995, 2004).

Researchers evaluated the anti-cancer potential of *S. canadensis* and *S. nigra* *in vitro* and found both had similar effects and mechanisms of action on tumor cell lines, and similar quantities and qualities of other classes of molecules, including iridoids (secondary metabolites present in various plants), phytosterols (steroid compounds which occur in plants) and sesquiterpenoids (another naturally occurring organic compound) that are considered partly responsible for the plant’s medicinal activity (Thone et al., 2006).

The chief chemical constituents in the berry and flower include oligomerized polyphenols of the bioflavonoid class (anthocyanins) and simple phenolic acids (such as caffeic and chlorogenic acids). Researchers noted that in spite of some differences between *S. canadensis* and *S. nigra*, a high degree of variability in the chemistry elaborated by elder was in response to different growing conditions rather than species difference. This suggests that cultivation and breeding techniques could be used to favorably alter the chemistry of elderberries (Lee and Finn, 2007).

The King’s American Dispensatory (Felter and Lloyd, 1898) was written for physicians in the United States, and as such, focused on *S. canadensis* and its medicinal applications and preparation. The authors note that although *S. canadensis* and *S. nigra* look quite different, the medicinal applications of the two species are very similar, particularly for the flowers and bark (which were the parts most often used in the 19th century in the United States).

RESEARCH: *Toxicity*

The leaves, stems, unripe berries, seeds and roots of elderberry contain small amounts of hydrocyanic acid that is converted into cyanide when consumed by people. These compounds are neutralized if the berries are cooked, cool processed or fermented. The levels vary by species and seem to not be very high in *S. canadensis*. However, it is still important to pick out the stems, leaves and green berries when cleaning flowers and berries for consumption.

Given the historical applications of *S. canadensis*, the similar chemical profile of the two species, and their identical mechanisms of action *in vitro*, it is reasonable to assume that the berries and flowers can be used interchangeably in medicine. This is the position of Health Canada (responsible for regulating medicinal claims on dietary supplements marketed in Canada), which uses *S. nigra* and *S. canadensis* interchangeably in its official product monograph (available at http://webprod.hc-sc.gc.ca/nhpid-bdipsn/dblimages/mono_elder--sambucus-under-consultation_english.pdf). However, more clinical research on *S. canadensis* is still needed to better understand its medicinal constituents and how they function.

Products Containing Elderberry

Elderberry fruit and flowers can be made into teas, tinctures, drinks, distilled spirits, wines and cordials, baked goods, jams and jellies. The berry juice makes a natural dye or food colorant which also could be marketed to food companies seeking to move away from synthetic food additives. The berries, whether fresh, frozen, dried, or sold as concentrate, are finding increasing demand as an ingredient in vitamins, supplements and “functional foods,” prized for the health benefits they confer (Cernusca, Gold and Godsey, 2011).



Ripe Berries (Jenny Brown, UVM Extension)

GROWER TIP:

Distance Between Plants

David Fried of Elmore Roots Fruit Tree and Berry Nursery notes that 60 feet may be too far to recommend for pollination, *“Because if it is open or if it is wooded or if the wind is blowing the wrong way pollination is unlikely to occur.”* He recommends an approximate distance between bushes of no more than 20 feet.

Cultivars, Site Preparation and Establishment

Elderberry flowers appear to be primarily wind-pollinated. The flowers lack nectaries and are not considered to be attractive to nectar-seeking insects (Robertson in Charlebois, et al., 2010). There is debate about whether elderberry is self-fertile or not. While bushes in the wild seem to have no problem bearing fruit, the conventional recommendation is to plant at least two different cultivars within 60 feet of one another to ensure cross-pollination and adequate fruit set (Charlebois, et al., 2010). Laying out rows of plants in elderberry orchards to take advantage of prevailing winds may help with pollination and fruit set.

Selecting Cultivars

Growers should take the differences between cultivars and how well each would fit their purposes when deciding which ones to plant. For example, wineries prefer cultivars with a higher Brix or sugar content, as the high sugar content is better for fermentation (Putney Winery interview, 2015). Other traits to consider when selecting which cultivars to plant might include:

- size of the bush (how much room is there for the planting?)
- height at maturity (although plant height and size can be controlled somewhat by pruning)
- size of the flower clusters
- size of the berries (the larger the berry, the higher the fruit to seed ratio)
- when the berries ripen
- how uniformly the fruit clusters ripen

Selecting cultivars that ripen at different times will spread out the harvest period, ensuring that the entire crop does not have to be harvested during one window of time in case of interference from weather or other circumstances.

Lewis Hill: Gentle Giant of Elderberry Horticulture

Lewis Hill grew up in Greensboro, Vermont on Hillcrest Farm. He was a well-known and influential horticulturalist who introduced many gardeners in our region either personally, or through his many books on growing fruit, pruning, and cold-climate gardening, including the *Fruits and Berries for the Home Garden* (recently been updated and re-released as: *The Fruit Growers Bible* by Leonard Perry of University of Vermont Extension).

Lewis was very interested in breeding and developing cultivars for local conditions. In addition to breeding nine registered daylilies and two black currant cultivars, Lewis developed two elderberry cultivars: Coomer and Berry Hill.

All of the grower-advisers of this guide were influenced by Lewis either directly or indirectly.

Todd Hardie of Thornhill Farm in Greensboro calls Lewis “the gentle giant of Vermont horticulture.” Todd credits Lewis with introducing him to elderberries and educating him about their health benefits. Todd founded Honey Gardens in the 1980s, a business that sold a popular elderberry-honey syrup. He recently planted hundreds of elderberry plants including the two Lewis Hill cultivars (Coomer and Berryhill).

—Condensed from Nancy Hayden’s article: *Home for Supper: Remembering Lewis Hill* in “Vermont’s Local Banquet”, Spring, 2016



Lewis Hill, developer of Berry Hill and Coomer cultivars. (Todd Hardie, Thornhill Farm)

ELDERBERRY CULTIVARS DEVELOPED IN MISSOURI

The cultivars below were developed in the Midwest and are being trialed by researchers at the University of Missouri (hardiness zone 5b). A few of these have been trialed by growers in Maine where they had a poor survival rate, but if they will be grown in a protected or mild microclimate, it may be worth experimenting with them in New England. Be sure to keep records if you do experiment with different cultivars.

Bob Gordon - The new cultivar Bob Gordon had a larger berry and yielded nearly triple that of Adams No. 2. Clusters hang upside down which protects berries somewhat from birds. The Bob Gordon was the number one producer in trials and researchers are confident Bob Gordon is a truly superior cultivar for the Midwest. This cultivar is sought out by winemakers for its higher brix (River Hills Harvest, 2015). Drought tolerant, developed at University of Missouri Extension (Robinson, 2013).

Eridu - Native to Missouri River Region. Original native berries found on Dunham Farm in 1968. Vigorous, uniform clusters of medium size berries, very sweet, productive, and prolific multiplier (River Hills Harvest, 2015).

Ranch - Drought tolerant. This hardy short plant seems to be most tolerant to harsh conditions. The stockiness provides a lower fruiting canopy. Single stemmed. Tends to grow upright and is not bushy. Grows well on less fertile soils. Developed at University of Missouri Extension (Robinson, 2013).

Wyldewood 1 - A vigorous producer that is first to reach bud break in spring and the latest to ripen. Tends toward having three cymes on each stem. WW1 came in second at university trials and showed a

We found contradictions between cultivar descriptions from the different sources we reviewed for this guide - this could be because elderberry may hybridize. Therefore, consider the table below an approximate guide of the distinctions between cultivars. When purchasing a cultivar from a nursery, defer to their description of the cultivar.

The cultivars below were all developed in New York, Nova Scotia, Vermont or New Hampshire and should perform well in New England.

Adams Number 1: One of the oldest cultivars from New York. This is one of the sweeter cultivars, somewhat self-fruitful.

Adams Number 2: Also sweet and somewhat self-fruitful. Berries are slightly smaller but more productive than Adams No. 1. Both Adams No. 1 and No. 2 are large fruited and vigorous, and late maturing.

Coomer: Developed in Vermont by Lewis Hill; very cold hardy, ripens uniformly all at one time.

Berry Hill: Developed in Vermont by Lewis Hill; very cold hardy, ripens uniformly all at one time.

Goodbarn: Introduced by Elwyn Meader of Rochester, N.H. Professor Meader named this Goodbarn because it was the good elderberry growing under the eaves of his barn in New Hampshire.

Johns: A longtime favorite in the Northeast. Medium to large berries. Very vigorous, tall, moderately hardy; largest fruit clusters but yields less than Adams. NOTE: ripens after Adams.

Kent: Seedling of Adams No. 1. Medium to large berries. Ripens before Adams No. 2. Best all-around performer according to some Vermont growers. Fairly high sugar content.

Nova: Seedling of Adams No. 2. Medium to large berries. Berries sweeter than Kent and Victoria. Ripens earlier than Adams No. 2.

Scotia: Seedling of Adams No. 2. Medium to large berries. Berries sweeter than Kent or Victoria. Highest sugar content.

Victoria: Seedling of Adams 2; moderately vigorous with medium sized berries and clusters. Ripens earlier than Adams No. 2.

York: Late maturing, vigorous, productive. Mildly tart; neutral flavor; lower sugar content. Persistent and will bear well for many years. Has some of the largest berries of all cultivars (growers in Maine report that this shrub is more compact than Adams, topping out at four to five feet, but a 10-foot specimen was found growing on a compost pile).

potential of 12,000 pounds per acre. This will be the first varietal released by the University of Missouri. This is their main commercial variety. Its unique processing properties and high yields make it the most popular (River Hills Harvest, 2015). Developed at University of Missouri Extension.

Wyldewood 2 - Pungent and loose flower heads for elderflower production. Introduced by pioneering grower Marge Millican. This is a vigorous grower (River Hills Harvest, 2015).

EUROPEAN ELDERBERRY OR *S. nigra* CULTIVARS

Although this guide is focused on *S. canadensis*, we are including a few *S. nigra* cultivars that are available from local nurseries for those interested in experimenting. Vermont and Maine growers have found that the European elderberry is significantly less winter hardy than *S. canadensis*, and has a poor survival rate in New England. *S. nigra* also has shown to ripen over a longer period and have less uniform ripening than *S. canadensis*. But if you have a protected area or are in a warmer region, it may be worth experimenting with cultivars of *S. nigra*, especially if you are primarily interested in using the flowers.

Korsor - Selected for flowers high in sugar content used for wines or cordials (Steven McKay; East Hill Tree Farm).

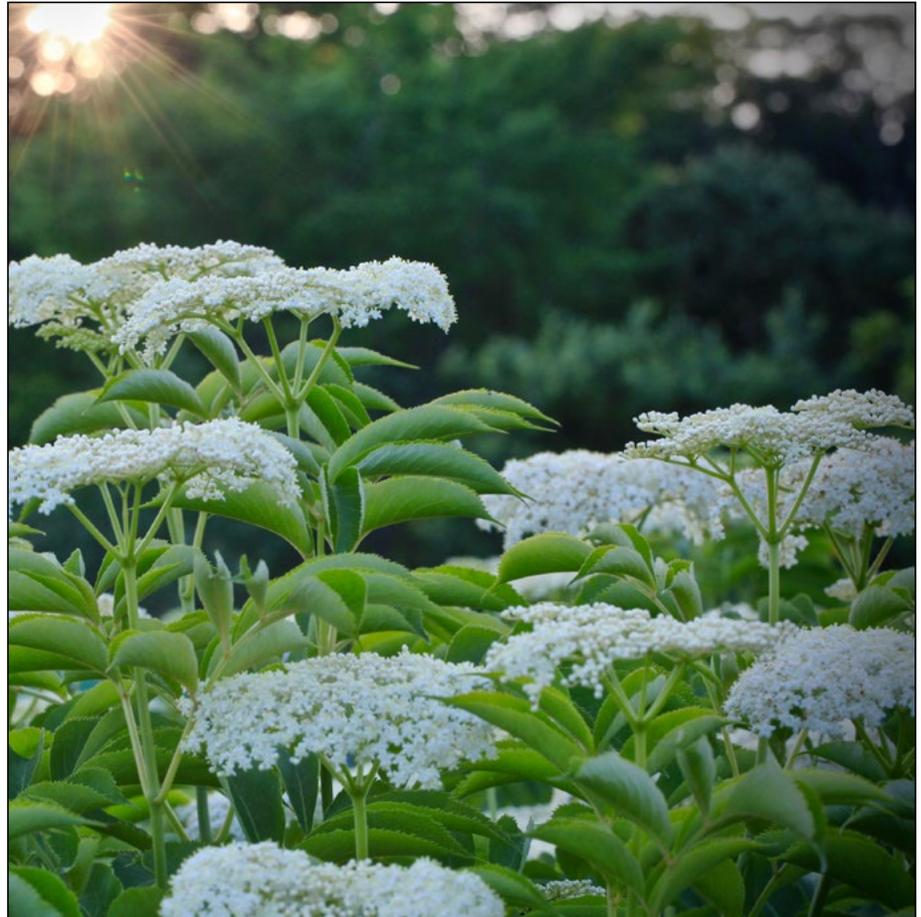
Samdal - Excellent yield and highly vigorous. Grower-friendly habit: the plants tend not to run/sucker far from the base of the plant. The wood tends also to be productive for a longer time (Steven McKay; East Hill Tree Farm).

Samyl - Production as good as or better than Samdal. Flower quality is particularly good (Steven McKay; East Hill Tree Farm).

Sampo- High producer with vigorous growth and stiff strong branch structure (East Hill Tree Farm).

Table 1: *S. canadensis* Cultivars Developed in the Northeast (New York, Nova Scotia, Vermont and New Hampshire)

	Yield	Height	Size of clusters	Size of berries	Hardiness
Early Ripeners					
Kent	Great yields even in first year		Large	Small	
Nova	Very productive, but lower than York	6 ft.	Smaller than York		Moderately hardy
Victoria			Medium	Medium	
Mid-season ripeners					
Adams No. 1		8 ft.	Large	Large	Zone 4
Adams No. 2		8 ft.		Large	
Later ripeners					
Johns	Less than Adams	6-10 ft.	Large		Moderately hardy
York	More productive than Adams	6 ft.	Large	Largest of these cultivars	Hardy
Ripening Periods Uncertain					
Berry Hill	Heavy			Large	Hardy, very cold resistant
Coomer	Heavy			Large	Hardy, very cold resistant
Goodbarn	Heavy	Lower grower, maybe to 5 ft.			Hardy, apparent self-fertility
Scotia				Smallest fruit size	



Elderflowers ready for harvesting (Abbie Sewall, The Bailey Farm, Freeport, Maine)

Acquiring stock

Growers can start with either potted plants or bare root stock from nurseries, or propagate your own stock from cuttings (see side page on propagation). Potted elderberries typically have a higher survival rate and come into full production sooner than rooted cuttings. One-year old rooted cuttings can produce a sizable crop as early as the second year after planting (Bolli, 1994 in Charlebois et al., 2010).

EXPERT OPINION:

Viruses

Viruses can be common in the plant world. For those planning to obtain plants from local nurseries, Patrick Byers of the University of Missouri Extension states it is safe to assume that most elderberry stock is infected with some type of virus. However, while plants in the trial fields in Missouri tested positive for viruses, Byers has not seen any appreciable impact on productivity from virus-infected plants, nor have the Vermont growers reviewing this guide (personal communications, 2016).

Beginning with potted bushes will be the quickest way to establish an orchard, but it is also more costly.

A list of sources and pricing of stock available from Vermont and regional growers can be found in Appendix A: Sources of Plants. For those interested in conducting trials and comparing cultivars, the United States Department of Agriculture's National Plant Germplasm System (NPGS) also maintains a catalog of *Sambucus* cultivars at its [National Clonal Germplasm Repository in Corvallis, Oregon](#) (NCGR). Up to two cuttings per cultivar may be obtained upon request by researchers and others who can enrich the NPGS's collections through trials and exchange of plant material. Some of these genotypes have been tested for viruses, and the [Repository](#) notes which *Sambucus* stock has tested to be virus-free.

If bare-root cuttings are used, soak the roots in water for two hours to rehydrate them before planting. Do not allow them to soak for more than a couple of hours, as this could injure the roots through lack of oxygen. Plant them in a furrow 6 to 8 inches deep, at a depth level with the crown of the plant (where the roots meet the stems), or slightly deeper. Make sure that the roots are completely buried and the earth around them is gently tamped down (Charlebois, et al, 2010; personal communication, Peronto, 2016).

PROPAGATION

The easiest, quickest and safest way to establish an orchard is to start with disease-free stock from a nursery that inspects its plants for viruses, pests and diseases. However, we realize some growers may prefer to propagate their own plants from cuttings to save on costs if they are planning on having many bushes. Growers who choose to propagate their own plants should carefully inspect the source bush for symptoms of pests and diseases. Use only healthy bushes for propagation stock. New plants can be propagated from cuttings from either softwood or hardwood.

Propagation from Softwood Cuttings

Softwood cuttings are taken during growing season from actively growing stems. The cuttings should be taken in June or early July before berries form.

1. Select new branches that are just beginning to turn from green to brown. Make sure they are pest- and disease-free. To minimize desiccation, harvest the branches in the early morning and put the cutting in the prepared moist rooting medium right away.
2. Cut each branch into sections 4 to 6 inches long. Each cutting should include 2 to 4 nodes. Cut the “bottom” or root end at an angle so that you remember which end is “up” or the growing end.
3. Remove the leaves from the lower two-thirds of the cutting, leaving at least one set of leaves at the top.
4. Prepare a sterile rooting medium by mixing 1 part peat moss to 1 part sand in a bucket. Stir in water until the medium is damp and crumbly, but not soaking wet. Do not use regular garden soil or the cuttings may rot before forming roots. (A commercial rooting hormone (auxin) can be used, but we have not found it to be necessary).
5. Fill a 2- to 4-inch pot with the damp sterile rooting medium.
6. Stick the bottom one-third of the cutting into the rooting medium.
7. Store the cuttings in a location with bright but indirect sunlight for 6 weeks. The cuttings should not be allowed to dry out. Humidity can be maintained putting a clear plastic bag over each pot to create a humid, warm environment around the cutting. If this is done, remove the plastic bag every 2 to 3 days and mist the cutting. If the medium is drying out, add water.
8. After six weeks, give the cutting a very gentle tug. If it feels like it is firmly rooted, it can be transplanted into a larger pot.
9. Fill a 6-inch pot with quality potting soil. Slide the cutting out of the starter pot and place it in the center of the new pot, keeping the base of the cutting at the same level in the soil.
10. Soak the potting soil around the cutting. At this point, leave the plastic bag off and place the elderberry into filtered indirect light.
11. Transplant the cuttings into the field the following spring.
12. Apply compost and mulch.
13. Wait to prune the bushes until their second winter.



Prepping softwood cuttings. (Patrick Byers, University of Missouri Extension)



Softwood cutting in rooting medium. (Patrick Byers, University of Missouri Extension)

Propagation from Hardwood Cuttings

Hardwood cuttings can be taken before bud break in the late winter/early spring and the cuttings can either be rooted in pots and then transplanted in the spring, or put in cold storage and planted directly into the orchard rows after danger of frost. Live stakes can also be planted directly into the ground in the spring.

Harvest branches from the previous years' growth – the wood should be brown, not green, and free of any damage. (One grower reports that stems with many lenticels seem to do better). Include 2 to 4 nodes on each cutting. Cut the “bottom” or root end at an angle, and make the “top” or shoot end a flat or straight cut, so that you remember which end is “up”.

Option 1 - Storing for direct planting in the spring: Wrap the cuttings in plastic to reduce moisture loss and store in a cool, dark place until spring when you can plant them directly into the field.

Option 2 - Propagation for transplanting: Put the cuttings in pots with rooting medium, with the lowest two nodes about two inches under the surface of the soil – roots will form from this node, and leaves will sprout from the top nodes. Care for the cuttings in the pots over and transplant into the field in the spring after danger of frost has passed.

Option 3 - Spring direct planting (live stake method): Alternatively, harvest one year-old hardwood branches in the early spring before bud break to be planted directly in the field. As you harvest the cuttings, put them in a bucket of water so they do not dry out. The canes can be planted directly in their permanent location.

With all three methods, position the cutting so that one to two nodes are below the surface of the soil, and only the top node or pair of buds is above the soil. It should take 6 weeks for the cutting to establish roots. Wait to prune the bushes until their second winter. Options 1 and 3 will have a lower rate of success than Option 2, so you may want to plant at a higher density with the expectation that some will not survive.



Hardwood cuttings in cell packs. (Patrick Byers, University of Missouri Extension)



Lenticels and leaf buds on a cane. (Patrick Byers, University of Missouri Extension)

Adapted from Patrick Byers' [Elderberry Propagation](#), University of Missouri Extension and [How to Grow Elderberries from Cuttings](#), SFGate Home Guides.

RESEARCH:

Avoiding Diseases

Avoid planting elderberries in areas where strawberries, mint, alfalfa, potatoes or tomatoes have previously been grown because of the potential presence of the soil borne fungus *Verticillium*, or where there have been solanaceous vegetables because of Tomato Ringspot Virus (Charlebois et al., 2010).



Elderberry Orchard in Maine. (Tori Lee Jackson, University of Maine Extension)

EXPERT OPINION:

Site Selection for Small Plantings

“Most elderberries I have seen growing naturally in Vermont have been on the sides of roads and the edges of fields. Though challenging to cultivate and harvest for the grower, some mimicking of nature may make it easier to have initial success for the smaller grower. The natural windbreak of at the edge of the woods may help the elderberry bush to produce more as fewer buds die from desiccation or cold temperatures. So even though the yield may not be as high as in rows in an open field, it may sometimes be higher in cold or windy years and this protected planting may over time be steadier and more reliable to count on.”

—David Fried, Elmore Roots Fruit Tree and Berry Nursery

Site Selection

Elderberries will tolerate a wide range of soil textures and fertility, but growers will obtain the best yields from plants grown in well-drained, moderately acidic soils (pH 5.5-6.5) (Cornell University, 2015). While wild elderberries will grow along forest edges and in partial sun, for commercial cultivation, they will yield best in open areas with full sun (Charlebois et al., 2010). Situating plantings away from forest edges may also reduce predation by birds, and will assist with pollination and disease prevention through good air circulation.

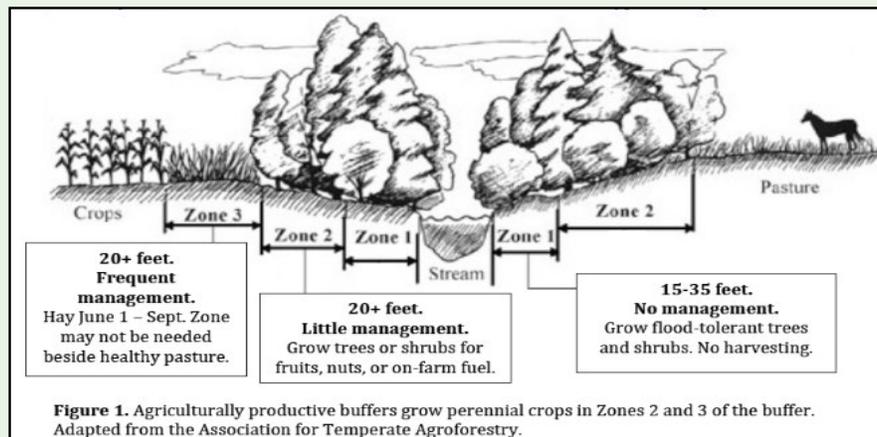
Elderberry can be planted in heavy soils as long as there is good drainage (Charlebois et al., 2010). Although the plants can withstand occasional flooding, they will not do well in areas with poor drainage that sustain standing water for more than a day or two, nor will they flourish on sandy soils due to limited nutrients and insufficient moisture.



David Fried harvesting elders planted in a riparian zone with other perennials. (Ginger Nickerson, UVM Extension)

AGRICULTURALLY PRODUCTIVE BUFFERS: ELDERBERRY AS A CONSERVATION PLANTING FOR RIPARIAN LANDS

By Michelle Graziosi, ECO AmeriCorps, serving with UVM Extension, Center for Sustainable Agriculture



Perennial crops grow in Zones 2 and 3 of agriculturally productive buffers

(Liz Brownlee, adapted from the association for Temperate Agroforestry)

When planted on the edge of a riparian buffer with other perennials and native vegetation, elderberries can help slow water during floods, reduce erosion and runoff into waterways and provide wildlife habitat. Riparian buffers improve water quality by trapping sediment and absorbing nitrogen and phosphorous, thus preventing an excess of these nutrients from negatively impacting river ecosystems (Brownlee & Stedman, 2013).

The [Vermont Clean Water Act](#) (Act 64) was passed in June 2015 to improve water quality statewide by reducing nutrient loading from all land uses and sectors, including agriculture. A part of this law is the new Required Agricultural Practices (RAPs), which will require 25-foot vegetative buffers of perennial vegetation between all croplands and surface waters, with 10 foot minimum buffers on ditches. Multi-functional riparian buffers, or [Agriculturally Productive Buffers](#) (APBs) might be able to help farmers meet these increased buffer widths while providing a valuable crop which meets water quality goals. According to one Vermont farmer, multi-species APBs make on-farm conservation “exciting,” while another reasoned that “it just seemed logical to conserve the river and make a profit” (Interview, November 2015).

In APBs, harvestable flood-resistant crops, such as elderberry, are grown in the outermost zone of the buffer, while native trees, shrubs and grasses are planted in zones closest to the river or stream (Brownlee 2013). Under existing water quality rules, as well as the current proposed RAPs, the harvesting of perennial crops within vegetative buffer zones is permitted (*Vermont Required Agricultural Practices and Regulations*).⁴

Through the ecosystem services they provide, vegetated buffers serve as a crucial component of [farmland flood](#)

[resilience](#). By changing the way agricultural land is used, plantings can help build soil organic matter to allow better infiltration and streambank stabilization that alleviate movement of water during severe weather events.

During Tropical Storm Irene, intact swamps, wetlands and floodplain along the Otter Creek between Rutland and Middlebury slowed and absorbed floodwaters (Brownlee & Stedman, 2013). Vegetated banks shielded farms in Middlebury from the worst of Irene’s impacts; only 40 acres of land in the Middlebury area were damaged by the flood, compared to over 4,000 acres damaged in the much less vegetated Rutland area (Brownlee & Stedman, 2013).

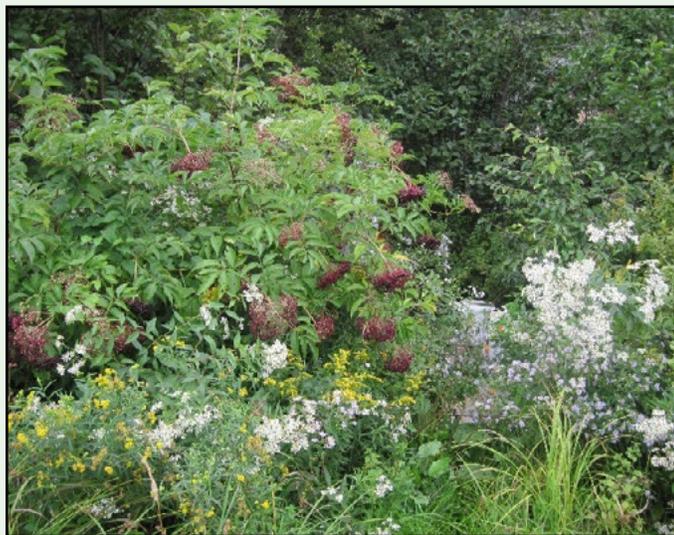
Over the past century, Vermont has seen an increase in overall precipitation and an increase in annual average temperature. These trends are expected to continue over the next several decades, and have multiple implications for agriculture. Though a longer growing season may be beneficial, increased likelihood of damaging floods and demand for irrigation will pose significant challenges (Faulkner, 2014). Cultivation of perennial crops like elderberry could serve as a beneficial adaptation strategy in the face of impacts from climate change. More information and resources on climate change impacts and flood resiliency practices can be found at the [Farming and Climate Change in Vermont](#) section of the UVM Extension Center for Sustainable Agriculture website.

While harvestable perennials can play a productive role in an APB, a buffer consisting of only perennial crops will fail to provide adequate streambank stabilization, flood protection and sediment control. The proper functioning of the buffer is heavily dependent on a sufficient area of unmanaged vegetation. The zones of the buffer work

⁴ The Vermont RAPs had not been finalized at the time of this publication. Interested farmers should stay up to date on the process through 2016.

together to provide both environmental and economic benefits. In addition to the economic value of harvestable perennial crops, buffers give rivers and streams the room they need to move, protecting valuable prime agricultural soils from being swept away during heavy precipitation events (personal communication, Brownlee, November, 2015).

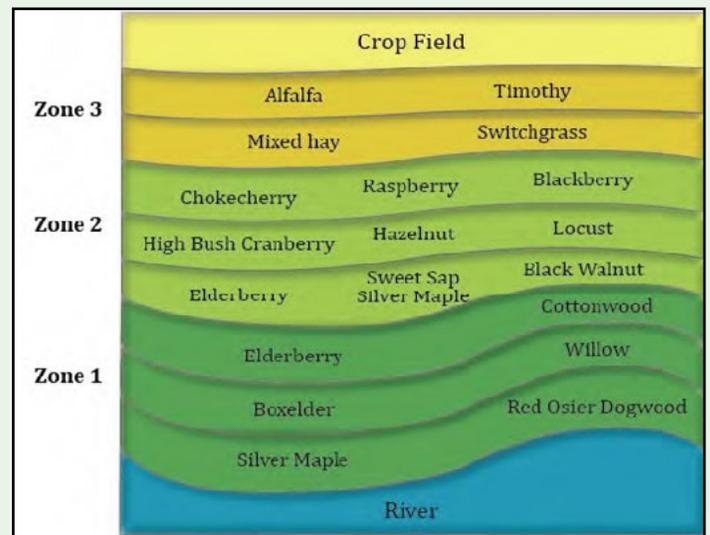
This also means that any crops planted within the buffer are at risk of damage from these flooding events, underscoring the importance of a zone of unmanaged native vegetation closest to the water. Growers need to recognize that planting harvestable crops within buffers means they are taking risks with flooding and the natural tendency of waterways to move. Consult with someone knowledgeable about soil, slope and hydrological factors, to make sure an APB makes sense for your property, before investing in plantings. In cases where flooding is frequent



Elderberry in a mixed species riparian buffer. (Ginger Nickerson)

or the waterway or soils are less stable, a fully unmanaged vegetated buffer may be a wiser decision.

There are [many options](#) available for farmers and landowners who seek assistance in planning and financing a riparian buffer on their property. Some, like the [Conservation Reserve Enhancement Program](#) (CREP) provide 90- to 100-percent cost share only for fully forested buffers. Other incentive and cost share programs are available through the [Farm Service Agency](#), [Natural Resources Conservation Service](#) and many local watershed groups such as the [Farmers Watershed Alliance](#), [Trees for Streams](#) and local [Natural Resource Conservation Districts](#). Farmers should work with their local conservation districts to design an effective buffer that meets their needs, enhances the native landscape, and achieves important water quality goals.



Example of crops that can grow in buffers in the Northeast. (Liz Brownlee)

FOOD SAFETY: EVALUATING FLOOD POTENTIAL

Because elderberry is such a recent commercial crop, there is much that is not yet known about growing it on lands that flood often. Before planting elderberry in riparian lands that flood frequently, growers should use the information below to determine whether it makes sense to cultivate elderberries on that land.

Under the Food Drug and Cosmetic Act, it is illegal to sell food that has come in contact with adulterants. Because floodwaters can carry various contaminants, including sewage, hydrocarbons and heavy metals, growers cannot sell any flowers or berries that have come in contact with floodwater. Whether products can be sold if the floodwater touches the lower parts of the plant, but not the edible portion is more of a gray area, and one where farmers will need to make a case-by-case determination, taking the following considerations into account:

How frequently does the land flood?

- Is the planting downstream from potential sources of contamination? This can be determined by using the [Vermont Agency of Natural Resources Atlas](#) to identify upstream sources of hazardous waste.
- If flooding occurs every year, what time of year does flooding occur in relation to flowering and fruiting?
- How high does the water come on the plants?
- How long are the plants in contact with the floodwater?

—Adapted from "[Frequently Asked Questions about Handling Flooded Produce](#)" Nickerson, Grubinger, Nwadike and Blevins, UVM Extension, 2013.

GROWER TIP:

*East Hill tree Farm's
Hugelkultur solution*

A raised bed is a great strategy for improving drainage and airflow in wet soil. Woody plants appreciate it just as much as annuals. However, given the larger size of the root system, a larger bed is often in order. How do we build an adequately large pile? We frequently plant trees and shrubs into piles of coarse woody debris loosely covered with topsoil and compost, an age-old practice called hugelkultur (translated loosely from German as "hill-beds"). Woody debris is abundant in our landscape and easy to move and pile. Depending on the wetness of the existing site and the anticipated size of the root mass, the mound may be adjusted accordingly. We have planted into mounds from six inches to six feet tall. In addition to improving drainage, the wood acts as a sponge improving water retention in dry times. The decomposition supports healthy fungi in the soil. Decomposing wood will also draw nitrogen so it is worth adding animal manure or an organic fertilizer for the first couple years. We have planted elder in Hugelkultur mounds to good success.

—Nicko Rubin, East Hill Tree Farm, Plainfield, Vt.

What to do on Wetter or Heavier Soils?

For sites that may be subject to inundated soils or have less than ideal drainage, plants will be more productive if they are planted on berms or raised areas with better drainage. There are a number of different ways to do this.



Elderberry planting on a berm (Patrick Byers, University of Missouri Extension)



(Ginger Nickerson, UVM Extension)

Elderberry trials on wet soils at the Intervale Farm in Burlington, Vermont. The plants are on raised berms that were cover cropped with buckwheat and mulched with wood chips. The rows between are planted with white clover. Note the 8-foot deer fence around the planting.

GROWER TIP:

*Elmore Roots Nursery's
Recommendation for Helping
Elderberry Plants Thrive
in Wetter Areas (for
smaller plantings)*

1. Remove the plant from its container; make sure it has a good root system, as this will increase chances of success.
2. Place the plant on top of the earth.
3. Pin it to its spot with a bamboo stake or other type of stake (so it does not wash away or blow over).
4. Mound sufficient earth around the roots and base of the plant so it does not dry out.
5. Cover the mound with moisture retaining mulch such as woodchips.

This technique enables the elderberry to root into the drier soil initially, and then later go into the wetter earth as needed, rather than drowning it right away by submerging the roots in a wet hole.

—David Fried, Elmore Roots Fruit Tree and Berry Nursery



Example of planting elderberries in wet area with hilling method.
(David Fried, Elmore Roots Fruit Tree and Berry Nursery)



The Intervale planting later in the season: All three plantings were done on berms. The berm on the left was covered with wood chips, the berm on the right was covered with wood chips and landscape fabric, and the berm in the middle (harder to see) was planted with white clover and buckwheat. The plants on the berm covered in landscape fabric are doing best, but this was a dry growing season.

(Jennifer Brown, UVM Extension)

Fertility Management

A soil test should always be the first step to land preparation to determine what amendments, if any, should be added to correct pH and nutrient deficiencies. If possible, do a soil test the fall before planting. If necessary, adjust for pH, phosphorous and potassium based on recommendations from the soil test. Adjust the pH level to 5.5 to 6.5; lime is most effective for adjusting pH (it is very hard to adjust pH once the plants are established, so this is best done prior to planting). Incorporate compost or manure during bed preparation.

GROWER TIP:

Where to get soil test kits?

Soil test kits can be obtained through the University of Vermont Soils lab: <http://go.uvm.edu/agb3h>

Contact Extension offices in other states.

For perennials, in general, nitrogen (N) application is a set recommendation with the assumption that the average soil does not have available nitrogen in spring to meet the needs of a flourishing crop for the year (more than the recommended rate for N application might be needed in cases where carbon rich mulches would tie up nitrogen). Other nutrients, such as phosphorous (P) or potassium (K), might not need to be added based on soil mineralogy or organic matter composition. A soil test can indicate baseline levels of these nutrients and how much supplementation is needed via fertilizer application to meet the nutritional needs of the crop. While a blanket fertilizer recommendation such as 10-10-10 might appear at first to be economic insurance, because excess nutrients will negatively impact water quality, it is not environmentally responsible to use a general fertilizer in cases where soils test high for these nutrients. It is also a mistake to always assume that a lack of vigor or other apparent problems with the plant are a lack of sufficient fertility. A lack of vigor could also be due to soil compaction, insufficient water or soil that is too wet, a pH outside of the optimal range, or weed pressure.

Because Elderberry is a relatively new commercial crop, relatively little is currently known about nutritional needs of the plant and cost-effective fertilization for achieving optimum yields. Our review of literature showed different authors providing different recommendations for fertilizer rates. However, the University of Missouri is conducting research to determine fertility management for elderberries. These are their recommendations from a 2014 publication:

“Proper pre-plant site preparation should eliminate the need for all nutrients except nitrogen the first year. Do not apply nitrogen at planting time; a light application (no more than 10 pounds per acre) of nitrogen may be made 4-8 weeks after planting. Mature bearing elderberry plantings benefit from 60 to 80 pounds of nitrogen for a 4’ x 12’ spacing per acre annually, applied as growth begins in late March to early April [for Missouri]. Additional nutrients, such as phosphorus and potassium, are applied in later years as indicated by soil test results.” (Byers et al., 2014)

Sixty to eighty pounds per acre translates into 1.4 to 1.8 pounds per 1,000 square feet. New Mexico State has a factsheet on [determining amounts of fertilizer for small areas](#), and the University of Georgia has an online [fertilizer calculator](#) which you can use to plug in the size of area you wish to fertilize and the type of fertilizer you are using to determine the appropriate rate of nitrogen for your elderberry planting. But remember, the amount of fertilizer needed will vary depending on the results of your soil test. To determine the appropriate amount of fertilizer for your location, conduct a soil test and consult with the nursery where you purchase your plants or a local Extension horticulturalist if additional advice is needed.

EXPERT OPINION: **Adding Nitrogen**

“We don’t add calculated amounts of separate nitrogen inputs, we just count on long-term slow release of nitrogen from compost and wood chips.”

—John Hayden, The Farm Between



EXPERT OPINION: **Fertilizers and Minerals**

Here is what Elmore Roots recommends for a 3 to 50 elderberry bush planting:

If you have heavy soil: add a tree planting mix (Elmore Roots makes one which contains locally-made compost, peat, granite dust, rock phosphate, greensand, Sul-Po-Mag and kelp meal, or you can purchase the ingredients and make your own). Add about 3 shovelfuls per bush right at planting time, as you are not going to get to the bottom of the hole later!

If you have fluffy, well-drained, rich soil: add our mineral mix (this contains rock phosphate, greensand, azomite, kelp meal, Sul-Po-Mag and peanut meal, or mix up your own).

As the elderberry grows and needs it, the minerals will be there at the bottom of the hole to draw from. These nutrient mixes add to the heavy clay or sand environment a catalyst for soil life and microorganisms to come in and thrive. The elderberry roots will follow this new soil life into the surrounding areas and grow faster and sturdier and produce more fruit sooner. After planting we suggest mulching each bush with compost to at least 3 inches.

Water the elderberry with liquid seaweed for the first few weeks and then switch to liquid seaweed/fish concentrate. We drizzle these emulsions around the bush and water them in with a hose or bucket of water. After mid-August, go back to liquid seaweed only, as the fish concentrate will make it grow more and you want a cooling down period so the plant can harden off for the coming winter.

This practice has proven itself for establishing and feeding healthy, productive elderberries in Vermont for the last 30 years!

—David Fried, Elmore Roots



John Hayden showing Greg Ormsby the woodchipper he uses to make mulch (Ginger Nickerson, UVM Extension)

RESEARCH: **Plant Tissue Analysis**

For perennials like Elderberry, testing nutrient levels in leaves is a great way to gauge whether there is sufficient nutrient uptake. In cases where foliar analysis indicates nutrient uptake is insufficient, deficiencies might be corrected by boosting soil fertility. Foliar analysis is especially indicative of nutrient deficiencies in cases where both soil tests and foliar analysis point to low nutrient levels. Below is a table of sufficient nutrient levels for Elderberry leaves, based on research conducted by the University of Missouri Extension:

Plant Tissue Analysis

Estimated elderberry petiole nutrient sufficiency levels

Macronutrients	%	Micronutrients	mg·kg ⁻¹
Nitrogen	4.47	Iron	71
Phosphorus	0.39	Manganese	147
Potassium	2.82	Boron	63
Calcium	1.60	Copper	8
Magnesium	0.60	Zinc	24

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More information can be found in: [“Overview of Elderberry Nutrition in Missouri”](#) by Patrick Byers

ORGANIC FERTILIZERS, INORGANIC FERTILIZERS AND COMPOST

Fertilizers provide plants with the nutrients necessary for growth and development. The primary nutrients are nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O); secondary nutrients are calcium (Ca), sulfur (S) and magnesium (Mg). Other micronutrients include iron, manganese, copper and zinc. Organic fertilizers are derived from plant or animal sources and include manures, seaweed, fish emulsion, blood and bone meal. Inorganic fertilizers, such as ammonium sulfate and ammonium phosphate, go through a manufacturing process (although they may also come from mineral deposits).

Inorganic fertilizers usually contain only a few nutrients: usually nitrogen, phosphorous and potassium, either singly or in a combination. They can be lost from the soil quickly unless you use a slow-release formula. In contrast, organic fertilizers usually contain many nutrients in low concentrations, and many of them must be converted into inorganic forms by soil bacteria and fungi before they can be taken up by plants, and so by nature they are more slowly released. Cover crops are often legumes that also release nutrients into the soil slowly through organic processes – usually over a period of two to six months.

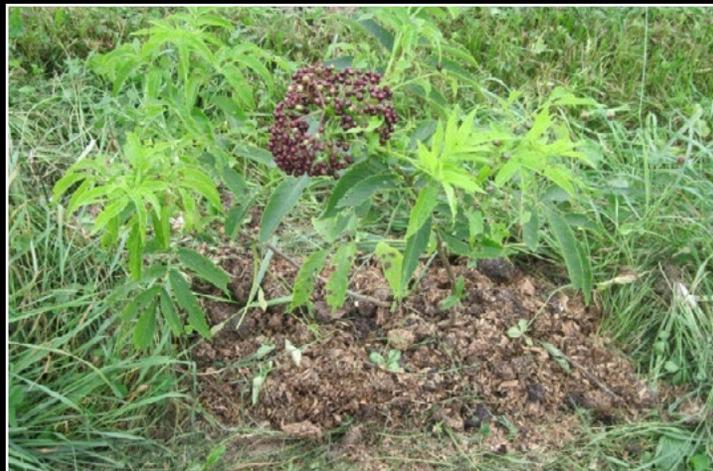
Compost deserves special note. Compost consists of decomposed organic matter that enhances the soil. It includes humus (the portion of organic matter that takes hundreds of years to decompose and contributes greatly to soil structure), beneficial microbes, and small amounts of nutrients – especially the micronutrients usually not in synthetic fertilizers. In general, composts do not usually contain enough of the primary nutrients (N, P and K) to qualify as a fertilizer, but it cannot be beat as an all-around soil conditioner. Compost increases the cation exchange

capacity (CEC) of soils, making nutrients less likely to leach away, and retaining moisture. It adds important microorganisms, such as bacteria and mycorrhizae, which make nutrients more available to plants; and reduces drainage problems in both clay and sandy soils.

One way to think of the difference between fertilizers and compost is that fertilizers “feed” the plants with specific micro- and macronutrients, while compost “feeds” the microbes and builds soil structure. By improving soil structure, adding beneficial bacteria and fungi, and increasing the cation exchange capacity (CEC), compost improves the mobility of air, water and nutrients in the soil, which make nutrients more *available* to plants.

Indiscriminate use of fertilizers may quickly overload the soil with excess nutrients and upset the symbiotic relationship of microbes in soil. Compost provides a mix of nutrients and microorganisms that provide a healthy medium for plant growth. However, be careful with compost that is not fully decomposed. Any organic matter that has not fully composted (turned into humus) should be applied sparingly to actively growing plants so as not to bind up available nitrogen in the soil.

Both organic and inorganic fertilizers can be used in excess and have the potential to negatively affect the quality of ground water and nearby surface water. Growers should familiarize themselves with the water quality standards for their state. For example in Vermont, the Required Agricultural Practices or RAPs prescribe the appropriate size of buffer strips and timing and amounts of fertilizer applications to protect water quality. The rules vary depending on the size of the operation. Vermont’s Required Agricultural Practices can be found on the [Vermont Agency of Agriculture’s website](#).



Well-composted manure around base of planting (the grasses will be mowed to keep competition down).

(Ginger Nickerson, UVM Extension)

RESEARCH:**Compost Promotes Mycorrhizae**

One way compost benefits elderberry plantings is by enhancing the environment for mycorrhizae. Mycorrhizae are fungi that maintain symbiotic relationships with the root systems of most vascular plants. They benefit the plant host by increasing root area, and enhancing the plants' ability to take up nutrients and moisture. This is especially important in nutrient-poor soils, when plants are getting established, and during dry years.

“Elderberries greatly benefit from inoculation with mycorrhizae because they don't have fine root systems. They have very big, chunky root systems, and so they have a hard time absorbing all the micronutrients they need from the soil. Mycorrhizae effectively increase their root zones. A grower study was done using elderberries, black currant, and aronia to try to determine which particular mycorrhizae are best for each. We found out that the best thing to use is just good, finished compost to get the mycorrhizae going.”

—Terry Durham, in Country Folks Grower, <http://cfgrower.com/growing-elderberries-a-new-market-for-u-s-farmers/> For the report on this Sustainable Agriculture Research and Education (SARE) funded study, search the SARE archive for [report no. FNC08-745](#).

GROWER TIP:**How Much Compost to Use?**

Elmore Roots recommends applying a wheelbarrow of compost per bush, per year for the first three years. *“A wheelbarrow of compost per bush for the first three springs will keep the grass competition down, feed the newly growing and spreading roots, and keep moisture in.”*

— David Fried, Elmore Roots

Bed Preparation

Elderberry has a mat-like root system and young plants do not compete well against more aggressive species, so good bed preparation is essential. Bed preparation can begin as early as one year before planting, by adding amendments such as ground limestone, phosphorus, potassium and organic matter in the fall before planting the following spring. If you are planning on planting in an old hayfield or other land where there will be heavy weed pressure, you also might want to plant a cover crop the fall prior to planting the elderberry.

The conventional approach to bed preparation uses tillage to prepare the rows and alleys (see side page on no-till approach). Eliminate any perennial weed species in the field prior to planting by repeated tilling. Remove perennial weeds, including their roots. Amend the rows with any amendments indicated by the soil test and compost. Plant the cuttings or potted bushes into the rows.



Landscape fabric as weed control around plants that are getting established.
(Tori Lee Jackson, University of Maine Extension)

GROWER TIP:

Use Corrugated Cardboard Instead of Landscape Fabric as a Weed Barrier for Small Areas

If only planting a few bushes in a small area, sheets of corrugated cardboard can be used instead of landscape fabric as a weed barrier. If using cardboard place it *beneath* the compost and mulch instead of on top of it as one would with landscape fabric.

GROWER TIP:

The Benefits of Ramial Mulch

Ramial is a particularly good mulch for fruit trees. Ramial is chipped wood made from the branches and young stems of deciduous trees less than 3 inches in diameter. Ramial chips have a higher ratio of cambium to cellulose than chips made from heartwood, so it is higher in nutrients and has the ideal carbon to nitrogen ratio for promoting soil fungi and building organic matter – it effectively acts a slow-decomposing compost. Mulch at least 2- to 4-inches in depth.

– John Hayden, The Farm Between

GROWER TIP:

A Cautionary Tale on Mulching

“Meadow voles love straw and woodchips. Keep mulch away from the stems, as the bushes will root into the mulch and then you will have to keep it mulched forever at that height or those roots will die.”

– David Fried, Elmore Roots Fruit Tree and Berry Nursery

After planting the elderberries, the rows should be mulched with three to four inches of woodchips, ramial or straw (see description of ramial chips in the sidebar) and the alleys or middles between the beds should be sown with a cover crop of a mix of slow-growing grasses, such as hard fescue and dwarf perennial rye grass, or white clover. The compost and mulch is then covered with strips of landscape fabric, held down with 8-inch staples on either side of the row to control weeds. The landscape fabric should be taken up in the fall to prevent rodents from nesting under it as they may girdle the bushes. The fabric can be replaced in the spring, although once the bushes are large enough, they will shade out most weeds and the fabric will not be necessary.

Even with a heavy layer of mulch during the first two years, monitor the plantings for weeds and weed by hand as necessary, paying special attention to remove grasses. If using tools, only cultivate to a depth of less than two inches to prevent damage to the elderberry’s shallow roots. Once the bushes are tall, the plants can, to a good extent, suppress weeds on their own.

NO-TILL BED PREPARATION

Organic farmers John and Nancy Hayden use no-till methods for planting their elderberry beds. They avoid tilling because tilling inverts the soil layers and mechanically breaks down organic material.¹ Tilling also introduces a lot of oxygen into the system, feeding oxygen-loving bacteria which speed the breakdown of organic matter, and creates a soil matrix that favors bacteria. In contrast, a no-till system builds up organic matter and favors fungal microorganisms, such as mycorrhizae.

1. Conduct a soil test to assess whether any specific nutrients need to be amended.
2. Without tilling the bed, plant directly into the area where you want the elderberry bushes.
3. Top dress each plant with compost and any other soil amendments as indicated by the soil test.
4. Put down a layer of mulch or deciduous woodchips.
5. Use a barrier material (either cardboard or landscape fabric, depending on the size of the planting) for weed control.
6. Frost seed a cover crop in the alleys between the rows of elderberry plants. White clover is an excellent cover crop and will attract beneficial insects.
7. Allow flowering plants such as clovers, asters, goldenrods and milkweeds to grow in the alleys to provide habitat for pollinators and other beneficial insects. Stagger mowing the strips so there are always some flowering plants for beneficial insects.

–John Hayden, The Farm Between



A new planting of elderberry bushes with a cover crop of clover between the rows at The Farm Between. There are three rows of Elderberry on the left and one row of Aronia on the right under landscape fabric. (Ginger Nickerson, UVM Extension)

⁵ Organic material consists largely of plant residues decaying in the soil. As microorganisms break down the organic material they release nutrients into the soil that become available to plants and create humus or the more stable organic matter (OM). Humus or OM increases the soil’s ability to aggregate or clump together, to attract and retain nutrients, and to hold water and carbon.

EXPERT OPINION:
Diversity and Resilience

“We would never have just a monocrop of anything. We are always trying to maximize biodiversity to provide habitat for beneficial organisms and to avoid putting all of our eggs in one basket. If you have a monocrop, you are simplifying the system and just asking for trouble with pests and diseases.”

– John Hayden, The Farm Between

GROWER TIP:
Score and Loosen Pot-Bound Roots

Plants that have been grown in pots for long periods of time may become pot-bound. If roots are tightly packed and girdling one another they should be loosened or scored prior to planting

– David Fried, Elmore Roots Fruit Tree and Berry Nursery

GROWER TIP:
De-head in first year to help plants establish

The first year after planting, cut off the flowering heads. You can harvest a few berries the second year after planting. By the third year, the plants should start to bear well.

– Terry Dunham in [Country Folks Grower, April 26, 2013](#)

The Middles are Just as Important as the Crop

Ben Waterman, a blueberry farmer in Johnson, Vermont, notes that growers can save themselves a lot of time and labor by paying as much attention to the middles or alleys between the rows where the crop is planted as they do to the beds in which the crop is growing. This is especially important when planting into an old hay field. If you are planting into an old hay field, Ben recommends starting with a clean slate and first eradicating perennial weed pressure, then establishing turf species, such as low-mow hard fescues or dwarf perennial rye grasses in the middles. Pollinator plants can also be seeded into the middles as habitat. NRCS now has a program to assist with pollinator habitat through the [Environmental Quality Incentives Program \(EQIP\)](#), talk to your local NRCS Conservation Officer for more information.



A middle alley between rows of blueberry bushes, planted with a mix of dwarf rye and white clover. Clover is a low-growing legume that will add nitrogen to the system, is easy to manage with a small mower, and will provide food for pollinators. (Ben Waterman, Waterman Berry Farm)

Establishment

Planting

Planting can be done in either the fall or spring, as long as the bushes are watered and are not allowed to dry out after planting. Spring planting has the best rate of success, provided you have done a good job of site preparation the year before. Planting in the fall can be more risky unless the plants have adequate time to send out new roots and become well anchored, otherwise, fall plantings can suffer from frost heaving, leading to weak or dead plants the following spring (Charlebois et al., 2010).

Before planting potted plants, prune off damaged or broken roots or stems, and cut back the top portion of the canes to 8 to 10 inches. Plant with the lowest branch at or just below the soil line. Water the entire root zone thoroughly just after planting and weekly afterwards if there is no rain (Roper et al., 1998). Plants should receive 1- to 2-inches of water per week while getting established in their first growing season. During the first establishment year, remove the flowering heads to prevent the plant from putting energy into fruit development and to encourage the development of good root system (Byers et al., 2014).

EXPERT OPINION:
Benefits of Wider Spacing

"I prefer wider spacing to allow for adequate air flow and for a lawn tractor to get easily down the rows. Weeds can be managed with good mulching and hand-pulling near the plants."

- Tori Lee Jackson, University of Maine Extension

Spacing

The recommended spacing for elderberry varies from grower to grower. Spacing can be as minimal as 1-foot between plants (the current spacing employed by River Hills Harvest in Missouri) to as much as 12-feet between plants. The enterprise analysis in this guide uses Vermont grower recommendations of 6-foot x 12-foot spacing (six feet between plants and twelve feet between rows).



As the bushes grow, the space between them will quickly fill. (Tori Lee Jackson, University of Maine Extension)

More space allows the plants room to grow and yield more, and provides better air circulation to help prevent the spread of fungal diseases. But larger spacing will also mean increased weed pressure (Charlebois et al., 2010). Some growers find it easier to get in and cultivate, prune and harvest between the individual bushes if there is more space between them. Other growers appreciate denser hedge-like plantings because they shade out weeds and can make harvesting efficient. While hedge-like rows may optimize harvest efficiency, the efficiency comes at the expense of yield per bush as a denser spacing will inhibit growth between bushes and make picking berries in between bushes harder, resulting in lower yields per bush (University of Missouri). More room between bushes also makes it easier to weed and clean debris between bushes and maintain lower humidity. Because these sanitation practices are important for keeping pest populations down, we recommend the 6- x 12-foot spacing.

Table 2: A Sampling of Spacing Options

Feet Between Plants	Feet Between Rows	Plants Per Acre ¹
4	8	1,361 ¹
4	10	1,089 ²
4	12	908 ³
6	10	726 ⁴
6	12	605 ⁵
7	8	778 ⁶
7	12	519 ⁷
8	10	545 ⁸

When determining the width of rows between plants, keep in mind that the rows will have to be mown and plan for the width of the machinery used for mowing. You will also need to take into account the maximum spread of the largest cultivar planted. Some cultivars can grow up to 15-feet tall

⁶ Sources: ¹Hearthstone, 2011; ²Byers, 2014; ³Byers, 2014; ⁴Hearthstone, 2011; ⁵Way, 1981; ⁶Hardie and Hayden, 2015; ⁷Hearthstone, 2011; ⁸Hearthstone, 2011; ⁹Carroll, 2014.

GROWER TIP: Sideshoots

The side shoots are like the shoots from strawberry or raspberry plants – they can fill in a row or be used to start a new row. You can save a lot of money on plants by using these shoots as new plants: by separating and planting them, or by counting on them to come up, and therefore starting with fewer plants and letting the shoots fill in between plants. This works particularly well if you are growing them along a stream bank or river or in a hedgerow.

– David Fried, Elmore Roots Fruit Tree and Berry Nursery

GROWER TIP: Landscape Fabric Mulch

“We use landscape fabric as an organic herbicide. It does a great job of controlling weeds in an environmentally friendly way.”

- John Hayden, The Farm Between



under favorable conditions, with a 10-foot spread (Charlebois et al., 2010). In order to provide adequate space between plants for access for pruning and harvesting, Charlebois et al. recommend planting cuttings 6.5- to 8-feet between plants, with 10- to 12-feet between rows.

While larger spacing between bushes may increase the need for good weed management, growers note that it's easier to manage weeds with a tractor or mower when there is wide spacing between the rows.

Elderberry bushes will send up side shoots. Although the roots are fibrous and shallow, only going down about 8-inches in depth, they can spread up to 7-feet away from the base of plant (Charlebois et al., 2010). Regularly mowing side shoots is an effective method of controlling the spread of elderberry bushes. These shoots can also be dug and transplanted to expand your planting.

Weed Control

Elderberries do not compete well with weeds, especially during the establishment phase. Mulching will greatly reduce competition from weeds and support the viability of the crop and yields. Mulch to about 4-inch deep with wood chips or bark and hand-remove any weeds that come up until the canopy forms. For extra weed control, and to retain moisture and minimize the need for irrigation, place strips of landscape fabric on either side of the plants secured with 8-inch staples. Remove the fabric in the fall to prevent voles from nesting under it and girdling the plants.

Planting in former hayfields is especially precarious because hayfields have a strong predisposition to harbor weed seeds and perennial grasses that can be very competitive. One grower discovered this the hard way when they did not adequately till, de-nude the hayfield of weeds and plant a cover crop before planting their bushes. The weeds out-competed the elderberry to the point that the bushes were stunted, unproductive, and the planting would be difficult to salvage for commercial production. If planting in a former hayfield take extra precautions, such as planting a cover crop for one season before planting the elderberries.



Three-year-old, 400-bush elderberry planting outcompeted by weeds. (Tori Lee Jackson, University of Maine Extension)

GROWER TIP: *Mulch Mowing*

“We spread several semi loads of mulch around the plants. Then when we mow, we use a mulch mower with a front discharge mulcher to throw the clippings onto the row to become additional mulch.”

– Terry Dunham in Country Folks Grower, April 26, 2013 <http://cfdgrower.com/growing-elderberries-a-new-market-for-u-s-farmers/>



Mowing the elderberry orchard at Thornhill Farm, Greensboro, Vt. (Ginger Nickerson, UVM Extension)

Irrigation



Irrigation hose between bushes. (Tori Lee Jackson, University of Maine Extension)

Because of their shallow root system, it is important to make sure elderberry bushes receive sufficient water and their roots do not dry out while getting established, especially during the first season. Generous applications of compost and mulch will go a long way to help retain soil moisture, but the bushes will require more moisture during dry periods and when the fruit is ripening, and watering may be necessary. While smaller plantings can be hand-watered, for larger plantings, drip tape can act as an “insurance policy.” It may not be needed in some years, but in dry years irrigation can mean the difference between failure and a profitable crop. One grower interviewed for this study noted that he lost half his 2015 crop due to dry conditions in the summer. He watched as berries literally dropped off the branches. Plan to provide 1- to 2-inches of water per week when rainfall is inadequate. If using drip irrigation, the standard size is 0.5-inch plastic lines with emitters spaced at 18 to 24 inches.

EXPERT OPINION: *Irrigating*

“We prefer to avoid irrigating with drip tape as much as possible. If it is necessary to do an emergency watering when conditions are really dry, we’ll put a water tank on a truck and water with a hose.”

– John Hayden, The Farm Between

Summing up the Importance of Establishment Preparation

The key to a long-lived, productive elderberry orchard is proper establishment and soil preparation. Although elderberry is native to our region and does not require significant infrastructure, the bushes will not provide the commercial yields identified in this report unless given the opportunity to thrive. Growers who have not put the time and effort into proper bed preparation, irrigation, and weed control have found that their plants take longer to mature than anticipated, and expenses exceed revenues.

THOUGHTS FROM SMALL-SCALE GROWER MARIE FROLICH

*I grow 10 bushes. I have been growing them for years – for so long that the nursery I purchased them from is no longer in business! They seem very resilient. I think they are *S. nigra*, which were the only type commercially available from the nursery back then (Smallwood Nursery, Williamstown, Vt.). I also have some unknown cultivars from a friend’s garden. I usually get up to 10 to 15 pounds per bush on my best four bushes. I do also harvest my flowers.*

My four main elderberry bushes were completely girdled last winter and shot up huge this spring when I thought they were all dead. I’ve cut them back halfway (see picture below) to see what kind of crop I’ll get now. I mulched last year but I think this is what brought the rodents in so I will not be mulching this year. When the bushes get too tall they can be difficult to harvest. I pull out the older canes each year.



Marie’s pruned canes (Marie Frolich)

I used a 4-foot by 4-foot spacing but if I were to do it again I would give myself more spacing to make it easier to get in between the plants for harvesting.

This year the birds were eating the berries before they were ripe, before they even got red, this was very unusual!

I dry and freeze my berries and use them in various products. I make a “fire-cider kit” with the dried berries for winter medicine, and use fresh and frozen berries to make an elderberry-plus tincture, which includes other herbs that I sell at farmers’ markets.

-Marie Frolich, Grower in Williamstown, Vt.

EXPERT OPINION: *Burning vs. Burying Pruned Canes*

“We do not burn canes because one of the benefits of woody species is carbon sequestration – burning the canes would just undo that benefit and put carbon back into the atmosphere. Instead, we bury old canes in Hugelkultur berms, but we are careful not to put them near any elderberry plantings to avoid the potential spread of pests and disease.”

—John Hayden, The Farm Between

RESEARCH: *Selective vs. Complete Pruning*

Researchers at the University of Missouri subjected different cultivars to four different pruning regimes:

- 1) Removing all the shoots every year
- 2) Removing all of the shoots every other year
- 3) Selective pruning every year (the method discussed in this guide)
- 4) No pruning.

They found that while annual selective pruning remains an excellent method and maintains high yields, annual or biannual pruning to the ground resulted in slightly lower yields in that those plants produced fewer, but larger fruiting cymes; but also required less labor in that mowing is simpler and faster than selectively cleaning out individual canes. Pruning treatment also affecting the timing of flowering and fruit ripening in that plants that flowered only on new stems (the annual and biannual pruned to ground treatments), ripened 14 to 21 days later than the plants that fruited on old canes.

—Thomas, A.L., Byers, P.L., Ellersieck, M.R. Productivity and Characteristics of American Elderberry in Response to Various Pruning Methods. HortScience 44(3): 671-677, June, 2009.

Maintenance

Pruning

For best fruit production and pest management, once established, bushes should be pruned each year (Charlebois et al., 2010). Pruning helps improve production in several ways:

- eliminates older, less productive growth
- removes diseased or insect-infested wood
- reduces cane and branch density allowing more light and air movement into the bush, reducing diseases
- reduces competition for resources within and between plants; resulting in larger, higher quality fruit, and better harvest efficiency

Elderberry bushes will send up new canes or primary branches each year. It usually takes five years or more for bushes to reach full height, depending on the cultivar. Beginning in the second year, bushes will also send out lateral branches. Flowers and fruit develop on the tips of that season’s canes and lateral branches. The best yield is usually on the second year canes with lateral branches (Cornell University, 2015). As the number of berry clusters increases, the size of the clusters will diminish if the bushes are not pruned (Charlebois et al., 2010).

New plants that are getting established do not need to be pruned during their first two years. After the second growing season, bushes should be pruned in the late winter, well before the bud-break when plants begin to grow. Remove all canes that are dead, damaged or over three years old. Leave an equal number of one, two and three-year old canes (Cornell University, 2015). Depending on the cultivar, each bush should have 6 to 10 canes total. Any pruned canes that are suspected of harboring pests or diseases should be buried away from the elderberry orchard to prevent reinfection.



Elderflowers, mostly open. Tori Lee Jackson, University of Maine Extension

EXPERT OPINION: *To Prune or Not to Prune*

“At Elmore Roots we rarely if ever prune, yet have three- to five-pound harvests of high quality certified organic berries per bush most years. We also know that Lewis and Nancy Hill were growing elderberries that were still fruiting heavily 20 years after planting with little or no pruning.”

- David Fried, Elmore Roots Fruit Tree and Berry Nursery

Different cultivars have different growth forms. More information about how to tailor pruning methods for specific cultivars can be found in [“Elderberry, Botany, Horticulture, Potential” by Charlebois et al., 2010.](#)

Disease and Pest Management

When considering growing elderberries as a commercial crop it is important to understand factors that may affect annual yields. While elderberries are native to the northeast and relatively hardy, they are still susceptible to certain diseases and pests. In particular, the insect Spotted Wing Drosophila (SWD) is becoming a major concern and growers should be aware of the potential for contamination from tomato ringspot virus.

Disease

In 1981, a bulletin published by Cornell University’s Roger Way, indicated that tomato ringspot virus (“Tom RSV” aka “ToRSV”) was a serious problem commonly encountered with elderberry. Tomato ringspot virus is spread by nematodes in the soil and by pollen. It causes a weakening that can slowly kill the plant over several years and inhibits plants from yielding a productive harvest. Bushes often show no clear sign of infection, but a conspicuous yellowish ring on the leaves can be an indication of infection. In addition to Tom RSV, elderberry can be susceptible to tobacco ringspot virus, a rod-shaped virus similar to the potato X virus, and white pine blister rust. According to Vermont growers and Tori Lee Jackson of University of Maine Extension, there have been no documented cases to date of Tom RSV impacting growers in Vermont or Maine.

White Clover, Nematodes and Tom RSV

Because nematodes are a vector for tomato ringspot virus (Tom RSV), and white clover is a host plant for nematodes there is some concern about using white clover as a cover crop. A mix of slow-growing grasses, such as hard fescue and dwarf perennial rye grass can be used as a cover crop in place of white clover.

-David Handley, University of Maine Extension

Farmers in New England can test for nematodes by sending soil samples to the [University of Massachusetts Tree Fruit and Small Fruit Diagnostics Lab](#). The lab’s general recommendation is to take twenty, 1-inch diameter soil cores per 1,000 square feet of area to be planted with elderberries. Take the sample cores about 6 inches deep. Put all of the samples in a bucket and stir them up well and send them to the UMASS lab (look on their [website](#) for the form and fees). If you already have elderberry plants in the soil, take the soil samples from the root zone around the plant; if you are taking the samples prior to planting, take the samples randomly.

EXPERT OPINION: *S. nigra* and Tom RSV

Cornell Extension researcher Stephen McKay notes that *S. nigra* is more resistant to Tom RSV virus than *S. canadensis* cultivars (McKay, 2004). The 1981 report by Roger Way also posited that *S. nigra* may be more tolerant of viruses because it crops well even when infected.

GROWER TIP: *Soil Fertility and Resiliency*

“We have not seen any diseases. That may be because we put so much effort into building soil fertility so the plants are strong and healthy.”

—John Hayden, The Farm Between

EXPERT OPINION: *Mowing Middles*

Keep your ground cover cut short. This lowers the humidity around the plants, and you’ll have fewer problems with diseases.”

—Terry Dunham in Country Folks Grower, April 26, 2013 <http://cfgrower.com/growing-elderberries-a-new-market-for-u-s-farmers/>

GROWER TIP: *Develop Intervention Thresholds for Pests*

“We take a wait and watch approach with most pests. Interventions for pests can be costly and stressful compared to just observing – can the plant tolerate the pest? Will a natural predator take care of it so we don’t have to do anything?”

—John Hayden, The Farm Between

RESEARCH: *Testing Maine’s Wild and Cultivated Elderberries for Tomato Ringspot Virus (Tom RSV)*

Maine is home to the largest producer of certified organic elderberries in the U.S. (Eldertide Farm in Dresden), and there is increasing interest in the commercial production of elderberries in the state. However, University of Maine Extension was concerned that tomato ringspot virus (Tom RSV) may limit the productivity of Maine’s current and potential commercial elderberry producers as there is no treatment or cure.

In order to learn more about the potential for this disease in Maine, tissue samples were tested at an independent lab during the summer of 2015 to determine the presence or absence of Tom RSV in both wild and cultivated elderberries from around the state.

Research Summary: Tissue samples were taken from fifteen locations in June and July, 2015. They included samples from the towns of: Freeport, Monmouth (2), Pownal, Livermore, Turner, North Berwick, North Waterboro, Orono, Dresden, Caribou, Ellsworth, Bethel, Belgrade, and Augusta. Overall, samples were taken from a total of 57 plants. Analysis from an independent laboratory found no Tom RSV in any of the samples.

—Tori Lee Jackson, Extension Educator, Associate Professor of Agriculture and Natural Resources, University of Maine Cooperative Extension

Pests

Until recently, pests did not seem to be a significant problem for elderberries. This may be because elderberries typically have not been grown at such a large scale as to attract pest infestations and because some of the pests we are now seeing, such as spotted wing drosophila (SWD) are new to our region. Vermont growers have found Japanese beetles, stem or shoot borers (also known as cane borers), aphids, leaf wrinkling (*Eriophyid*) mites, birds, moles, voles and deer impacting their elderberry harvests. Most of these can be kept to manageable levels. The pest of greatest concern to date is spotted wing drosophila (SWD).

Until the arrival of SWD, which was documented in Vermont elderberries as of 2014, only stem borers were documented as having presented a significant negative impact on elderberries in the northeast (McKay, 2015). Cornell researchers Stephen McKay and Roger Way recommend growers be sure to purchase root stock free of stem borers and certified virus-free prior to planting. Stem borers can usually be managed by monitoring, removing the adults by hand, and pruning out canes that appear to be infested with larvae. Despite being subject to these pests, McKay considers elderberry along with Aronia, gooseberry, and black and red currant to be “grower friendly, sustainable crops” for the Vermont/New England region (McKay, personal communication, 2015).

GROWER TIP: *Prune to Ground to Control Shoot Borer*

Some growers in Missouri who are experiencing losses due to shoot-borers are experimenting with mowing the canes down at the end of each season as a way to reduce borer pressure. This may also make harvesting more efficient as the next year's canes will all be of a similar height, but this will result in a slight decrease in yield.

GROWER TIP: *Chickens as Japanese Beetle Control*

A grower in Missouri controls Japanese beetles by allowing his chickens to peck in the elderberry plantings. *"In the early morning, the beetles are lethargic, and dew on their wings impairs their ability to fly. Knowing this, each morning we pulled on our walking boots, raked the infested foliage with some scavenged branches, and had our chickens feast on the falling pests. Homegrown solutions: 1, pests: 0"*

—Hayes, 2015

Note: this would not be allowed in a certified organic operation as there must be a 120-day gap between presence of raw manure (chicken poop) and harvesting of the edible crop.



Adult Elder Borer (aka Elderberry Longhorn Beetle) *Desmocerus palliatus* (Ginger Nickerson, UVM Extension)

The adult beetles of the elder borer beetle (aka elderberry longhorn beetle, *Desmocerus palliatus*) feed on leaves and flowers. The beetles lay eggs near the base of the plant, where the larvae burrow into the roots of the plant, where they take two years to mature. When almost mature, the larvae burrow upwards into the canes before emerging again as adults to feed on the foliage. They usually do not cause significant economic damage and can be controlled by crushing the adult beetles and pruning out infected canes.

Elder shoot borer (*Achatodes zae*) is a moth with somewhat similar habits to the elder borer. The larvae, also known as "spindle worm" are distinguished by the rows of black dots the length of their bodies. They hatch in April or May to feed on young leaves and progressively bore into first the lateral shoots and then move towards the ground and the lower sections of the primary stems. They then feed upward as they mature, killing the infested cane. Around June the larvae burrow into dead canes to pupate. Once they pupate, the adult moth will lay eggs in July and August in mature canes. Monitor for both the elder borer beetle and the elder shoot borer by looking for canes with holes and small piles of sawdust-like frass. Prune out and destroy these canes.

Japanese beetles (*Popillia japonica*) will feed on elderberry leaves, but they usually do not cause economic damage and can be controlled by hand removal. Do not use traps for Japanese beetles – as the traps will only attract the beetles to your property. The beetles may make elderberry leaves look a little ragged without impairing the overall health of the plant or economic yield. Tachinid flies will parasitize Japanese beetles and can do a good job of keeping them under control. Plants in the dill and aster families provide habitat for tachinid flies and other beneficial insects. Virginia creeper and raspberries will also attract Japanese beetles, and you might want to remove these if they are growing near elderberries. Japanese beetles can be knocked into containers of soapy water in the early morning.

RESEARCH: *Spotted Wing Drosophila*

Information on the use of small mesh exclusion netting can be found in a Northeast SARE report from New York Berry Grower Dale Ila Riggs by searching the SARE Project Report database at www.SARE.org for Project number FNE14-813.



Japanese beetle on elder leaf. Elderberries can withstand a fair amount of foliar feeding by Japanese beetles without damage to the crop. (Ginger Nickerson, UVM Extension)

Spotted wing drosophila (SWD) is likely to be a serious pest. Some farms in the northeast have lost 50-percent of projected yields due to spotted wing drosophila. Using barrier methods, and beginning in the first growing season, may be one of the most effective organic methods of protecting crops from SWD. Small mesh netting (less than 1 mm mesh) will keep out SWD. It can be placed over the entire bush using a simple supporting structure made of wood, metal or plastic posts. The structure should leave enough head space over the plants to allow ease of movement for people harvesting within it. The netting would be placed over the structure and anchored with weights to the ground. A double-curtain type of door can prevent flies from entering as workers enter and leave. Place the netting over the planting as soon as the fruit starts to color and remove it after harvest. This will maintain the life of the netting for many seasons. This netting will also exclude birds and Japanese beetles.

Plantings should be monitored for the presence of SWD with simple traps baited with apple cider vinegar before the fruit begins to ripen. Cornell, Michigan and UMass Extension have detailed factsheets on SWD monitoring and control available on the internet (search for “SWD monitoring”). If using netting, monitoring traps can be set inside the nets.



Monitoring trap for SWD (Ginger Nickerson, UVM Extension)

GROWER TIP: *Protecting Against SWD*

John and Nancy Hayden at The Farm Between are experimenting with covering the cymes with “footie socks” (the short nylon socks typically used by shoe stores for trying on shoes) attached with twist ties. These socks have a fine enough gauge mesh to obstruct Spotted Wing Drosophila from laying its eggs on the berries, while maintaining air flow for the crop to breathe. They chose this method instead of covering the bushes with fine mesh netting because the SWD can live in the soil under the bushes and they did not want to trap the insects inside of the netting. They had good results from preliminary trials in 2015; however, hand-covering each cyme may not be commercially viable for farms with larger plantings. The Haydens are also considering increasing the percent of flowers harvested rather than leaving them to mature into berries as a strategy to mitigate against berry crop loss from SWD.



Nylon “footie” sock on berry cluster provides protection from SWD and birds.
(John Hayden, The Farm Between)

Certified organic growers are allowed to use Entrust® for SWD control on elderberry. The special use label for SWD is at <http://www.cdms.net/ldat/ld62B006.pdf>. The general label for Entrust lists elderberry but not SWD. Growers can look up pesticides approved for elderberry on the [Organic Materials Review Institute \(OMRI\) Products List](#).

However, before using approved pesticides, certified organic growers must first use practices that manage for pest prevention. Given that Entrust and Pyganic are toxic to pollinators they should be used only as a last resort and applied with the lowest possible human and environmental risk.

Pollinator sanctuary
signage at The Farm
Between (Ginger
Nickerson, UVM
Extension)



Eriophyid mites (*Phyllocoptes spp.*) are microscopic insects that cause cupping and crinkling of leaves. While the damage may look awful, most plants can tolerate the damage and using pesticides can actually make infestations worse. The University of California Integrated Pest Management website states that: *As Eriophyid mites are a source of food for predatory mites, using broad spectrum pesticides that will also kill the predatory mites, will only make Eriophyid problems worse. Eriophyid mites are more likely to reach high densities in sprayed orchards where predaceous mites are destroyed. Treatments are only recommended in orchards with chronic infestations or when there is a danger of defoliation* ([University of California Pest Management Guidelines](#)). Eriophyid mites overwinter in bud scales. Prune out and remove badly infected canes to control the mites.

The elderberry gall midge makes galls in the flowers. Spraying pesticides to try to control the midge can make the problem worse. The best practice is to prune out branches with galls.



Cupping and crinkling of leaves from Eriophyid mite.

(Patrick Byers, University of Missouri Extension)



(Jennifer Brown, UVM Extension)

GROWER TIP: *Eriophyid Mites*

“We saw mites this year. They showed up for a couple of weeks during the summer, did some cosmetic damage and then were done. The damaged leaves persisted. When I looked at them under the microscope, there was also a healthy population of predatory mites.”

- John Hayden, The Farm Between

Table 3. Common Elderberry Pests and Control Strategies

Pest	Damage	Sign	Control
Spotted Wing Drosophila	Lay eggs in developing fruit.	Larvae hatch in infested fruit, may drop to the ground around harvest.	Exclusion netting or nylon socks over berry clusters, beginning in the first growing season if possible. Use traps to monitor for presence and amount of pest.
Shoot Borer (aka Cane borer or spindle worm)	Lays eggs in exposed pith of tops of broken canes in summer and larva burrow down length of stem, hatch the following spring.	Cane dies. Small piles of sawdust on the ground at base of older canes.	Prune all damaged canes, chop and bury or burn at distance from orchard.
Elder Borer beetle	Wilting of new growth, cane death.	Small piles of sawdust on the ground at base of older canes.	Smash adult beetles. Prune out infested canes and shoots annually. Bury or burn all prunings at distance from orchard.
Eriophyid mites	Crinkled and cupped leaves	Crinkled and cupped leaves	Spraying will kill natural predators and can make problem worse. The mites overwinter in bud scales. Prune infected branches down to the ground. Remove from orchard.
Japanese beetles	Lace-like feeding damage on leaves. Plants can sustain a fair amount of damage from Japanese beetles.	Clusters of beetles.	Traps will attract beetles. Encourage plants in the dill family to attract beneficial predators. Hand pick beetles in the morning into soapy water.



Jenny Brown, UVM Extension

SEVEN COMPONENTS OF INTEGRATED PEST MANAGEMENT



Elderberry Orchard in Maine (Tori Lee Jackson, University of Maine Extension)

Proper Identification. Know your pests, and make sure you are connecting the perceived damage to the actual cause. If a beneficial insect is doing a good job of keeping a pest under control, treating a perceived problem with a broad spectrum pesticide may end up making the problem worse.

Learn pest and host life cycle and biology. By the time you see evidence of a pest, it may be too late to control it effectively with biological methods. Learn the life cycle stages of pests and the best times to control them.

Monitor a sample area. Get to know one area of a planting well. Monitor for presence or absence of pests. Are they distributed evenly or only in patches. Are their numbers increasing or decreasing? Do they change under different weather conditions? Do they have parasites?

Determine your action threshold. Often, plants can tolerate a fair amount of pest damage, especially if the damage is aesthetic or to the leaves and not the flowers or berries. The action threshold is the point at which the cost of damage is greater than the cost of controlling the pest.

Choose management strategies. Usually there is more than one method available for controlling the pest.

These include:

- cultural methods – minimizing the food, water and shelter needed by the pest
- physical methods – preventing pests from accessing the plant with barriers, traps, pruning or tilling
- genetic methods – selecting pest-resistant cultivars
- biological methods – use of predators parasites and diseases of the pest to control it
- chemical methods – chemicals that will kill the pest, these vary a great degree in terms of how toxic they are to non-target organisms and how long they persist in the environment

Only use chemical controls when all other (cultural, physical, genetic) control methods fail. If you choose to use chemical controls, be sure you understand how long they will persist and their impact on beneficial organisms. If you have any questions about what products are allowed, contact the Vermont Organic Farmers office: 802-434-3821, vof@nofa.org or talk to your certifier.

Evaluate results. Keep records for next year.

How did the action work? Would you take the same action in the future?

Adapted from PennState Extension Pennsylvania Integrated Pest Management “Six Steps of Integrated Pest Management”

<http://extension.psu.edu/pests/ipm/schools-childcare/schools/educators/curriculum/contents/sixsteps>

ORGANIC CERTIFICATION BASICS

The Vermont Organic Farmers (VOF) Certification Guidelines provide general guidance for growers wishing to be certified in organic practices. The Guidelines are available on the VOF website <http://nofavt.org/vof>. Below are a few of the general guidelines to be aware of, as well as some tips specific for organic elderberry production.

General strategies to consider:

Avoid prohibited substances for at least three years: Fields to be certified as organic should have had no prohibited substances applied for three years immediately preceding the harvest. A list of allowed and prohibited substances can be found in the full VOF Guidelines Book on the VOF website: <http://nofavt.org/vof/resources-guidelines/guidelines>.

Begin with certified organic stock: Purchase certified organic stock from a local nursery, or propagate plants from cuttings from certified organic plants. If selling stock yourself, it must be grown out for one year before selling it as organic nursery stock.

Consider no-till bed preparation and weed control: Reducing tillage will promote soil health by building up organic matter and favoring beneficial fungal microorganisms such as mycorrhizae.

Develop tolerance for some plant damage: You do not necessarily need to take action every time you see pest activity. Plants can tolerate and compensate for a fair amount of pest activity before the crop will be affected. For example, Japanese beetles may make elderberry leaves look a little ragged, without impairing the overall health of the plant or economic yield. Tachinid flies will parasitize Japanese beetles and can do a good job of keeping the beetles under control. Wild parsnips and other plants in the dill and aster families provide habitat for tachinid flies and other beneficial insects.

Soil fertility: Continue to top dress the bushes with compost every year to two years. A ramial mulch will continue to add a slow release of nutrients.

Maximize biodiversity: Provide habitat for the birds and insects that will naturally keep pest populations down. Promote flowering plants such as clovers, asters, goldenrods and milkweed in the strips between elderberry rows, and then stagger mowing the strips so there are always some flowering plants available for beneficial insects.

Only use (OMRI approved) chemical controls when all other (cultural, physical, genetic) control methods fail: If you have any questions about what products are allowed under organic certification, contact the VOF office: 802-434-3821, vof@nofavt.org or talk to your certifier.

Build organic matter to reduce need for irrigation: While it is important that new plantings do not dry out while getting established, it may be possible to avoid using drip tape or other expensive irrigation measures. If you have different types of soils on your property, plant elderberries in heavier soils with more organic matter as they will hold moisture better than sandier soils. Ramial mulch will help retain moisture and reduce the need to irrigate.

Keep records of practices: Certified organic producers are required to keep records of all production activities. The VOF Guidelines list the records required.



Elderflowers (Tori Lee Jackson, University of Maine Extension)

GROWER TIP: *Aluminum Bird Scares*

Strips of aluminum foil or noisy, shiny aluminum pie plates help to scare birds away, as long as you don't attach them to the bushes too far ahead of the ripening period. The clever birds catch on quickly and will ignore your devices.

—Lewis and Nancy Hill, Hillcrest Farm, Greensboro, Vt.

Birds

Birds can significantly reduce the amount of harvestable fruit, and may be one of the greatest pressures on commercial production.

While devices to scare birds (humming wires, scare-eyes, tape-recorded calls of predators and air guns) exist, few are effective for long. If the above methods are used, it is essential to randomize their placement and/or timing, otherwise birds will quickly become habituated and ignore the deterrent. Netting is the most sure-fire way to protect the crop from birds. If the mesh is small enough it will serve the dual purpose of also keeping out spotted wing drosophila. Both bird and SWD netting must be removed in the winter or it will be destroyed by snow and ice.



Conduit pipe with bird netting stretched over it covering a row of elderberry bushes at The Farm Between. The soda bottles are used to keep the net away from the bushes and make it easier to harvest. (Ginger Nickerson, UVM Extension)



Bird netting stretched over conduit pipe around an individual bush at The Farm Between. (Ginger Nickerson, UVM Extension)

Deer

Deer can be a problem as they will nibble the growing tips in the winter. The most effective solution for deer is fencing. Because deer have poor depth perception, two rows of tensile fence, slanted at an angle can be used for smaller plantings, while netting may be a more cost effective solution for larger orchards. Deer netting should be at least seven feet high as deer can easily jump over lower heights.



Deer fencing around the trials at the Intervale Farm, Burlington, VT (Ginger Nickerson, UVM Extension)

Harvesting



Harvesting berries in Missouri
(Patrick Byers, University of Missouri Extension)



Freshly harvested flowers
(Abbie Sewall, The Bailey Farm, Freeport, Maine)

Timing

Elderberry takes three to five years to establish and achieve mature harvest yields (Byers, 2014). Partial harvests can begin as early as the second year, but it will take longer to reach maximum expected yields. For example, a planting on a Vermont farm was yielding only two thirds of its full-anticipated production volume in its fourth year.

Flowering should occur for most cultivars in Vermont from mid-June to mid-July with the berries ripening in mid-August to mid-September, depending on the cultivar. Fruits from branches or plants that are in the shade will ripen later than those in full sun. Not all cultivars ripen at the same time and even within cultivars and on the same bush, fruit clusters can ripen unevenly over a five- to fifteen-day period. New canes will flower a few days later than older canes, and thus, the fruit on new canes will tend to ripen later than berries on more mature canes. The fruit on new canes can ripen 14 to 21 days later than those on secondary branches (Thomas et al. in Charlebois et al., 2010). This uneven ripening is one reason why it is difficult to mechanize elderberry harvesting. Growers should anticipate needing two to three harvest sessions during the window of time their berries are reaching maturity.



(Tori Lee Jackson, University of Maine Extension)
Majority of flowers not ready for harvest.



(Tori Lee Jackson, University of Maine Extension)
The majority on this cyme are open, ready for harvest.

GROWER TIP: *Determining Harvest Time*

If you want to use the blossoms for fritters or for the drink referred to as “blow,” pick them just after they’ve opened wide.

The berries are ripe when they’ve turned a reddish-black color. We pick entire clusters as units into a basket or box, and wait until later when we’re ready to use them to strip off the chokecherry-size berries. Often the birds race you to the berry patch as soon as the berries begin to ripen, so keep a close watch if you want to win the race!

--Lewis and Nancy Hill, Hillcrest Farm, Greensboro, Vt.

Harvesting flowers: Harvest flowers when all (or the majority) of the flowers on a cyme have opened. Individual flowers can be removed from the stems by gently rubbing them over a screen with a mesh that is large enough for the flowers to drop through. The detached flowers can then be either frozen or dried.



(Tori Lee Jackson, University of Maine Extension)
Berries start out on upright clusters.



(Jennier Brown, UVM Extension)
Clusters often bend with the weight of berries as they ripen. Note the uneven ripening.



(Jennier Brown, UVM Extension)

Berries are ripe for harvest when they reach their darkest color.



(Todd Hardie, Thornhill Farm)

Harvesting berries: The berries start out green, and over six to eight weeks will transition to red and finally a purplish-black when fully ripe (some cultivars may have a reddish-purple-black hue). They will go through significant biochemical changes while ripening: acidity and amino acid content decrease as they ripen, while the anthocyanins, phenols and antioxidant capacity increase (multiple authors cited in Charlebois et al., 2010). Harvest the berries when they are a deep purplish-black or reddish-purple-black. Ripeness is also indicated if, when the berries are squished, the juice is a bright red. If birds are eating the berries that is also a good indicator that they are ready for harvest.

The stalks will bend under the weight of ripe clusters. Occasionally, very large clusters can break the cane, or fall off from the strain of their weight. Growers might want to harvest the flowers from such large cymes to avoid losses of large berry clusters.



Branches bending under weight of heavy clusters. (Ginger Nickerson, UVM Extension)

Harvest Methods



(Tori Lee Jackson, University of Maine Extension)
Ripe and unripe berries on the same bush, different cluster.



(Patrick Byers, University of Missouri Extension)
Ripe and unripe berries on the same cluster.

At present most elderberry growers in the United States, both large and small, are harvesting by hand. The uneven ripening of berry clusters makes mechanical harvesting challenging. The University of Maine Extension will be conducting a varietal trial in 2016 with the goal of exploring cultivars for uniformity of ripening per bush and cyme to help in future cultivar selection for commercial growers in the Northeast.

River Hills Harvest in Missouri has designed a mechanical harvester; however, as of this writing, the cost to fabricate the machine is approximately \$100,000. River Hills Harvest currently has 52 member growers and hundreds of thousands of pounds of berries, yet still notes they will require “a lot more volume” before it becomes feasible to consider investing in building the harvester (interview with Terry Dunham, 2015). As the industry evolves, and demand and pricing for U.S.-grown berries becomes more stable and predictable, mechanical harvesting may become a viable option, until then, berries can be harvested by using shears or severing the stems with fingers, and placing the berry clusters into harvest containers.

GROWER TIP: *Use Square Buckets for More Efficient Storage*

Some growers recommend using square buckets instead of round ones as square buckets can be packed more efficiently into freezers and transportation vehicles with less wasted space than round buckets.



(Patrick Byers, University of Missouri Extension)

Berries can be harvested by clipping the entire cluster into a clean, dry container and later picking out any insects and unripe berries, and separating the berries from the stems. Another strategy is to gently knock the berry cluster against the side of the harvest bucket, so that only the ripe berries fall into the bucket, leaving the stems behind. Yet a third method consists of placing a hardware cloth screen over the top of a bucket and rubbing the berry cluster over the screen so that the ripe berries will drop through the screen into the bucket (this latter technique results in more small stems in the bucket and more damaged berries than either the technique of knocking the cluster against the side of the bucket or removing the berries from the stems by hand).

Once harvested, the berries are very perishable, and can begin to spoil within 2 to 4 hours after harvesting, so it is best to harvest them in the cooler, early part of the day and process them as soon as possible. Refrigerate berries at 35 to 40°F for short-term storage, freeze them at negative 4°F for longer term storage, or dehydrate them.

Rate of Harvest, Benchmarks for Labor and Efficiency

To understand the financial viability of growing elderberry, it is essential to understand the cost of harvesting berries, especially because at present production in the United States relies on manual labor. Unlike other berries, whole cymes of elderberries are harvested at once, allowing for relatively rapid harvesting. However, hand-harvesting and cleaning is labor-intensive, and high labor costs could drive annual operating costs over annual income. While there are few detailed records of the average time one can expect to spend harvesting berries or flowers, following are anecdotes from existing growers and research conducted in Quebec.

Berries

One grower interviewed for this study estimated they harvest an average of 5 bushes per hour. Assuming an average yield of 4.46 pounds of berries per bush, this would result in a harvest rate of 22 pounds of berries per hour. It is important to note that this is an average rate as the size of cymes, and thus yields and rate of harvest, will vary slightly with cultivars.

Flowers

Another grower estimates they hand-pick 5 pounds of flowers with stem attached per hour (picking the entire cyme), with each bush producing an average of 3 pounds of flowers with stems. In Quebec, researchers estimated that growers should be able to pick up to 14 cymes per minute, and 7.59 minutes per pound, which would result in 38 minutes to pick five pounds of fresh flowers (Filière des plantes médicinales biologiques du Québec, 2010).

GROWER TIP: *Processing in the Field*

Growers who sell to River Hills Harvest in Missouri harvest, process and freeze berries directly in the field on the same day they are picked. The berries are destemmed, cleaned, sorted, sanitized and packed straight from the wash station into 4-gallon pails, and loaded onto a freezer trailer. This process is followed to ensure the fruit meets Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs) standards, required by some buyers, including River Hills Harvest. Once loaded, the freezer trailer can remain on site indefinitely (the grower would incur lease and utility expenses), or a truck can be hooked up to the freezer trailer and transport the berries to the centralized warehouse freezer that River Hills leases.

—Interview with Terry Dunham, 2015

GROWER TIP: *Host an Herb Mob for Harvesting!*

By Kate Westdijk, Owner, Spoonful Herbals

Have extra elderberries or flowers or need help harvesting them? Consider hosting an “herb mob” to bring volunteer harvesters to your farm or property, contributing to improved education and access to herbal medicine in our communities! [Spoonful Herbals](#), in collaboration with the Vermont Center for Integrative Herbalism and the Railyard Apothecary and Clinic, organizes community herb mobs, which are groups of volunteers going out in their community to harvest medicinal plants for donation to local sliding-scale herbalism clinics.

Vegetable gleaning events (aka “crop mobs”) are well established in Vermont, largely due to the work of one of our key partners “The Vermont Gleaning Collective” at Salvation Farms. Medicinal plant gleaning is a new concept and we are the first to use the term “herb mob”. While Vermont is a national leader in vibrant local food systems and integrative natural health services, these activities are rarely connected. Spoonful Herbals is stepping into this gap to raise awareness of the opportunities to both “eat local” and “heal local” through education and organizing for a local medicinal plant distribution system. Gleaned medicinals are donated to local herbalism clinics who provide personalized education and distribution to members of the community who typically cannot afford to pay for local, plant-based remedies to support their health and wellbeing.

Elder growers can organize an herb mob independently or in collaboration with Spoonful Herbals to harvest flowers or berries for donation to community herbalism clinics in Vermont. While it is not legally possible to pay the producer directly for the harvested produce, compensation may be available for hosting educational workshops or by sharing a portion of the harvested flowers or berries with the producer (typically 50-percent of the harvest).



Herb Mob harvesting hawthorn berries (Deane Baker)

How to Use Elderflowers



(Tori Lee Jackson, University of Maine Extension)

THE FLOWER

The flowers of the elder (also called “blow”) can be used for such diversities as champagne, pickles, wine, jam, vinegar; strewn in salads, and dried for teas. To date we have sampled them only in “shrubs” and fritters, and found both delicious.

ELDERFLOWER SHRUB

“Shrubs” are fruit or herb-infused vinegar-based syrups, popular in Colonial times.

Place a couple of blossom clusters in a gallon of cold water in a glass jar. Add one lemon cut in 4 pieces, 2 Tbsp. white vinegar, and 1 pound of granulated sugar (or the equivalent in honey). Set the concoction in hot sun for a day, joggling it occasionally as you walk by. Strain, bottle, keep in the refrigerator and use in about 3 weeks. Serve chilled, over ice.

ELDERFLOWER FRITTERS

Make a batter: 1/2 cup flour, 1/2 cup milk, 1 egg, 1/2 tsp. sugar, 1/4 tsp. salt. Holding the stem, dip the flower into the batter and fry in deep, hot fat until light brown. Sprinkle with cinnamon and sugar. This is a favorite delicacy to accompany tea in some parts of Germany.

—Lewis and Nancy Hill, Hillcrest Farm, Greensboro, Vt.

RESEARCH: *Anthocyanins degrade with long-term storage*

“Berries may be stored frozen for a few months before processing; however, research has shown that the health-giving anthocyanins (purple pigments) in elderberry are fragile and easily destroyed by long-term storage, repeated freezing and thawing cycles, and over-processing, resulting in brown fruit (and brown products) with reduced health benefits.”

—Byers, Thomas, Cerusca, Godsey and Gold, 2014. [Agroforestry in Action: Growing and Marketing Elderberries in Missouri](#). University of Missouri Center for Agroforestry.

Post-Harvest Handling and Processing

Berries

Elderberries are very fragile and do not store well. Fresh berries must be refrigerated within four hours of harvesting, and frozen or dried within five days of refrigerating to prevent degradation in quality (Quebec, 2010)Guide de production sous regie biologiques, Quebec</style></titles><pages>29</pages><contributors><authors><author>Filiere des plantes medicinales biologiques du Quebec</author></authors></contributors><added-date format=“utc”>1447790182</added-date><pub-location>www.plantesmedicinales.qc.ca</pub-location><ref-type name=“Generic”>13</ref-type><dates><year>2010</year></dates><rec-number>11</rec-number><publisher>Bibliothèques et Archives nationales du Quebec</publisher><last-updated-date format=“utc”>1447790308</last-updated-date></record></Cite></EndNote>.

Most buyers will be seeking destemmed berries. Destemming can be done on fresh or frozen berries, manually or mechanically. While there are a couple mechanical destemmers on the market for small-scale growers, these are still in the prototype phase and will be cost-prohibitive for most small-scale producers, thus, the majority of smaller growers will be processing by hand.

There are a few different techniques for destemming by hand. Growers may want to experiment to see which method works best for their operation and workers.

Destemming Method I – Knock against harvest container: The first method was mentioned in the harvesting section – when harvesting each cyme in the field, knock it gently against the side of a rigid harvest bucket. The ripe berries should fall into the bucket, leaving the unripe berries still attached to the cluster.

Destemming Method II – Screening: The second method is to rub the berries against a hardware cloth screen. Make a stationary frame, cover with ½- by ½-inch stainless steel “hardware cloth” to create a screen. Then place the screen on a collection vessel, put a quantity of fresh berries still attached to the cymes on the screen, and gently manually rub the berries across the openings of the screen. The berries will separate from the stems fairly easily. One or two people can process a couple hundred pounds per hour rather easily using this method that’s efficient and cheap for smaller growers. After the berries are destemmed they can be washed and sanitized (Andy Luegger, personal communication, 2016).

Berries from both Method I and II can be washed for further cleaning. Wash the berries by putting the berries in one container, and placing the container with the berries in it inside a larger container (e.g. placing a bucket or bowl inside a sink or tub). Add water to the container with the berries in it. As water is added into the smaller container, the heavier ripe berries will remain on the bottom of the container, and stems, unripe berries and other debris will float to the top and can be skimmed off into the larger container or tub.

Destemming Method III – Destem frozen berries: A third option is to freeze the berries while still on the stem in plastic bags. After the berries have fully frozen, manipulate the plastic bags with the frozen berries inside them by rubbing the bags with your hands until the stems float to the top. The frozen berries can then be placed on a screen and shaken to separate them from the stems. The berries can be screened and refrozen. It is best to do this with small batches of berries at a time to try to prevent them from completely thawing. Repeated thawing and freezing will result in brown berries with reduced health benefits.

DESTEMMING MACHINES

As commercial elderberry production increases, more growers may be interested in mechanical destemming. Andy Luegger has designed a portable destemming machine that can be run by one person on single phase 220-volt power and can process 100 pounds per hour. His design is based on a short stroke and fast frequency of the shaker screen. The benefits of this design are that it requires less manual effort in releasing the berries from the cymes. However, the movement is currently hard on the bearings and the drive components. A YouTube video of his prototype destemmer can be found at this [link](#) or by searching youtube for “elderberry destemmer Luegger.” For more information, see Andy Luegger’s contact information in the Additional Resources section in the Appendices.

River Hills Harvest has also designed a destemming machine, the T.E.D. It is based on a slow stroke shaking mechanism which is gentler on the equipment than Luegger’s model, but can require up to four people to move the berries around on the table. The T.E.D. sells for \$8,500 and includes a three-bay sink designed to facilitate washing and sorting. The T.E.D. can process several hundred pounds of berries per hour. “Pods” of growers can share one destemmer amongst themselves. Growers who sell to River Hills Harvest use the T.E.D. in the field, where they destem, wash, sort, sanitize, and pack their berries and then load them onto waiting 18-wheel freezer trailers. A YouTube video of the T.E.D destemmer can be found by searching for “[Elderberry Destemmer River Hills Harvest](#)”.



The T.E.D., River Hills Harvest



(River Hills Harvest)

is done using large washing drums that roll and spin using an electric motor. These are similar to grape or blueberry destemmers (McKay interview, 2015). Pictures of blueberry destemmers can be found at the website for [A & B Packing Equipment of Lawrence, Michigan](#). A YouTube video of a blueberry destemmer in action can be found by searching for “[Lakewood Process Machinery’s Drum Destemmer](#).”

Washing and Sanitizing

Fresh elderberries are often washed prior to selling or freezing to eliminate debris, insects and unripe fruit. When considering selling wholesale, growers should ask buyers if they require GAPs certification and/or what they expect in terms of washing and sanitizing berries. If washing the berries, growers adhering to GAPS or Good Agricultural Practices certification must add sanitizer to the wash water.

To wash the berries, place in a container, cover them with water and gently stir. The ripe berries should sink, while insects, debris and unripe berries will float to the surface and can be skimmed off. The remaining ripe berries can then be drained on a screen (Le Sureau du Canada Sous Regie Biologique). The River Hills Harvest washer/destemmer uses mesh baskets or colanders to catch the ripe berries that sink to the bottom, and separate colanders to capture the unripe berries that float to the surface. Using colanders allows the processors to remove the debris.

GAPS or Good Agricultural Practices Certification

Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs) are hygiene and sanitation practices for fruit and vegetable production that minimize the risk of contamination with microbes such as *Salmonella* or *Listeria*, which could make consumers sick. Examples of Good Agricultural Practices include cleaning harvesting and shipping containers, washing the crop (if appropriate), and keeping product at the appropriate temperature. These are practices that most growers normally follow because they help ensure good product quality. Some larger buyers may require that the farmers they buy from have a third party audit them to certify the farm is following GAPs.

You can learn more about what GAPs certification entails through [UVM Extension's Produce Safety Program](#), the [Vermont Agency of Agriculture, Food and Markets](#) or the [United States Department of Agriculture's GAPs](#) websites. The Vermont Vegetable and Berry Grower's Association (VVBGA) is also initiating a certification program for small-scale producers selling to local buyers called the [VVB-GA Community Accreditation Produce Safety Program or CAPS](#).

Renting Destemming and Processing Equipment

Alternatively, for larger quantities, you may be able to locate a commercial kitchen or co-packing facility where you can have berries processed for a fee. For example, a fresh berry wash-and-dry set-up is available for rent at the [Vermont Food Venture Center \(or VFVC\)](#) in Hardwick, Vermont. The berries still on cymes sit on a raised, perforated conveyor belt that is lowered into a water bath, then raised and conveyed under a fan to dry. Once the berries have been washed and dried they can then be quickly blast frozen to -4 °F. Following the blast freezing they can be shaken or gently knocked against a hard surface to remove them from the stems and then packaged into 2- to 20-pound bags and vacuum-sealed.

VFVC has used this process for both blueberries and aronia and believes it should work well for elderberries. VFVC estimates that one can wash, blast freeze, and destem between 600 to 1,000 pounds in one six-hour day using two to four staff/laborers, and then use a second six-hour day or less with two staff to package, vacuum seal, and store the berries.

The 2015 cost for renting the equipment and space for washing, drying, blast freezing and vacuum sealing at the VFVC was \$28 per hour, the cost for renting freezer storage at the Food Venture Center is \$40 per pallet per month. All the equipment and storage is available for lease.

Drying Berries

Small batches of elderberries will dry well. For home use, berries can be dried in a dehydrator, on an elevated stainless steel mesh screen with a fan circulating air so there is air flow under, above and around the berries, or in your oven on the lowest setting (120°F is ideal, do not go over 140°F or the berries will cook). However, drying berries in an oven will take twice the amount of time as in a dehydrator and will use more energy. If using an oven, to improve air circulation, leave the oven door open 2- to 6-inches. There are many dehydrators on the market for small-scale home production.

Larger scale growers interested in selling dried berries should invest in a commercial dehydrator to ensure the final product will meet buyers' specifications and the dehydrator will be sanitary and cleanable. Sources for commercial scale dehydrators are listed in the Additional Resources section in the Appendices.

It is important that the berries are actually drying as opposed to cooking. If the outside of the berry cooks and hardens, and the inside remains moist, the berries will mold and spoil. Similarly, drying the berries too quickly can also cause sugar to accumulate on the surface and make it hard for the berries to dry throughout. More detailed information on how to dehydrate fruits can be found on the Montana State University Extension Guide "[Drying Fruits](#)".

The standard calculation for achieving appropriate dryness is a finished weight for dried berries that is one fourth of the starting weight of the fresh berries. Measure the weight of the fresh berries before drying and then divide this total by four, to estimate the target finished weight goal. Then monitor the weight of the berries through the drying process until the desired end weight is reached. For example, if you average 4.46 pounds of berries per bush, for every 4.46 pounds you dry, you will want a finished weight of 1.12 pounds of dried berries.

If you are considering selling dried berries, it will be important to run drying tests first. The University of Maine's Food Science and Human Nutrition Department's Process and Produce Review Testing Services is available to help producers in the Northeast develop and test dried berry products. See Additional Resource Section for contact information.

Traits to Look for in a Dehydrator

- Double-wall construction and enclosed heating elements.
- Thermostatically controlled temperature dial with settings from 85 to 160°F.
- Fan or blower to distribute warm air evenly.
- Shelves made of stainless steel or food-grade plastic.
- A timer to turn the dehydrator off (especially useful if running dehydrator at night).
- Underwriter Laboratories (UL) seal of approval and one-year guarantee.
- Humidity control (this is desirable as it will help ensure that the berries dry throughout and reduce the time it takes to reach the target percent moisture for the finished berries).

—Adapted from Paul, Friedrich and Enkerud, 2011

Flowers



(Abbie Sewall, The Bailey Farm, Freeport, Maine)

Flowers can be removed from the stems prior to drying by rubbing them over a screen. Alternatively, the Le Sureau du Canada publication recommends drying flowers on the stems individually in paper bags at 80.6°F for 48 hours. At higher temperatures, the flowers may brown or caramelize which can negatively affect their flavor, appearance and medicinal properties. The conversion ratio of fresh elderflower on-stem to destemmed, dried elderflower is 20:1. Therefore, 20 pounds of florets on-stem should yield one pound of dried florets (Quebec, 2010; (Carpenter and Carpenter, 2015).

Wholesale Product Quality Specifications

Fresh, Frozen or Dried

Commercial buyers in Vermont expressed a willingness to retrieve freshly picked, refrigerated berries or flowers directly from the harvest site at their own expense if the sites were within a two-hour drive. (Some have been travelling to Quebec to buy their berries, which can be up to a five hour drive and requires the additional complication of crossing the border). These buyers will accept frozen berries if it is not possible to acquire fresh berries. One commercial buyer sources dried, ground (powdered) berries. They would be willing to buy local dried, whole berries and grind the berries themselves, if grinding is an issue. One commercial buyer sources certified organic and/or wild-harvested florets. They are willing to buy them fresh and destemmed, dried, or as a simple syrup.

Conventional vs Certified Organic

Only two of the commercial buyers interviewed for this study required organic certification or wild-harvested product. Three buyers stressed that price sensitivity for their own value-added products would preclude them from buying certified organic ingredients, and two stressed that price sensitivity may preclude them from buying Vermont elderberries altogether.

Microbiological Testing

Most local food manufacturers we interviewed do not require microbiological testing of the elderberries they are purchasing. Nutraceutical manufacturers such as Urban Moonshine, a Vermont-based herbal product manufacturer, however, do require microbiological testing. According to Le Sureau du Canada Sous Regie Biologique, the following guidelines for testing should be considered: dried flowers should be yellow in color, they should not disintegrate into powder when handled, they should maintain a 12 percent or less humidity, and smell and taste “floral.” Berries should undergo microbiological analysis on the following parameters: total count; yeast and mold; *E. coli*; *Staphylococcus aureus*; *Pseudomonas Aeruginosa* and *Salmonella spp.*

Urban Moonshine’s microbiological analysis for berries needs to include total aerobic plate count (<10⁸/g), yeast/mold (<2x10⁵/g), *E. coli* (absent/25g), *Salmonella* (absent/25g). The requirements are roughly the

same for flowers, though the total aerobic plate count should be lower ($<10^7/g$), as should be the yeast/mold count ($10^5/g$), because the berries are more colonized and the acceptable limit is higher (Guido Masé, personal communication, 2016). Masé also noted that identity testing also would be desired and could be achieved through macroscopic, organoleptic or microscopic analysis. Identity testing is described in detail below.

Labs that will do microbiological testing can be found in the Additional Resources section in the Appendices.

Heavy Metal Testing

Medicinal elder products must undergo contamination testing. This testing of berries and flowers should include heavy metals and, if not certified organic, pesticide residue testing. The specifications for acceptable limits of contaminants are not defined by the FDA, but guidance is offered by the American Herbal Products Association (AHPA), which can be found at http://www.naturalhealthresearch.org/wp-content/uploads/2013/02/09_1214_AHPA_Heavy-Metals-White-Paper-Revised.pdf. Guido Masé has helped establish the following for elderberry and elderflower heavy metal specifications for Urban Moonshine.

Table 5. Heavy Metal Specifications for Elderberries and Elderflowers (Urban Moonshine)

Heavy Metal	Limits for Berries	Limits for Flowers
Arsenic	<1.06ppm	<3.18ppm
Lead	<1.06ppm	<3.18ppm
Cadmium	<0.44ppm	<1.32ppm
Mercury	<0.21ppm	<.63ppm

The reason for the lower levels for berries is that they are juiced for nutraceutical product manufacture, whereas the flowers are extracted using ethanol. The juicing process removes a much higher proportion of the heavy metals, so that amounts are lower in the finished product. This illustrates that these limits are not absolute, but rather rely on a reasoned calculation based on safe daily exposure for a potential customer. For more details, see the American Herbal Products Association guidance paper noted above.

There are also heavy metal specifications established for final products. For example, in a final blend that used both elderberry juice and elderflower extract, Urban Moonshine defines and tests for the following specifications for heavy metals: <.1ppm for arsenic, lead, cadmium and mercury. (Notice how much lower the amount is in the final product than in the starting material. This is because of extraction, - heavy metals are very poorly soluble and are discarded with the spent herbs. This would not apply if the starting material was encapsulated into a supplement).

Identity Testing

Elderberries, like all ingredients used in a dietary supplement, are subject to identity testing as part of the manufacturing process. All components must be positively identified by the company manufacturing the dietary supplement. Additionally, the final product must have a defined identity as well. These descriptions of identity are specifications, and the company must test to ensure that those specifications are met.

The FDA has agreed that visual inspection, tasting and smelling (collectively known as “organoleptic” tests) are adequate for ensuring the identity of herbs such as raw elderberries and elderflowers, whether fresh or dried. However, the company manufacturing the dietary supplement must keep the organoleptic descriptions on file, along with reference samples (voucher specimens), and the testing for whether the raw material and/or finished product meets the identity specifications must be conducted by a qualified analyst (meaning someone with the documented ability and experience to identify elderberries and flowers).



Todd Hardie at workshop at Thornhill Farm (Jenny Brown, UVM Extension)

Identity Testing

Following is an example of an organoleptic description for elderberries, and one for flowers. Note the rejection criteria for both berries and flowers. In both cases, the sample would be compared to a voucher specimen to determine if it is acceptable or not.

General Appearance (fresh frozen berries): “Deep purplish black frozen spherical and single berries around .75cm in diameter, some clusters as a result of freezing. Outer skin is deep purple and inner skin and structure of berry is a slightly lighter purple. Upon handling, leaves a deep purple stain to the skin. Pink-reactive to exposure to pH<7 . . . The berries have little or no odor, an acid-saccharine taste, and yield by expression a purple juice, called elder-rob, which turns a dark-lilac color with alkalis, and a scarlet with acids (Felter, 1898).”

Organoleptic Properties: Slightly sweet smelling, tangy, characteristic. Characteristic sweet berry flavor, moderate astringency with a slight sourness left on the tongue.

Rejection Criteria: Pale or colorless fruit, lack of characteristic sweet fruity flavor. Thawed berries.



(Guido Masé, Urban Moonshine)

General Appearance (dried flowers): Inflorescence a flat compound cyme. Flowers white, up to 5 mm in diameter, has 3 small bracts (visible with a hand lens) and may have a peduncle. Calyx minute, 5-lobed; corolla light yellow, with 5 broadly oval petals fused at their bases into a tube, 5 yellow stamens with short filaments and lemon-yellow anthers, and a trilobular inferior ovary. Ovary bears a short style with 3 obtuse stigmata; filaments of the 5 stamens alternate with the petals. Corolla often isolated or fused to base of the stamens. Dried material delicate and rough in texture, golden-yellow, with large amounts of golden yellow pollen present (World Health Organization, 1999).

Organoleptic Properties: Odor is strong, characteristic, aromatic. Taste is mucilaginous, sweet but slightly bitter.

Rejection Criteria: Lack of characteristic odor. Presence of stems/bark/leaf. Lack of pollen at the bottom of the sample, or brown pollen.

Packaging

Commercial buyers expect fresh and frozen berries to be stored in FDA-approved, food-grade buckets. Typically, growers are using 5-gallon food grade plastic pails that hold up to 25 pounds of fresh berries. Smaller quantities of fresh or frozen berries may be sold in food grade plastic bags. Dried, ground berries are sold in vacuum-sealed 10- or 20-pound food grade bags. Dried florets are sold in one- to five-pound vacuum-sealed food grade bags.

Yields

Reported production yields vary widely. This is where variables such as which cultivars are grown and spacing between bushes and rows can make a difference in yields. For example, the University of Missouri estimates an average yield of no more than 7 pounds per bush using a 4-foot by 12-foot spacing, and no more than 3.5 pounds per bush using a 2-foot by 12-foot spacing. The 2-foot by 12-foot configuration gives a lower yield per bush because the denser spacing inhibits growth between bushes and makes picking berries between bushes harder, resulting in a lower yield per bush.⁴

One of the reasons European berries of *S. nigra* are less expensive than U.S.-grown *S. canadensis* is due to higher yielding bushes. In Poland, cultivated *S. nigra* “Samyl” and “Sampo” achieve yields of 37 pounds per bush. Hungary also reported yields for various cultivars of *S. nigra* ranging from 11.5 to 51 pounds per bush. Even in the wild, *S. nigra* in Poland was found to average 3 pounds per bush (Charlebois et al., 2010).

Though several established Vermont growers state that mature bushes should yield 10 lbs. per year, none have yet achieved that. The Farm Service Agency (FS), which recently began offering crop insurance for elderberry, lists the average Vermont elderberry yield per acre at 2,700 pounds based on recorded production in Chittenden County. The spacing we recommend of 6-foot by 12-foot spacing with a 4.46 pound per bush average should produce a 2,700 pound per acre harvest. Terry Dunham of River Hills Harvest agrees with these estimates and states that the most notable Quebec growers achieve average annual yields of 2,000 to 2,200 pounds per acre. Dunham said that even for the River Hills Harvest Midwest growers, he takes the University of Missouri yield volumes and “cuts them in half” when setting grower expectations. Terry commented that they have been doing this for ten years and of the fifty-two farmers selling to River Hills Harvest, only five have achieved yields of 5,000 pounds per acre or greater, and this occurred for the first time in 2015.⁵

Based on the data above, this guide adopts the FSA-recorded average for Vermont of 2,700 pounds of berries per acre (4.46 pounds per bush based on a 6-foot by 12-foot spacing) as the benchmark for assessing the financial viability of growing elderberry in Vermont. We do not have good data yet on yields of elderflowers for the Northeast, but The Farm Between estimates they are harvesting three pounds of fresh elderflowers (on stem) per bush.

Understanding the discrepancy in yields between Europe, the Midwest and Vermont is critical to understanding the commercial viability of growing elderberry in Vermont. It is little surprise that berries from Europe can range as low \$0.20 per pound if European growers are harvesting 37 pounds per bush. If a Vermont berry is competing at 12 percent of the yield per bush of its European counterparts then the cost per berry will be significantly higher for the Vermont product. The important question becomes, “Will buyers value the extra cost required to source a more local berry?”

⁷ Although the 2-foot by 12-foot spacing is anticipated to yield a slightly higher maximum production per acre (139 pounds more) because of the increased number of bushes per acre, this peak production is not anticipated to occur until year ten and is anticipated to decline starting the following year (University of Missouri Elderberry Decision Tool, 2015).

⁸ Dunham noted that it is natural for volume and production to decrease in northern latitudes. In Southern latitudes, volume will be higher, but the size of the berries will be smaller and the Brix number (sugar content) will be lower. These Southern fruit will be better for juicing as a juicer would not need to alter the pH. In more northern zones, the berries will be bigger and sweeter, but the bushes will be less productive.

RISK MITIGATION

Crop Insurance

Two new crop insurance plans have recently been established that may benefit elderberry growers both large and small. These include a new Whole Farm Revenue Protection plan (WFRP) aimed at small, diversified growers and offered through private insurance carriers; and elderberry as an insurable crop within Farm Service Agency's Noninsured Crop Disaster Assistance Program (NAP) (Roche, 2015). The two programs are described in detail below. Additionally, USDA provides an insurance risk management tool to estimate the cost benefit of various crop insurance options. The tool allows you to enter your information and identify what coverage options, expense/fees and potential reimbursement would be. The link can be found at: <http://prodwebnlb.rma.usda.gov/apps/CIDT/>.

Whole Farm Revenue Protection Plan (WFRP)

Whole Farm Revenue Protection Plan (WFRP) is a new policy from the 2014 Farm Bill. WFRP provides protection up to 85 percent of whole farm revenue against revenue loss due to weather or market price fluctuations. A benefit to the WFRP program is that it insures the entire farm's harvest, it is not crop specific and therefore it is ideal for small scale diversified farms. If you have crop failure, insurance is paid on the shortfall from your projected whole farm income based on previous historic whole farm income averages. WFRP is encouraged for small, beginner and diversified farms. To encourage the participation of beginning farmers, the WFRP premium fee is waived. The program requires no minimum production acreage. To apply for WFRP a grower should have 3 to 5 years historical records of their Schedule F demonstrating whole farm revenues. Alternatively you can provide documentation demonstrating your production plan (Farm Operation Report), organic certification (if certified organic), and historical sales documentation (invoices) showing actual market prices received per crop in the past. WFRP insured revenue is the lower of the current year's expected revenue projected from the Farm Operation Report, or historic revenues adjusted for growth. There is no minimum revenue required for participation. Sign up for WFRP closes in March each year for coverage for the upcoming season. Claims are filed at the close of the tax year after income taxes have been filed (Roche, 2015).

How to Estimate the Cost Benefit of WFRP insurance

NAP Elderberry Loss Example*	
Guarantee:	1,755 lb ac ⁻¹
Actual Yield:	1,000 lb ac ⁻¹
Loss:	755 lb ac ⁻¹
x Price election:	\$3.38 lb ⁻¹
= Indemnity:	\$2,552 ac ⁻¹

(University of Maine Extension)

In the image on left the grower has demonstrated average gross annual income records of \$100,000 in sales per year. The coverage level the grower is requesting is 85 percent, thus the maximum insured revenue allowance will be \$85,000. If the grower's income is less than \$85,000, she will be reimbursed

the cash difference between her actual gross income and her \$85,000 insured limit. In this example, her actual gross income came to \$50,000 so she will receive an insurance reimbursement of \$35,000 (\$85,000-\$50,000 = \$35,000). For beginner farmers (less than 10 years), there is no premium fee, thus the net benefit to having insurance in this scenario is a reimbursement of \$35,000 which would have been worthwhile in this situation.

Noninsured Crop Disaster Assistance Program (NAP)

Noninsured Crop Disaster Assistance Program (NAP) provides protection up to 65 percent of the actual yield history at 100 percent of the average market price against production losses due to drought,

hail, frost, hurricanes, excessive moisture, fire, insects, plant disease and wildlife damage. To be eligible for coverage, producers must:

1. Earn less than \$900,000 in average adjusted gross income.
2. Be growing on at least 1/100th of an acre.

NAP requires an annual administrative fee. To receive reimbursement growers must report losing at least 35 percent of the crop or planting 35 percent or less of the planned acreage due to disaster (University of Missouri, 2014). To apply for NAP growers need documentation of 4 to 10 years of historical yields, otherwise the program will utilize the average yield recorded in your county. In Vermont for example, NAP elderberry coverage is based on 2,700 pounds per acre which is the recorded average based on Chittenden County. NAP payments are set using an FSA determined price election. The minimum premium fee is \$250. Sign-up for NAP closes in November each year for coverage the following year. If growers do sign up for coverage and experience crop loss, it is imperative they call FSA within 72 hours to inspect the loss (Roche, 2015).

How to Estimate the Cost Benefit of NAP insurance

NAP Farmer Premium*	
Premium	Example
Farmer Share	1
Acres Planted	x 5 ac
Approved Yield	x 2,700 lb ac ⁻¹
Coverage Level	x 65%
Price Election	x \$3.38 lb ⁻¹
Premium Fee	x 5.25%
Farmer Premium	= \$311 ac ⁻¹

Farmer guaranteed 1,755 lb ac⁻¹

(University of Maine Extension)

Note: FSA approved average yield and county was taken from Chittenden County.

In the illustration on left, the grower has 5 acres planted, and the illustration assumes a yield equal to the USDA average yield of 2,700 pounds per acre. This grower is applying for 65 percent coverage, meaning the grower will be eligible for reimbursement if his yield comes in below 65 percent of 2,700 pounds per acre. The USDA's established market price for reimbursement is \$3.38 per pound. There is a 5.25% premium fee for this policy. The dollar amount of this fee is calculated by multiplying the total estimated crop yield by the percentage of yield to be covered, by the premium fee: $2,700 \times .65 \times 3.38 \times 0.0525$, which arrives at a cost per acre to insure of \$311 per acre. Given the farm has 5 acres the total cost of insurance would be $\$311 \times 5 = \$1,555$ per year.

WFRP Loss Example	
Approved Revenue:	\$100,000
Coverage Level:	85%
Insured Revenue:	\$85,000
Actual Revenue:	-\$50,000
Indemnity Payment:	\$35,000

(University of Maine Extension)

In this example we see that based on the 65 percent coverage, the grower will receive reimbursement on any yield less than 1,755 pounds per acre. This calculation is derived as follows: Coverage level = 65 percent. $2,700 \text{ pound} = \text{average } 100 \text{ percent yield. } 2,700 \times 65\% = 1,755 \text{ pounds.}$ The grower will receive reimbursement of \$3.38 per pound on any shortfall between actual harvest and 1,755 pounds. In the example above the actual yield came in at 1,000 pounds per acre, thus the grower will receive a reimbursement of \$3.38 per pound x 755 pounds per acre. This equates to a reimbursement of \$2,552 per acre x 5 acres, for a total reimbursement of \$12,760.

The net benefit to the grower for having coverage in this example would be \$11,205 (the total reimbursement less the cost of insurance). In this scenario it would have been worthwhile to have purchased insurance coverage.

Marketing



Sample of products using elderberry or elderflower

Historical Use and Growth Trends in the U.S.

While use and knowledge of elderberry's beneficial properties is widespread in Europe, the market for elderberry in the United States is in its infancy. Perhaps the most notable commercial elderberry planting in U.S. history was the Smuckers Jam Company's planting in Oregon. Elderberry became one of Smuckers's top six selling flavors, but after 35 years, the company decided to discontinue production, even though the bushes were still productive, possibly because the cost of production was higher than for other flavors (Terry Durham, personal communication, 2015).



(Ginger Nickerson, UVM Extension)

One of the many nutraceuticals on the market that contain elderberry.

GROWER TIP: *Discovering New Markets*

River Hills Harvest has found there is a market for unripe berries as a poultry feed and a pet food ingredient, further optimizing gross income from the whole harvest. Unripe berries have not only been found to be non-toxic to animals, but there is also some research in England that has demonstrated that elderberry helps poultry with oxidative stress recovery.

—Terry Dunham, interview, 2015.

While this demonstrates that there has been commercial elderberry production aimed at the general U.S. population, the recent interest in elderberry is due largely to a growing market for “functional” and “natural” foods known as the “natural food channel” or TNC. In 2010, during the H1N1 flu pandemic, shoppers in the natural food channel began flocking to elderberry as the new immunity-booster. Sales for elderberry products within the natural foods channel grew by nearly 53 percent to \$7.48 million that year. Elderberry now ranks seventh on the list of top ten natural channel herbal ingredient sales. By comparison, natural channel sales for Echinacea in 2010 grew by only 10 percent and only ranks ninth in the top ten natural channel herbal ingredient sales (Winter, 2010; Grebow, 2015).

As elderberry gains recognition within the natural food channel in the U.S., it is also gaining favor within the mainstream market, known as the “Food, Drug, Mass-Merchandise” (FDM) channel. Within the FDM channel, sales of elderberry were \$4.55 million in 2010, and have experienced annual double digit growth since. While not yet a top 40 herbal ingredient sales item within the FDM channel, elderberry is a “notable mainstream standout” (Winter, 2010; Grebow, 2015).

Vermont Elderberry Market

Use and Growth Trends

In Vermont, unlike other markets, the sixteen retail buyers surveyed for this guide are not yet reporting a significant increase in demand for elderberry products.

At City Market, in Burlington, sales of elderberry-based products have remained steady from year to year, with seasonal peaks during cold and flu season.

At the Brattleboro Co-op, growth in elderberry is perceived to be driven by the manufacturers rather than by consumer demand. The Brattleboro Co-op is seeing a growing number of drink manufacturers incorporating elderberry into their products but not because consumers are requesting elderberry in their drinks. The Co-op has not done any analysis to see if elderberry drinks are selling better than non-elderberry flavors but this would be a next step. To date, the value-added products Brattleboro Co-op has come across with elderberry listed as an ingredient have been functional beverages, they have seen little activity in elderberry being incorporated into snacks or sold as a raw ingredient.

In line with this finding, Citizen Cider, a Vermont hard cider maker, noted that while they experimented with an elderberry-flavored cider and consumers who sampled it liked it, there is not sufficient demand from consumers or distributors to warrant producing the elderberry cider on a commercial scale, and the expense of adding elderberry to their cider is cost-prohibitive (Interview with Caitlin Jenness, Citizen Cider).

Buffalo Mountain Co-op in Hardwick finds consumers are drawn to elderberry syrups that contain raw honey, and to elderberry juice concentrates that make health claims. However, these products may be more complicated for smaller scale companies to produce because

retaining raw honey's natural properties during the processing phase may be complicated, and in order to make health claims the product must be approved by FDA, which can be an expensive proposition.

The Brattleboro Co-op buyer advised that any growers considering launching a new value-added elderberry product consider the following: for an elderberry beverage or juice to succeed, growers will need solid research and development, packaging, marketing and advertising, and the product must be reasonably priced. With respect to specific types of product the buyer noted the following: elderberry jelly consumers are typically parents buying jelly for their children's sandwiches. They are price-driven. Conventional jellies sell well; health claim jellies don't move much. This would corroborate Smuckers' experience and reasons for exiting elderberry jelly production. However, if the focus is on the "Vermont-grown" aspect of the product it could do well. The buyer noted that Vermont-made jellies such as Elmore Roots Fruit Tree and Berry Nursery's jellies have a fairly strong following.

While Vermont consumers may not be driving demand, Vermont value-added food and nutraceutical producers are following the national trend of trying to create a market by increasingly incorporating elderberry into their products. This presents opportunities for growers to sell to these manufacturers, while also expanding consumer awareness about elderberry. Expanded consumer awareness could in turn spur demand for value-added elderberry products produced by growers, and for direct-to-consumer sales of unprocessed berries and flowers for consumers wishing to make their own elderberry products for personal use.

Vermont Direct to Consumer Market Demand

Of the eleven growers surveyed for this guide, most stated that local consumer demand is sufficient to absorb their current harvests. They are selling direct-to-consumers on their farms, at farmers markets and via the Internet. They are selling fresh berries and flowers, dried berries and flowers, frozen berries, concentrate, syrups and jams and other value-added products. At present, most of these growers have fairly small-scale plantings from a few to a few hundred plants. As the size and scale of plantings increases, if direct-to-consumer sales do not keep pace with increased production, growers should explore wholesale markets and retail accounts.

Direct-to-Consumer Pricing

Direct-to-consumer (retail) pricing for elderberries ranges widely. Fresh berries can sell for as much as \$21 per pound. In 2015 most growers in Vermont and Maine were selling their berries for between \$5 and \$8 per pound for both conventional and certified organic, on-stem and destemmed berries.

Dried berries retail for \$12 to \$37 per pound. This equates to \$3 to \$9.25 per pound for fresh berries.

Flowers were retailing for \$12 to \$36 per pound fresh (stem-on or destemmed), and \$15 to \$132 per pound dried (Carpenter and Carpenter, 2015; interviews with Vermont growers and buyers, 2015; review of Internet prices for bulk and retail elderflowers, 2015-2016).

Table 4. A sampling of 2015 retail prices for dried berries offered for sale on the Internet:

Brand	Product	Unit and Packaging	\$/Unit
Frontier Spices	Whole, dried, organic European elderberries	1 lb. foil bag	\$21.10/pound
Frontier Spices	Whole, dried elderflowers	1 lb. foil bag	\$25.97/pound
Starwest Botanicals	Organic elderflowers: dried, cut, sifted	4 oz. bag	\$49.28/pound
Kombucha Kamp	Dried elderflowers	0.6 oz. bag	\$132/pound
Starwest Botanicals	Wild-harvested, European dried elderflowers (Elderflowers C/S wild-crafted) certified cGMP Compliant (current Good Manufacturing Practices)		\$19.70/pound

Frozen berries sold direct to consumers are typically packaged in vacuum-sealed FDA-approved food grade plastic bags that can come in a range of sizes, most often from two to twenty pounds. Dried ground berries and dried florets are sold in bulk or in pre-packaged one- to five-pound vacuum-sealed bags.

Pick-Your-Own

Pick-Your-Own (PYO) arrangements may be another option for growers, as they can help reduce the cost and effort of harvesting for the grower. The University of Missouri Center for Agroforestry found growers were charging an average of \$1.25 per pound for PYO elderberry (Byers et al., 2014). Remember that all parts of the elderberry bush are mildly toxic to humans and customers should be warned not to harvest any green plant parts (including berries) and to not consume berries raw. Some Vermont farms chose to offer PYO elderberry to local herbalists but not to the general public.

Tips on Developing a Market and Getting the Best Prices for Your Products



(Ginger Nickerson, UVM Extension)



(Ginger Nickerson, UVM Extension)

General Tips

Much of marketing relies on relationships. These practices may help you secure reliable customers and the best pricing for your elderberry products:

- Make sure the berries or flowers you are selling are always top quality, clean and free of insects.
- Refrigerate fresh berries as soon as possible after harvesting and keep cool during delivery to maintain their quality.
- Develop good relationships with your buyers. Educate them about your growing practices and the freshness and quality of your product. Tell them the story behind your farm so they can use it in their promotions.
- Conduct your own market analysis: ask potential buyers about their preferences for fresh, frozen or dried product; preferred quantities and best delivery dates and times.
- Be consistent with delivery times and quantities. If you have promised a certain amount of product, make sure you are able to come through.
- Consider submitting a press release about your business to local papers for free PR.
- Prepare a flyer about your farm with information about the benefits of elderberry along with your contact information to share with potential customers wherever you go.

At Farmers Markets

- Offer free samples, recipes or pamphlets to help customers understand elderberries qualities and how to use them.
- Collect customers e-mail addresses to let them know about harvest dates and develop a sense of personal connection with your product.
- Start with smaller price tags. For example \$5 for a pint of berries versus \$10 for a quart.
- Volume quantities do not need to be exact, whereas products sold by weight must be exact as weighed by certified scales. Selling by the pint or quart container may be an easier way to sell products at farmers markets, rather than by the pound.
- Consider rewarding your regular buyers with special discounts.

To Restaurants

- Talk with local chefs to see if they might be interested in your product and offer to provide some samples.
- Provide them with recipes (there are many available on the Internet) and your contact information.
- Consider offering a bulk discount to chefs that are willing to purchase large quantities.

To Grocery Stores

- Stores that put emphasis on buying locally or eating healthy foods, such as grocery cooperatives, are good choices for elderberries. Ask if the store currently offers dried bulk elderberries or elderflowers, and if so, if they would be interested in a locally grown product.

To Sell Wholesale or Direct-to-Consumer?

It is important for growers to think about how and where to sell berries and who their preferred customer may be. From a quality of life perspective, selling berries wholesale is well suited to growers who don't care to interact regularly with the general public. Their net income per pound may be less, but if they can grow sufficient quantity to generate the net income they desire, they can attain their financial goals without impacting their quality of life. If a farmer is gregarious, enjoys interacting with people and likes having people on their farm, then direct-to-consumer sales may be a good fit. Income per pound will be higher and it might not be necessary to produce as much volume, but there is a trade-off in the form of hours spent selling and marketing the product, interacting with the customer and providing a high degree of dedicated customer service.

Vermont Wholesale Market

Based on interviews with ten food, beverage, and "nutraceutical" manufacturers (nine in Vermont, one in New York) in 2015, the average volume of fresh berry equivalent needed per manufacturer is approximately 3,143 pounds per year. The maximum stated need was 13,200 pounds per year, and the minimum 75 pounds per year. The total demand for berries from the ten manufacturers came to 25,145 pounds per year.

None of the Vermont buyers interviewed required GAPs-certified berries at the time of the survey. Their top concern was the ability to source fresh, destemmed berries. At the time of the interviews, at least three buyers indicated they were willing to travel to the harvest sites to retrieve fresh berries on the day they were harvested, two are already travelling to Quebec on harvest day to source berries. Most buyers indicated they would buy frozen berries if it were not feasible to obtain fresh berries on the day of harvest.

There was less demand for elderflowers, with only one value-added producer indicating a need. This buyer requires 120 pounds of dried florets per year, which is equivalent to 2,400 pounds of fresh elderflower on the stem per year (assuming a 5 percent conversion rate from dried florets to fresh florets on the branch).

The authors of this guide were unable to reach seven additional Vermont and Maine manufacturers sourcing elderberry to inquire about their volume and pricing needs. Assuming these purchasers have comparable needs and volumes to the average stated above, total manufacturer demand for Vermont elderberry could be roughly equivalent to 53,433 pounds per year. Assuming average production yields of 4.46 pounds of berries per bush and 3 pounds of florets on stem per bush, Vermont would need approximately 11,980 bushes to meet the current demand of local manufacturers for berries and 800 bushes to meet the current local demand for elderflower. Using a 6-foot by 12-foot spacing, this translates into 20 acres needed for berries and 1.32 acres for elderflower.

These findings are in line with the results of other studies. The 2011 University of Missouri Elderberry Market Study (based on 2009 data) for example, found that: *Manufacturers in the six Midwest states required*

only a total of 90,000 pounds of elderberries annually. Many of these manufacturers “were small and often picked their own fruit.” “Given the overall volumes of fruit used by this industry in the Midwest, commercial production would be limited to a relatively small number of growers” (Cernusca et al., 2011).

However, as noted in other places in this guide, as elderberry becomes better known as an ingredient and new value-added products using it are developed, the demand may increase. As a grower, you can play a role in increasing demand through your marketing strategies and by educating your customers about the benefits of this crop.

A list of buyers interested in sourcing Vermont elderberries can be found in the Resource section in the Appendices. These companies make or would like to make elderberry-flavored products including: hard cider, yogurt, rum, vodka, syrup and kombucha. But remember this list is not exhaustive. As a grower, it will be up to you to seek out other potential buyers – perhaps people who have not even thought of using Elderberry yet!

Vermont Wholesale Pricing for Elderberries and Flowers

In 2015, the *average* wholesale prices paid in Vermont for elderberries and flowers were as follows (Based on buyer interviews, 2015) :

- Conventional (i.e. not-certified organic berries) including fresh berries on the stem, fresh destemmed berries, and frozen berries: \$2.59 per pound
- Dried, powdered berries: \$14 per pound
- Frozen, destemmed certified organic berries: \$4.69 per pound
- Fresh and dried elderflower florets: \$18 per pound

Other sources cite different average prices. In 2013, the average U.S. price paid was \$1 per pound for fresh *Sambucus canadensis* berry clusters and \$2 per pound for destemmed *S. canadensis* and the average price equivalent paid in Europe was \$0.20-0.35 per pound for fresh *Sambucus nigra* clusters (Patton, 2013). In 2009, the average price paid in the Midwest was \$0.75 per pound of fruit (Cernusca, Gold, and Godsey, 2011). In 2015, River Hills Harvest sold cleaned, frozen, destemmed berries for \$3.50 per pound plus shipping to manufacturers across the U.S., including buyers in Vermont and New Hampshire (Terry Durham interview, 2015). This illustrates that like many agricultural products, the prices and market for elderberry fluctuate over time and location, and growers should keep in mind that prices one year may not be the same the next year.

As U.S. production increases price pressure may become an increasing concern. European bulk concentrate is selling for \$70/gallon plus shipping. Terry Durham anticipates RHH prices may fall to \$3.50 per pound for certified organic, cleaned, destemmed berries, and to \$1 to \$2 per pound for conventional, destemmed berries. (Terry Durham interview, 2015). However, in Vermont, some speculate that an increase in local growers may create more buyer awareness and demand for “native elderberries,” and thus increase the desirability and ability to maintain a price premium for Vermont-grown berries.

Setting Your Prices

What does the information above mean in terms of setting your prices? Obviously, if you can grow a certified organic crop, you will be able to obtain higher prices. Although the average price paid for frozen, de-stemmed certified organic berries was \$4.69, the Vermont-based growers interviewed for the project have been able to get \$8 and even up to \$11 per pound for their certified organic de-stemmed berries.

So much of marketing is based on building relationships with customers. The Vermont growers are able to get these prices because their customers know:

- They will get a quality product
- They have a personal relationship with the local grower - that can include face-to-face interactions, and potentially greater ease in sourcing product
- The local grower is passing on the brand of a Vermont-grown product

These are benefits that are hard for non-local sources to provide, and you can explain that to potential buyers. Don't be afraid to educate your customers about how you arrive at your prices – they should value all the work that goes into your crop!

Although you may be tempted to set lower prices when you are starting out, or if you have a hard time moving your crop one season, think twice before you take that step. What might seem like a short-term solution could end up creating a long-term expectation among buyers that they can purchase the crop below the cost of production. If you are not even covering your costs of production, you may want to ask: why are you doing this?

Set your prices based on your enterprise analysis: how much do you need to charge to cover your costs of production and make a profit? Then search out and develop relationships with customers who are willing to pay what you need to make.

Competition and Demand for a Wholesale Vermont-Grown Elderberry

To date, 90% of elderberries supplied to the U.S. have been *Sambucus nigra* imported from Europe. With the growers in the mid-west beginning to hit their stride, *Sambucus canadensis* is becoming increasingly available in the U.S. As of 2015, there are 52 growers selling to River Hills Harvest and another 100 or more are anticipated by 2016. River Hills Harvest is actively marketing to all corners of the United States. Yet, even with its national outreach, River Hills Harvest is sitting on 70,000 pounds of berry surplus. Given this, is there demand for a Vermont-grown elderberry?

The ten buyers interviewed for this guide said they would prefer to source a local berry if it were available and competitively priced. Twenty-two percent indicated they would be willing to pay a premium for Vermont-grown berries. They noted that there is a price ceiling on their own products that limits what they can afford to pay for ingredients: \$2.50 per pound for destemmed, non-organic berries and up to \$7.50 per pound for certified organic berries appear to be the upper thresholds for what Vermont buyers will be willing to pay.

Making Value-Added Products

Elderberries and elderflowers are used in food and supplements for their health benefits, flavor, and color. They can be added to or made into many food and beverage products: jams and jellies, pies, sodas, seltzers, teas, kombucha, alcoholic beverages including liquors, cordials, rum, vodka, beer and cider. They are also made into nutraceutical and herbal products: extracts, tinctures and lozenges for cold and flu relief; and used as natural dyes and food coloring. Dried, ground elderberries are being increasingly incorporated into “functional foods,” vitamins and supplements as a fortifying ingredient that boosts the nutritional and health benefits of these products.

A number of Vermont elderberry growers make their own value-added products from the flowers or berries they grow. The benefit of vertical integration (where one company grows the inputs, produces the value-added product, and sells the value-added product) is that it allows growers to maximize profit by creating efficiencies within the supply chain and realize the full margin of the finished product by selling it directly to the end user. The challenge with vertical integration is that often when done on a small scale, efficiencies within the supply chain are marginal, the cost of production can be high, and human resources/capacity to manage all aspects of the business can be challenging, which can impact profitability and success. Producing value-added products also requires strong sales and marketing skills. Thus, while the potential to yield the full margin by adding a value-added enterprise exists, the reality of accomplishing this for a small-business person can be difficult, and interested growers should carefully research whether adding a value-added enterprise makes sense for them.

If growers have the desire and interest to pursue value-added, the first step is to decide which product to make, where and how to sell it (farm stands, farmers markets, online, in a local store, etc.) and then do some market analysis. Begin asking prospective buyers if they would buy that product, at what price, and with what frequency. The next step is to determine the cost and logistics involved in making the product. Could the product be made at home, would it require the use of a commercial kitchen, or would it be necessary to invest in building a commercial kitchen? The cost to build facilities to produce value-added products is significant and will not make sense for most small-scale elderberry producers. Fortunately, there are a few commercial kitchens and co-packing facilities in the region available for rent. If you are interested in making a value-added product, when developing your business plan, consider the length of time it will

take to become profitable once investments are made, whether the required volume will mean expanding acreage or buying-in fruit from other producers, and the considerations of working under strict regulation (Tori Lee Jackson, University of Maine Extension).

If the logistics and financials make good sense for that value-added product, the next step is product research and development. Sample batches should be made to determine whether it tastes good, shelf life and if it stores well. Are there unanticipated issues with production, and, importantly, what do the customers think? Both Cornell Extension and University of Maine Extension have laboratories that will help with product development. These are listed in the Additional Resources section of this guide.

STEPS TO DETERMINING IF MAKING A VALUE-ADDED PRODUCT IS RIGHT FOR YOU



Elmore Roots Artisan Jam
(Ginger Nickerson, UVM Extension)



The Farm Between's Elderberry, Ginger and Honey Syrup
(Ginger Nickerson, UVM Extension)

1. Assess the costs of production, projected price points, and consumer demand to ensure there is a market for the product at the price points and volume needed to reap the desired financial goals.
2. Use the online Elderberry Financial Decision Support Tool to plug in the costs and prices for your proposed value-added operation to see if such a venture makes economic sense for you. At the bottom of the sheet there are three tabs, the one labeled: "Elderberry Value Add" allows you to enter costs and prices for making your own value-added products. The tool can be downloaded by clicking [this link](#) or by searching online for: "[UVM Elderberry Financial Decision Support Tool](#)"
3. Develop, implement and evaluate a business plan to ensure there is capacity to produce, market and sell the product in a practical and sustainable way.
4. Assure product quality to ensure the product that will be well received when it is launched into the marketplace.

There are many resources available to help growers with business planning and value-added production technical assistance in Vermont. We have listed several in the Additional Resources section in the Appendices.

Value-Added Pricing

Following is an example of 2015 retail pricing for some value-added elderberry products in Vermont grocery stores.

Table 6. Retail Prices of Elderberry Products in Vermont Grocery Stores (2015)

Product	Unit	\$/Unit	Standard Size
Elderberry syrup	Ounce	\$3-3.75	4 to 8 ounce bottles
Elderberry jam and jelly	Ounce	\$0.55-2.59	5 to 20 ounce jars
Elderberry juice	Ounce	\$1.32	8 to 16 ounce bottles
Elderberry concentrate or extract	Ounce	\$0.50-\$3.62	4 to 8 ounce bottles

Regulatory Considerations for Value-Added Production - 2

In Vermont, if there are no health claims related to the product and gross sales are less than \$10,000 per year, it is acceptable to make a value-added product in a home kitchen. But if the label includes health claims, or the products earn more than \$10,000 in gross sales per year, then more regulations apply. The manufacture and distribution of such value-added products are governed by the U.S. Food and Drug Administration (FDA). Guidelines and regulations for manufacture are broadly called “Good Manufacturing Practices” (GMPs), and apply to foods and drugs that are released for distribution to the general public. This includes everything from packaged foods, to dietary supplements, to pharmaceuticals.

When using elderberries or elderflowers in manufacturing, it is important to understand the distinction between a food and a dietary supplement. Often, this distinction is difficult to make: an elderberry syrup can be marketed as a “food” or as a “dietary supplement” and different regulations will apply depending on which category is used. The regulations rely on the label claims to assign a category to the value-added product, namely:

- Elderberry or elderflower products that state their ingredients (elderberry juice, elderflower infusion, honey, etc. as examples) but make no claims on their label, neither for nutrient quantity (vitamin C, for example), nor for activity on the structure or function of the body (“helps maintain healthy immunity,” for example), are considered “food” and excluded from the regulations that apply to dietary supplements.
- Elderberry or elderflower products that either claim a discrete amount of nutrient(s) other than calories, sugars, fats, and proteins, or that make a claim about activity on the structure or function of the body (“helps maintain healthy immunity,” for example), are considered “dietary supplements” and have to meet more stringent GMP standards that approximate those used in the manufacture of pharmaceuticals.

The GMPs for food manufacture are covered in the Code of Federal Regulations, Title 21, Part 110 (21CFR 110). A good overview, including sanitation requirements and controls in manufacture for a kitchen/production space where the manufacture of food products takes place, can be found in the FDA's Food pages at [this link](#) or by searching for: "FDA Food Good Manufacturing Practices."

LABELLING: *Dietary Supplements vs. Food Products*

Dietary Supplements: If nutrients other than calories, sugars, fats and proteins, (such as "contains vitamin C" or "contains anthocyanins") are listed on a label, or if claims are made about the products' activity on the structure or function of the body (such as "flu remedy" or "helps maintain healthy immunity") the product is considered a dietary supplement and must meet FDA regulations for pharmaceuticals.

Food: to be considered a food product, the label can list ingredients, but it cannot make any claims about nutrient composition (other than calories, sugars, fats and proteins); or claims about the products' effects on the structure or function of the body ("shortens recovery time from flu").

Dietary Supplements

The GMPs for dietary supplement manufacture are covered in 21CFR 111, available at [this link](#) or by searching for: "21CFR 111" or "Current Good Manufacturing Practice in Manufacturing, Packaging, Labeling, or Holding Operations for Dietary Supplements"

These regulations for dietary supplements add substantial burdens to those for general food manufacturing, including labeling, packing and distribution requirements. But the major additional requirements call for the establishment of a quality control responsibility, which includes:

- Defining specifications for raw materials used, including the elderberry or flower, all solvents, excipients and packaging that contacts the product.
- Defining a formula and process for manufacturing, which includes double-checking the addition of all ingredients and sampling the elderberry and/or flower at all stages of manufacturing to ensure they meet established specifications.
- Defining specifications for all in-process and finished products, which include a definition of contamination (microbiological, heavy metal, and, if not certified organic, pesticide contamination), identity (the recipe and qualities of the final product), and strength (the concentration of the various ingredients in the final product).
- Analysis to ensure all established specifications are met, both for the raw material (berries and/or flowers, solvents, etc.) and for finished products.

Value-Added Product Quality Analysis

The complete details of the analysis methods and specifications required to comply with 21CFR 111, the GMPs for dietary supplements, is beyond the scope of this guide. Guido Masé recommends using the resources available through the American Herbal Products Association, <http://ahpa.org>, as well as experienced legal counsel, if attempting to manufacture and distribute dietary supplements made from elder.

There are numerous laboratories available that will conduct microbiological, heavy metal, and (for non-certified-organic raw material) pesticide testing. Some are listed in the Additional Resources section of the Appendices.

Part 2

Enterprise Viability Analysis and Return on Investment Scenarios

A key goal of this production and marketing guide is to help growers determine whether it makes sense for them to invest in elderberries. We have provided an overview of the production costs and markets; now we will attempt to provide examples of the enterprise analysis we recommend to help growers assess the potential for financial viability.

To do this we have aggregated the costs of orchard establishment and annual operating expenses from existing literature and from Vermont and Maine growers' first-hand experience. We then added in the market data from our buyer interviews so that we could develop a cash flow analysis to project the net income and rate of return a grower could expect to receive based on certain yields and price points for three different scenarios: a 40-bush planting, a one-acre planting, and a 5-acre planting.

We also created an online **Elderberry Financial Decision Support Tool** for both berries and value-added products so that growers can plug in their own costs and prices received to tailor the figures to their own operation. The tool can be downloaded by clicking [this link](#) or by searching online for: "[UVM Elderberry Financial Decision Support Tool](#)".

Capital Investment: Establishment Costs

So, what are the costs involved in establishing an elderberry orchard? Plan on costs for cuttings, irrigation, site and soil preparation, mulch and weed control, soil amendments and labor for site preparation and planting. If you are planning to plant more than one acre, in year two or three (or once bushes begin yielding more than can be immediately sold or stored using existing infrastructure), it may be time to consider purchasing a mechanical destemmer, and investing in additional or leased freezer space.

Plants

The first cost to consider is the source and size of the plants. For commercial growers we are assuming growers will use cuttings; the return on investment for a commercial orchard is not feasible if beginning with potted plants unless yields dramatically improve.

Site Preparation and Soil Amendments

Plan on tilling, testing, weeding, seeding and amending the soil, and preparing the site with irrigation. Using landscape fabric in the first year

(for certified organic the landscape fabric must be removed after the growing season) for weed control and moisture retention will help a great deal in ensuring successful establishment. Use adequate amounts of compost, mulch or ramial. Growers from Vermont and Maine all agreed that amending the soil with nutrients prior to planting, and then top-dressing in subsequent years is critical to long-term productivity.

Destemmer

If intending to cultivate more than one acre of plants, growers may want to consider investing in a destemmer, or in sharing a destemmer with other growers. As noted in earlier pages in this guide, there are different styles and costs of destemming systems being used.

Capital Expense Assumption Details

(These are best estimates of costs. You may be able to find lower prices on some of these items. Total costs may be less if you can provide inputs yourself, or you do not need to purchase the equipment)

- Cost of plants assumes purchase of cuttings: \$3-4/cutting, \$0.50 shipping
- Plastic mulch at \$0.76 per bush
- Drip irrigation at \$0.28 per bush
- Planting labor up to \$1.01 per bush
- Soil samples at \$60 per sample, 2 samples per acre
- Grass seed at \$0.66 per bush
- Fertilizer/Amendments
 - Wood chips: 0.08 yards per bush at \$10-12/yard
 - Manure: 6 tons per acre at \$70/ton
 - Compost: 0.08 yards per bush per year x three years at \$50/yard
 - Wood ash 6 tons per acre at \$35/ton
 - N Organic: \$0.12 per bush
- Bird netting: \$2-4/bush and \$3/hoop
- 16.5 HP wood chipper: \$2,800
- Mechanized destemmer (optional): \$8,500. Plantings of an acre or more will include the cost of a mechanical destemmer as a start-up expense.

Annual Operating Expenses

Annual operating expenses for growing elderberries involve labor (pruning, amending, mulching, mowing, monitoring, treating, and harvesting and processing the berries), soil amendments and weed control, pest and disease control, supplies, insurance, replacement plant costs, shipping, organic certification, utilities, tractor work, oil and gas expense, and any

sales, marketing and distribution expense. If storing berries for future sale, processors should take into account the cost of leasing freezer space, or the utilities expense associated with operating their own freezer.

Operating Expense Assumption Details

- Growers of less than an acre will have fewer operating expenses (will not need tractor work, oil and gas, insurance, packaging supplies).
- Replacement plants: 10% of total plantings per year
- Weed control:
 - Wood chips: 0.08 yards per bush, \$10 per yard
 - Wood chips: delivery flat fee of \$90
- Labor:
 - Pruning labor: 8 hours per acre, \$10 per hour
 - Mowing labor: 8 hours per acre, \$10 per hour
 - Harvesting labor: 5 bushes per hour, \$10 per hour
 - Processing (destemming, washing, sanitizing, packing): 32 hours per acre, \$10 per hour
- Fuel and oil for tractor based on 40 gallons per acre, \$3.50 per gallon
- Repairs and maintenance for equipment \$100 per acre per year
- Supplies:
 - 25 lb. (5-gal) FDA-approved food grade buckets at \$3.79 per bucket
 - 25 lb. (5-gal) FDA-approved food grade lid at \$1.50 per lid
 - \$.25 per label, 1 label per bucket
- Utilities based on 100-watt motor for appliances for destemming or drying, 100 pounds per hour, \$0.145 per kWh
- (Optional) Crop insurance based on Farm Services Agency's Noninsured Crop Disaster Assistance Program (NAP) elderberry coverage example 2,700 lbs. per acre, 65% coverage, price election \$3.38 per lb., premium fee 5.25%
- Property tax based on \$5,000 per acre property value, 1.59% property tax, 72' per bush (6' x 12' spacing)

Income Assumptions

We assume that all berries from enterprises of 40 or fewer bushes could be sold directly to the consumer at an average of \$6 per pound. For larger enterprises of one and five acres we assumed some product may be sold direct-to-consumer, and up to 100% may be sold wholesale, so we calculated net income and return on investment scenarios for prices ranging from a low of \$2 per pound to a high of \$4 per pound.

40-Bush Scenario

Production Information for 40 Bushes

	Per Bush
Number of plants	40
Average productive life expectancy	10-15 years
Spacing	6' x 12'

Establishment Expense for 40 Bushes

Establishment Expense			
Average cost for cuttings	40	\$ 3.50	\$ 140.00
Shipping & transportation cost for plants	40	\$ 0.50	\$ 20.00
Plastic mulch (in feet)	120	\$ 0.10	\$ 122.00
Staples for plastic mulch	500	\$ 0.10	\$ 50.00
Amendments: Wood chips (in yards)	1	\$ 12.00	\$ 12.00
Amendments: Compost (in yards)	1	\$ 50.00	\$ 50.00
Bird netting	300	\$ 4.05	\$ 1,215.00
Bird netting hoops	17	\$ 3.00	\$ 51.00
Wood chipper 16.5 hp	1	\$ 2,800.00	\$ 2,800.00
Total Establishment Investment			\$4,460.00

Operating Expense for 40 Bushes

Annual Operating Expense			
Cost of cuttings (10% annual replacement)	4	\$ 4.00	\$ 16.00
Wood chip mulch (in yards)	1	\$ 12.00	\$ 12.00
Labor: Setting up & taking down netting	4	\$ 10.00	\$ 40.00
Labor: Setting up & taking down landscape fabric	4	\$ 10.00	\$ 40.00
Pruning	8	\$ 10.00	\$ 80.00
Mowing	8	\$ 10.00	\$ 80.00
Making wood chips	1	\$ 10.00	\$ 10.00
Harvesting	1	\$ 10.00	\$ 10.00
Processing (destemming, washing, packing, freezing)	6.5	\$ 10.00	\$ 63.00
Fuel, oil, gas	1	\$ 3.00	\$ 3.00
Supplies: Bags	150	\$ 0.10	\$ 15.00
Utilities: Electricity for freezing and storing	200	\$ 0.50	\$ 100.00
Total Annual Operating Expense			\$ 469.00

Total Capital Investment (Establishment and 2 Years Operating Expense) for 40 Bushes: \$5,397

Income Potential and Return on Investment for 40 Bushes

Price per Pound \$6.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$ 1,900	\$ 432	15
4.46	\$ 1,070	\$ 602	11
7.75	\$ 1,860	\$ 1,392	6
10	\$ 2,400	\$ 1,932	5
15	\$ 3,600	\$ 3,132	4

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

1 Acre Scenario

Production Information for 1 Acre

	Per Acre
Number of plants	605
Average productive life expectancy	10-15 years
Spacing	6' x 12'

Establishment Expense for 1 Acre

Establishment	Units	\$/Unit	Total
Average cost for cuttings	605	\$ 4.00	\$ 2,420.00
Shipping & transportation cost for plants	605	\$ 0.50	\$ 303.00
Plastic mulch (in feet)	605	\$ 0.76	\$ 460.00
Staples for plastic mulch	1.2	\$ 50.00	\$ 60.00
Drip irrigation	605	\$ 0.28	\$ 169.00
Planting labor	605	\$ 1.01	\$ 611.00
Soil samples	2	\$ 60.00	\$ 120.00
White clover/buckwheat or grass seed mix	605	\$ 0.66	\$ 399.00
Manure (in tons)	6	\$ 70.00	\$ 420.00
Compost (in yards)	145	\$ 50.00	\$ 7,260.00
Wood Ash (in tons)	6	\$ 35.00	\$ 210.00
N Organic	605	\$ 0.12	\$ 73.00
Bird netting	605	\$ 2.00	\$ 1,210.00
Bird netting hoops	240	\$ 3.00	\$ 721.00
Fresh berry washer and destemmer	1	\$ 8,500.00	\$ 8,500.00
Total Establishment Investment			\$ 22,936.00

Operating Expense for 1 Acre

Annual Operating Expense	Units	\$/Unit	Total
Cost of cuttings (10% annual replacement)	60.50	\$ 4.50	\$ 272.00
Wood chip mulch (in yards)	48.4	\$ 10.00	\$ 484.00
Wood chip mulch delivery fee (flat fee)	1	\$ 90.00	\$ 90.00
Netting & traps for SWD; Entrust/Pyganic			
Setting up & taking down netting	60.5	\$ 10.00	\$ 605.00
Setting up & taking down landscape fabric	60.5	\$ 10.00	\$ 605.00
Pruning	8	\$ 10.00	\$ 80.00
Mowing	8	\$ 10.00	\$ 80.00
Harvesting	121	\$ 10.00	\$ 1,210.00
Processing (destemming, washing, packing, freezing)	67	\$ 10.00	\$ 672.00
Fuel, oil, gas	40	\$ 2.50	\$ 100.00
Repairs & maintenance	1	\$ 100.00	\$ 100.00
Distribution (car, travel, shipping)			\$
25 lb. (5 gal) FDA-approved food grade buckets*	242	\$ 3.79	\$ 917.00
25 lb. (5 gal) FDA-approved food grade bucket lids*	242	\$ 1.50	\$ 363.00
Bags			
Labels	242	\$ 0.25	\$ 61.00
Sanitizer			
Organic certification			
Rent for washing, drying, freezing, packing facility			
Rent for freezer	2	\$ 40.00	\$ 80.00
Electricity for freezing, storing, drying, destemming, grinding	61	\$ 0.15	\$ 9.00
Insurance			
Crop insurance	1	\$ 311.00	\$ 311.00
General farm insurance			
Property taxes	1	\$ 79.50	\$ 80.00
Total Annual Operating Expense			\$6,118.00

Total Capital Investment (Establishment and 2 Years Operating Expense) for 1 Acre \$35,173

Income Potential and Return on Investment for 1 Acre

Price per Pound \$4.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$ 9,075	\$ 2,957	14
4.46	\$10,793	\$ 4,675	10
7.75	\$18,755	\$12,637	5
10	\$24,200	\$18,082	4
15	\$36,300	\$30,182	3

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

Price per Pound \$3.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$ 6,806	\$12,688	53
4.46	\$ 8,095	\$11,976	20
7.75	\$14,066	\$17,948	6
10	\$18,150	\$12,032	5
15	\$27,225	\$21,107	4

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

Price per Pound \$2.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$ 4,538	-\$11,581	N/A
4.46	\$ 5,397	-\$11,722	N/A
7.75	\$ 9,378	\$13,259	13
10	\$12,100	\$ 5,982	8
15	\$18,150	\$12,032	5

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

5-Acre Scenario

Production Information for 5 Acres

	5 Acres
Number of plants	3,025
Average productive life expectancy	10-15 years
Spacing	6' x 12'

Establishment Expense for 5 Acres

Establishment	Units	\$/Unit	Total
Average cost for cuttings	3,025	\$ 4.00	\$ 12,100.00
Shipping & transportation cost for plants	3,025	\$ 0.50	\$ 1,513.00
Plastic mulch (in feet)	3,025	\$ 0.76	\$ 2,299.00
Staples for plastic mulch	6.0	\$ 50.00	\$ 300.00
Drip irrigation	3,025	\$ 0.28	\$ 847.00
Planting labor	3,025	\$ 1.01	\$ 3,055.00
Soil samples	2	\$ 60.00	\$ 120.00
White clover/buckwheat or grass seed mix	3,025	\$ 0.66	\$ 1,997.00
Manure (in tons)	30	\$ 70.00	\$ 2,100.00
Compost (in yards)	726	\$ 50.00	\$ 36,300.00
Wood Ash (in tons)	30	\$ 35.00	\$ 1,050.00
N Organic	3,025	\$ 0.12	\$ 363.00
Bird netting	3,025	\$ 2.00	\$ 6,050.00
Bird netting hoops	1,202	\$ 3.00	\$ 3,605.00
Fresh berry washer and destemmer	1	\$ 8,500.00	\$ 8,500.00
Total Establishment Investment			\$ 80,199.00

Operating Expense for 5 Acres

Annual Operating Expense	Units	\$/Unit	Total
Cost of cuttings (10% annual replacement)	302.0	\$ 4.50	\$ 1,361.00
Wood chip mulch (in yards)	242	\$ 10.00	\$ 2,420.00
Wood chip mulch delivery fee (flat fee)	1	\$ 90.00	\$ 90.00
Neem/Entrust/Pyganic; netting or traps for SWD			
Setting up & taking down netting	302.5	\$ 10.00	\$ 3,025.00
Setting up & taking down landscape fabric	302.5	\$ 10.00	\$ 3,025.00
Pruning	40	\$ 10.00	\$ 400.00
Mowing	40	\$ 10.00	\$ 400.00
Harvesting	605	\$ 10.00	\$ 6,050.00
Processing (destemming, washing, packing, freezing)	336	\$ 10.00	\$ 3,361.00
Fuel, oil, gas	200	\$ 2.50	\$ 500.00
Repairs and maintenance	5	\$ 100.00	\$ 500.00
Laboratory analysis		\$ 68.00	
Distribution (car, travel, shipping)			
25 lb. (5 gal) FDA-approved food grade buckets*	1210	\$ 3.79	\$ 4,586.00
25 lb. (5 gal) FDA-approved food grade bucket lids*	1210	\$ 1.50	\$ 1,815.00
Bags			
Labels	1210	\$ 0.25	\$ 303.00
Sanitizer			
Organic certification			
Rent for washing, drying, freezing, packing facility			
Rent for freezer	10	\$ 40.00	\$ 400.00
Electricity for drying, destemming, grinding	303	\$ 0.15	\$ 44.00
Insurance			
Crop insurance	5	\$ 311.00	\$ 1,555.00
General farm insurance			
Property tax	5	\$ 397.50	\$ 1,988.00
Total Annual Operating Expense			\$ 31,822.00

Total Capital Investment (Establishment and 2 Years Operating Expense) for 5 Acres \$143,843

Income Potential and Return on Investment for 5 Acres

Price per Pound \$4.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$ 45,375	\$ 13,553	13
4.46	\$ 53,966	\$ 22,144	8
7.75	\$ 93,775	\$ 61,953	4
10	\$121,000	\$ 89,178	4
15	\$181,500	\$149,678	3

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

Price per Pound \$3.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$ 34,031	\$ 12,209	67
4.46	\$ 40,475	\$ 18,652	19
7.75	\$ 70,331	\$ 38,509	6
10	\$ 90,750	\$ 58,928	4
15	\$136,125	\$104,303	3

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

Price per Pound \$2.00

If Yield is X pounds per bush	Gross Income/Yr Starting in Yr 3	Net Income/Yr Starting in Yr 3	Return on Investment (Years)
3.75	\$22,688	-\$ 9,135	N/A
4.46	\$26,983	-\$ 4,839	N/A
7.75	\$46,888	\$15,065	12
10	\$60,500	\$28,678	7
15	\$90,750	\$58,928	4

Return on Investment is based on a simplified schedule. No discount rate on the value of cash over time is being applied.

Summary of Different Scenarios

The table below summarizes the different scenarios, assuming a 6' x 12' spacing and a conservative yield of 4.46 pounds per bush for all scenarios. We are also assuming manual processing for the one acre scenario and investment in a destemmer for the five-acre scenario.

Table 7. Summary of Different Enterprise Scenarios and Return on Investment

	40 bushes at \$6/lb. for berries	1 acre at \$4/lb. for berries	5 acre at \$4/lb. for berries
Establishment expenses	\$4,460	\$22,936 (includes cost of destemmer)	\$80,199
Annual operating expenses	\$469	\$6,118	\$31,822
Gross income potential in year 3	\$1,070	\$10,793	\$53,966
Net income potential in year 3	\$602	\$4,675	\$22,144
Return on investment	11 yrs.	10 yrs.	8 yrs.

Value-Added Enterprise Scenario Analysis

Growers who are interested in adding another enterprise to their businesses can also sell higher margin value-added products such as elderberry tea, syrup or concentrate. The scenario below provides a basic framework for analyzing a value-added enterprise for a food product such as elderberry juice or syrup. Growers who are making value-added products will need to factor in processing labor, ingredients, packaging, facility rental or utilities for a facility that meets the regulations for their specific product(s) and market(s), and the liability insurance, sales, marketing and distribution expenses for their specific product. They may also incur additional capital investment expenses related to purchasing of any processing/canning/juicing equipment or construction of a certified commercial kitchen. This scenario assumes that the producer is marketing the product as food and is not making any claims about nutrients or functional activities of the product. If planning to manufacture a product that would be considered a dietary supplement, the producer will need to factor in additional costs to meet FDA compliance.

Value-Added Expense Assumption Details

Developed with Daniel Keeney and Connor Gorham, Vermont Food Venture Center

This value-added enterprise analysis assumes the following:

- A juice yield of 10 pounds of berries to equal one gallon concentrate (juice).
- The processor will be renting a commercial kitchen such as the Vermont Food Venture Center and will have no capital investment expense for kitchen infrastructure.
- No cook-down time (i.e., the strength of the juice as pressed will be the strength going into the bottle).
- A fairly inefficient juicing process should be expected with berries: skins and stems clog the mesh bags and have to be frequently flushed out.
- We project that it's possible to process 600 pounds of berries into 60 gallons of juice and bottle it in a two-day process. The juicing day would be 8 to 10 hours, including a wash step. The juice would be stored in Brute food-grade 50-gallon totes in the refrigerator. The bottling day would be 4 to 6 hours, including a heat step. The juice would be bottled using a 4-head overflow filler into glass jars, sealed and inverted. The time for bottling does include time to apply labels.
- Terms and conditions of renting the Vermont Food Venture Center would apply and include a \$300 equipment security deposit.
- 60 gallons of concentrate would yield 960 8 ounce bottles of finished product.
- \$3,610 for 600 pounds of berries at \$6 per pound.
- \$63 for lemon juice (0.15 ounce lemon juice per 1 ounce elderberry extract to correct for pH at \$0.05 per ounce).
- \$1,056 for containers (\$1.10 per 8-oz. jar with closure, label and tamper-proof seal, shipping included).
- \$420 to \$560 for kitchen rental: 12 to 16 hours at full-use kitchen rental rate.
- \$30 for 3 hours of warehouse labeling rental rate.
- \$500 annually for product liability insurance.
- \$200 in expenses related to acid/acidified food "Scheduled Process" approval.

Income Assumptions for Value-Added Product

For this value-added product we assumed a price point of \$16.48 per 8 ounce bottle sold directly to the consumer.

Value-Added Production Scenario

8 Ounces Elderberry Concentrate

Production Information

	60 Gallons
Number of bottles of finished product	960 8-ounce bottles
Pounds of berries needed	600

Value-Added Production Costs	Units	\$/unit	Total
Elderberry extract (pure pressed juice)	7,680	\$ 0.47	\$ 3,610.00
Lemon juice or vinegar (to increase acidity)	1,152	\$ 0.05	\$ 63.00
Other ingredients (sugar, apple juice, etc.)			\$ -
Jars, caps, labels, tamper-proof seals	960	\$ 1.10	\$ 1,056.00
Labor	19	\$ 10.00	\$ 190.00
Facility rental (washing, pressing, heating, bottling)	16	\$ 35.00	\$ 560.00
Warehouse labeling rental rate	3	\$ 10.00	\$ 30.00
Acidified food "Scheduled Process" approval expenses	1	\$ 200.00	\$ 200.00
Shipping and distribution			\$ -
Sales and marketing materials and outreach			\$ -
Liability insurance	1	\$ 500.00	\$ 500.00
Total Value-Added Expense			\$ 6,209.00

Average Price per 8oz Extract \$16.48

Gross Income per 60 Gal Run	Net Income per 60 Gal Run	Net Income per 8oz Bottle	Net Income per # Berries
\$15,821	\$9,612	\$10	\$16

Note that the \$16 per pound of berries in net income is in addition to the \$6 per pound the processor is paying for the berries. If the processor and the producer are the same person, they would receive the \$6 per pound gross income from the berries less the cost of production, plus \$16 per pound in net income from the value-added product.

Conduct Your Own Enterprise Analysis

We have created an online **Elderberry Financial Decision Support Tool** to help growers decide if an Elderberry Enterprise makes sense for them. You can download the tool by clicking [this link](#) or by searching for: “[UVM Elderberry Financial Decision Support Tool](#)”.

The UVM Elderberry Enterprise Financial Decision Tool is an Excel spreadsheet designed to assist with evaluating the financial implications of establishment and management of elderberry. The spreadsheet allows you to input your number of bushes planted, yield per bush, and income and expenses related to establishment, management, harvesting and marketing to determine your potential economic return for your given scenario. The “Elderberry Enterprise Financial Analysis” tab has been formatted to provide a printable cash flow projection including a capital cost (establishment) budget that can be used as part of your business plan. There is also a tab for evaluating the costs and potential returns for a value-added enterprise.

Elderberry Financial Analysis Tool	
To Use This Tool, enter your data in the BLUE cells	
Income	
Enter Your Number of Bushes	
Enter Your Average Price per Pound	
Enter Your Average Yield per Bush (in Pounds)	
Enter Your Average Number of Cuttings Sold per Year	
Enter Your Average Price Per Cutting	
Enter Your Average Number of Elderberry Plants (other than Cuttings) Sold per Year	
Enter Your Average Price Per Plant	
Gross Income/Year	\$0.00

Financial Analysis

What does the financial analysis of these different scenarios mean for growers? For one thing, it clearly shows that at 4.46 pounds per bush, even a small grower receiving \$6 per pound will take 11 years to break even, and a large grower getting \$4 per pound will take 8 years to break even. This is perhaps why so many elderberry growers also try to do some value-added production - and why it is essential that the industry in the U.S., especially in northern regions, works on improving yield per bush.

In order to explore how our findings compare, we reviewed our numbers with what River Hills Harvest Co-op found in their feasibility study and the trend is consistent. River Hills Harvest Co-op concluded that to remain viable, the co-op and its members needed a mix of market strategies and price points. For example, their sales strategy is to target 60 percent of its berries for being processed into River Hills Harvest value-added product sold for a premium—a proprietary elderberry juice that is processed at low temperature and only very lightly filtered to maintain optimum bio-availability of the elderberry compounds—and only 40 percent of berries sold wholesale. The River Hills Harvest Co-op is also looking to generate income from the sale of cuttings and destemming equipment.

ENTERPRISE VIABILITY ANALYSIS SUMMARY: CAN ELDERBERRIES BE PROFITABLE?

Growing elderberry in Vermont at a small or large scale can be profitable, but as these are relatively slow-growing woody plants, and yields can vary dramatically, the return on investment can be longer than average. For example, a bank typically wants to be paid back within 10 years on intermediate assets (plant stock, equipment). But in our elderberry-growing scenarios the return on investment is more typically going to be in the 14-year range.

Our conclusion is that it is possible to make money with elderberries. But, as with all agricultural endeavors, it requires hard work and some risk. And with this industry that is still young and learning, patience will be an ally as you and fellow growers learn about and adopt best production methods (especially how to obtain high yields) and develop the infrastructure necessary for efficient processing and aggregation.



John Hayden steaming berries for juice.
Jenny Brown, UVM Extension

Our top recommendations for potential growers:

- 1) **Start small** to become familiar with the crop and work out any kinks in your production system before investing a lot and realizing afterwards you should have done things differently.
- 2) **Take the time and money to do things right.** The key to elderberries being profitable is optimizing annual yield. If you take the time and spend the money to establish your orchard for success in that first initial preparation and planting season, you will reap the rewards every passing year.
- 3) **Consider a mix of markets and products:** both wholesale and retail markets for fresh, frozen or dried whole fruit; and fresh or dried flowers.
- 4) **Making value-added products could further increase profit margin,** but is a second enterprise on top of growing the bushes and harvesting the flowers and fruit. If you think you might enjoy making value-added products and have the time, capacity and capital to do so, you may wish to explore recipes and markets for teas and tisanes, jams and jellies, baked goods, drinks and syrups. Elderberry juice/drinks and elderberry concentrate were identified most frequently by local grocery co-ops as a product of interest. Elderberry juice or concentrate may require special processing as its sugar content and pH promote

fermentation, so be sure to connect with the food processing centers in the Additional Resources Section of this guide if you are exploring making juice or concentrate.

Elderberry is increasingly recognized as an effective remedy against cold and flus. However, rather than consumers seeking it out, our research suggests that a growing number of companies are using a “push strategy” to create supply demand for elderberry-based products. As producers of value-added products seek to out-compete one another with features and benefits, they are adding elderberry as one of the ingredients that will give them a leg up on the competition. We expect to continue to see this trend grow, and so believe that the opportunity is there for you to both support this need and create your own new products to take part in growing that market segment.

—Rose Wilson, Rosalie J. Wilson Business Development Services

Cooperative Models for Sharing Resources and Aggregating Product

In Vermont, elderberries are currently produced on individual farms at small scales (relative to demand) and these farms are scattered throughout the state. The small scale of production and distance between growers presents challenges for buyers to source locally and increases transaction costs (Meyer, Helfand and Gerlicz, 2015). Forming legal cooperatives (or simply cooperating informally) can provide one way that growers can aggregate product and share the costs of processing equipment, while marketing a product in quantities large enough to satisfy processors' demands.

A cooperative model can mean:

- Beginning or expanding farmers have less need of start-up capital for the infrastructure needed for an elderberry operation. For example, while it may not be feasible for an individual grower to invest in a destemmer that he or she may use once per year, it may make financial sense if three or four growers were to buy that piece of equipment together and share it. The challenge, of course, would be determining how multiple growers could use the destemmer during the same few weeks of harvest. One option the Midwest Elderberry Cooperative is exploring to address this challenge is a mobile destemmer and blast freeze unit that could travel from farm to farm (Cooperative Development Services, 2013).
- Improved grower profitability by streamlining overhead expenses associated with sales, marketing and distribution of product; and access to packaging and other inputs at reduced rates if buying in larger quantities as a group order.
- Access to technical assistance, best practices, resources, instruction, and a venue for participating in co-learning and sharing of information and support.
- Sufficient production volume to access markets that would otherwise be inaccessible to an individual grower, through aggregating product from multiple co-op members.
- Collaborate to educate wholesale buyers and direct market consumers about the benefits of higher quality, locally sourced product.

An elderberry cooperative could perform one or more of the following functions (Cooperative Development Services, 2013):

- Intake and aggregate fresh, refrigerated, stemmed elderberries from members; wash, destem and freeze them; inventory them in a central facility; and market frozen fruit to processors.
- Intake and aggregate destemmed frozen berries from members, inventory them in a central facility; and market frozen fruit to processors.
- Intake and aggregate whole, dried berries from members; market dried berries to processors.
- Intake and aggregate whole, dried berries from members; transform them into value-added products, market value-added products to retail and wholesale accounts.



Elderberries. Jenny Brown, UVM Extension

Chris Patton Explains the Origins of the Midwest Elderberry Cooperative:

Question: What inspired you to consider a cooperative model for elderberry?

Response:

A cooperative model can be useful for farmers who are interested in elderberry production not as a main cash crop ... but in small plantings that could contribute to incomes ... The cooperative can also invest in more long-term strategic marketing that might not be available to the small grower. For instance, the cooperative can seek to substitute elderberry [for other] ingredients used by food/medicinal businesses that are currently imported.

It also gives growers more control over the process and flexibility in responding to new buyers and market shifts. Growers who cannot access processing equipment on their own retain some of the value from the processing (value-adding) either through shared use of equipment or more passively through collective investments in that equipment.

Cooperatives also might have more influence on research agendas, in particular concerning the interest in the health benefits of elderberry. Cooperatives might play a role in promoting research findings in the community and among consumers. They also might have access to external supports from government and foundations.

—Chris Patton of the Midwest Elderberry Cooperative in an interview with Andrew Gerlicz, March, 2015 (Meyer, Helfand and Gerlicz, 2015).



River Hills Harvest Model of a Network of Grower Co-ops or “Pods”

River Hills Harvest (RHH) is a private company based in Missouri that buys elderberries for the manufacture of their own brand of juice, jellies and throat remedies. In addition, they generate income through the sale of cuttings and destemming equipment to growers.

River Hills Harvest hopes to purchase berries from regional or statewide co-ops composed of “pods” of growers grouped by geographic proximity. (See for example, the [Midwest Elderberry Cooperative](#) (MEC). Each pod would share resources and infrastructure and sell their berries to their state or regional co-op. The co-op would then sell the berries to River Hills Harvest. River Hills Harvest transforms 60 percent of its berries into value-added products and wholesales the remaining berries. River Hills Harvest hopes that by maintaining ownership of 60 percent of the berries from raw to value-added form, it can generate sufficient profit margin to be able to uphold an average price of \$2.50 per pound for conventional berries and \$4.50 per pound for certified organic that it will pay the state co-ops or grower pods. RHH hopes this would enable the co-ops to pay an average price of \$2.00 per pound for conventional washed, destemmed, sanitized and frozen berries and \$3.50 per pound for certified organic berries to its growers. This average price would be based on berry quality.

River Hills Harvest pays growers a higher price for ripe berries meeting certain Brix (sugar content) standards, juice yields, larvae test standards, and other parameters, and a lower price for green or red berries (River Hills Harvest has a market for these unripe berries within the pet food and poultry feed industries).

River Hills Harvest is creating a set of standards and production methods for its growers and provides growing instruction and technical support. It sells cuttings at a nominal fee, reducing start-up capital expense for growers. River Hills Harvest also provides private label services, selling growers back value-added products made from their own berries under their own farm name at cost, so the growers can make their own sales at farmers markets, local stores and farm stands.

— Interview with Terry Dunham, 2016

Opportunities and Resources for Cooperative Efforts in Vermont



(Jennifer Brown, UVM Extension)

Elderberry growers workshop at Thornhill Farm, Greensboro, Vt.

Growers in Vermont and elsewhere in the region may want to explore forming a cooperative. As part of the Vermont Elderberry project, a group of students at the University of Vermont conducted a preliminary study on the feasibility of forming an elderberry cooperative in Vermont. They concluded that because the industry in Vermont is still in its early stages of development, it is too soon to determine if creating a cooperative makes sense. They recommend that any group considering forming a cooperative should follow a process of: holding exploratory meetings, electing a steering committee, conducting a member-use survey and conducting additional market analysis of the regional and national markets.

If—after conducting sufficient research—the group decided to form a cooperative, they would need to engage legal counsel for development of by-laws and grower contracts, and develop a business plan. They also note that most co-ops tend to rely on at least one individual in their early stages who is willing to put in a significant amount of time, energy and resources in forming the co-op. Without this person or persons, it is unlikely that a cooperative will materialize. Although there may be interest in a cooperative, feasibility depends on such an individual explicitly claiming this role and dedicating themselves and a significant amount of their time to the development of the co-op (Meyer, Helfand and Gerlicz, 2015). Commitment of all members during the first stage is critical. Because not everyone who expresses interest in a co-op may stay for the long-haul, it is advisable in the formation stage to consider having prospective members (e.g., representatives on a steering committee) sign a non-disclosure agreement that would prevent them benefitting from work or information generated by the cooperative if they subsequently leave and start an independent business.

The Vermont Herb Growers Cooperative, a certified organic medicinal herb growers' cooperative, is being formed to market dried herbs. They are interested in exploring partnerships with elderberry growers in Vermont. Certified organic elderberry growers may contact Pamela Hathaway for more information. Terry Durham from River Hills Harvest has also offered to come to Vermont and meet with growers to explain the River Hills Harvest model. Contact information for both Hathaway and Durham can be found in the Additional Resources section.

GROWER TIP: Assistance in Cooperative Development

For growers who are interested in exploring a cooperative model, the Cooperative Development Institute in Northampton, Massachusetts, provides both free and fee-based assistance to groups seeking to form cooperatives, and the USDA Rural Development's Cooperative Information Report 7 (CIR 7) offers a step-by-step model to forming a cooperative (USDA-RD 1996).

Since forming a legal cooperative can be costly in terms of time and expense, there are many ways that growers can benefit from cooperating with one another without going through the process of forming a formal legal entity. Growers can help one another by sharing information, making group bulk purchases of supplies or equipment, organizing work days to help one another with harvesting or processing, and agreeing together upon set prices for their products (Meyer, Helfand and Gerlicz, 2015). The UVM Elderberry listserv can provide one vehicle for growers to network and share resources and information.

Cornell University Cooperative Extension has an excellent article and worksheet that addresses other ways that small and mid-sized farms can help one another through collaborative marketing without taking on the legal identity of a cooperative. This article: [Collaborative Marketing for Small Farms: Selling and Working Together for Profitability](#) states:

“Collaborative marketing is a realistic solution for small to mid-sized farmers that are seeking access to larger markets, but are unable to individual serve such accounts. In collaborative marketing, several like-minded producers join together formally to market and distribute farm products, but not necessarily under the governance or control of a cooperative. [...] Generally, small farms should consider temporary, limited-scale collaborative projects before developing substantial business agreements. Such arrangements can be as simple as consignment sales, or as complex as a corporation dedicated to marketing and distribution.” (Cornell University Cooperative Extension, 2012)

Conclusions and Recommendations



(Abbie Sewall, The Bailey Farm, Freeport, Maine)

Elderberries can be grown in Vermont, and national demand for elderberry-based products is growing.

The two largest segments of the U.S. population (millennials and baby boomers) share a desire for good health. Among both groups there is significant demand for natural and functional foods, and that is likely to continue to rise for the foreseeable future. Local sources for “native” Vermont elderberries could be a logical part of these trends. At current production volumes, however, prices for whole berries are not high enough to generate a rapid return on investment. It will take 11 years to break even on a 40-bush planting earning \$6 per pound.

To improve the time for return on investment the industry should focus on improving yields and improving margins. To maximize margins, interested growers can consider making a value-added product. Elderberry concentrate, for example, could add up to \$16 per pound in value to berries.

Optimal yield is dependent upon good well-drained soil, soil amendments, irrigation, and weed control. With the rise of spotted wing drosophila, additional risk mitigation to help growers plan ahead against the impact of this pest may be important.

Growers in the Northeast can help the industry with these improvements by communicating with one another (for example via the UVM Extension listserv and the Maine Elderberry Group), by keeping records and sharing information on their production each growing season, and by participating in research projects. Both [Specialty Crop Block Grants](#) (also known as SCBG grants, available most years through each state's Agency of Agriculture) and SARE or [Sustainable Agriculture Research and Education Grants](#) (available through the [Northeast SARE](#)) are available for farmers who wish to conduct their own research or in partnership with natural scientists or economists. If you would like to be added to UVM Extension's Center for Sustainable Agriculture's Elderberry project listserv, contact sustainable.agriculture@uvm.edu. You can also find additional documents related to Elderberry production on our [Elderberry webpage](#) – which you can locate by using the search words: "UVM Elderberry." Appendix E is a list of additional resources, which may be helpful as you explore starting an Elderberry business.



(Tori Lee Jackson, University of Maine Extension)
Elderberry orchard in Maine.

References

Atkinson, M. D. and E. Atkinson. *Sambucus nigra* L. *J. Ecology* 90:895-923. 2002 in Charlebois et al. 2010.

Bowling, B. L. *The Berry Grower's Companion*. Timber Press. 2000.

Bolli, R. Revision of the genus *Sambucus*. *Diss. Bot.* 223:1-256. 1994 in Charlebois et al. 2010.

Brownlee, E. J., and Stedman, C. (2013, June 28). Cornell Small Farms Program. Retrieved November 12, 2015, from <http://smallfarms.cornell.edu/2013/06/28/elderberry-and-beyond-new-options-for-river-lands-in-the-northeast/>.

Brownlee, E. J. (April 2013) Growing Agriculturally Productive Buffers. (Master's thesis) Retrieved from author.

Brownlee, E. J. (April 2013) A New Option for On-Farm River Stewardship in Vermont. (Master's thesis) Retrieved from author.

Brownlee, E. J. (2015, November 16). [Telephone interview]. Interviewed by Michelle Graziosi.

Byers, P. L.; A. L. Thomas; M. M. Cernusca; L. D. Godsey; AND M. A. Gold, [Agroforestry in Action](#): Growing and Marketing Elderberries in Missouri. University of Missouri Center for Agroforestry. AF1016-2014.

Carpenter, J.; and Carpenter, M. *The Organic Medicinal Herb Farmer*. White River Junction, Vermont: Chelsea Green Publishing 2015.

Carroll, B. Growing Elderberries in Oklahoma. Oklahoma Cooperative Extension Service. HLA-6256 2014.

Charlebois, D.; P. L. Byers; C. E. Finn, and A. L. Thomas. Elderberry: Botany, Horticulture, Potential. *Horticultural Reviews*: Wiley-Blackwell. 37: 213-280 p. 2010.

Cernusca, M.; M. A. Gold, and M. Godsey, L. Elderberry Market Research. Report based on research performed in 2009: The Center for Agroforestry, University of Missouri 2011.

Cornell University, D. O. H. Minor Fruits, Elderberries, *Sambucus* spp. Cornell University: Cornell University 2015.

Criag, D. L. Elderberry culture in eastern Canada. Publication 1280. Information Services, Agriculture Canada. 1978 in Charlebois et al. 2010.

- Faulkner, J. (2014, October 1). Climate change and agriculture in Vermont. Retrieved November 11, 2015, from [http://www.uvm.edu/~susagctr/whatwedo/farmingclimatechange/ FarmCCQuickFacts.pdf](http://www.uvm.edu/~susagctr/whatwedo/farmingclimatechange/FarmCCQuickFacts.pdf).
- Felter, H. W. M. D. *King's American Dispensatory*. Lloyd, J. U. P. M., Ph. D. 1898.
- Grebow, J. U.S. Herbal Supplement Sales Up 6.8% in 2014. *Nutritional Outlook* 2015.
- Hayden, N. Home for Supper: Remembering Lewis Hill. *Vermont's Local Banquet*, Spring, 2016.
- Hayes, M. News from our Elderberry Farm. 2015.
- Hearthstone Berry Farm, 2011 Field Days Elderberry Production Notes, 2011.
- Kneller, M.; Peteet, D. Late-Glacial to Early Holocene Climate Changes from a Central Appalachian Pollen and Macrofossil Record: *Quaternary Research*. 51: 133-147 p. 1999.
- McKay, S. A. Demand Increasing for Aronia and Elderberry in North America. *New York Berry News: New York Berry News*. 3 2004.
- Nickerson, V; V. Grubinger, L. Nwadike and L. Blevins. Frequently asked Questions about Flooded Produce. UVM Extension, 2013.
- Ochterski, J. Cornell University Cooperative Extension, October, 2012.
- Paul, L.; S. Friedrich and P. Enkerud; Drying Fruits. Montana State University Extension MontGuide MT200909HR. 2011
- Quebec, Filière des plantes médicinales biologiques du Québec. Le Bureau du Canada, Guide de production sous regie biologiques, Quebec. www.plantesmedicinales.gc.ca; Bibliotheques et Archives nationales du Quebec: 29 p. 2010.
- Robertson, C. Flowers and insects. IX. *Bot. Gaz.* 17:269-276. 1892. in CHARLEBOIS et al. 2010.
- Robinson, A. Y. Elderberry at East Grove Farm: Mid-American Agroforestry Working Group 2013.
- Roche, E. Risk Management Program for Elderberry Growers. University of Maine Extension: University of Maine Extension 2015.
- Roper, T. R., D. L. Mahr, and P. S. McManus. Growing Currants, Gooseberries and Elderberries in Wisconsin, A1960 UW Extension RP-07-01-(R12/98)-3M-300, 1998. <http://learningstore.uwex.edu/Growing-Currants-Gooseberries-and-Elderberries-in-Wisconsin-P752.aspx>
- Secher, D. Uncommon Fruit: Observations from Carandale Farm [http://uncommonfruit.cias.wisc.edu/ american-elderberry/](http://uncommonfruit.cias.wisc.edu/american-elderberry/) (date unknown)
- Schooley, K. Elderberries for Home Gardens. Ontario Ministry of Agriculture, Food and Rural Affairs, 238/10, 1995 <http://www.omafra.gov.on.ca/english/crops/facts/95-005.htm>
- Thole, J. M., T. M. Burns Kraft, L. A. Sueiro, Y. H. Kang, J. J. Gills, M. Cuendet, J. M. Pezzuto, D. S. Seigler and M. A. Lila. 2006. A Comparative Evaluation

- of the Anticancer Properties of European and American Elderberry Fruits. *Journal of Medicinal Food*, 9(4): 498-504. <http://online.liebertpub.com/doi/abs/10.1089/jmf.2006.9.498>
- Thomas, A. L.; Byers, P. L.; Eilersieck, M. R. Productivity and Characteristics of American Elderberry in Response to Various Pruning Methods. *HortScience* 44(3): 671-677, June, 2009.
- Thomas, A. L., P. L. Byers, C. E. Finn, Y. C. Chen, G. E. Rottinghaus, and W. L. Applequist. Occurrence of rutin and chlorogenic acid in elderberry leaf, flower and stem in response to genotype, environment and season. *Acta Hort* 765:197-206. 2008. in Charlebois et al. 2010.
- University of Missouri Elderberry Financial Guide. University of Missouri 2014.
- USDA Nutrient Data Laboratore: [Elderberry](#) Elderberry is already recognized as a super fruit (see USDA [Database for Flavonoid Content of Selected Foods, Release 2.1](#), 2007, page 40, NDB No.09088).
- USDA Rural Development. (1996, Revised March 2015). How to Start a Cooperative. Cooperative Information Report 7.
- Vermont Agency of Agriculture, Food and Markets Required Agricultural Practices Regulations. (2015) V.S.A §§ 4810a and 4810.
- Way, R. Elderberry Culture in New York State. New York's Food and Life Sciences Bulletin. Number 91, 1981.
- Winter, J. Elderberry: Flu-fighters' secret weapon. <http://newhope360.com/ingredientsgeneral/elderberry-flu-fighters-secret-weapon?page=1>: NewHope360 2010.
- World Health Organization. WHO monographs on selected medicinal plants. Vol. 2. World Health Organization, 1999. Page 269 (Flos Sambuci).
- Zakay-Rones, Z., Varsano, N., Zlotnik, M., Manor, O., Regev, L., Schlesinger, M., & Mumcuoglu, M. (1995). Inhibition of Several Strains of Influenza Virus in Vitro and Reduction of Symptoms by an Elderberry Extract (*Sambucus nigra* L.) during an Outbreak of Influenza B Panama. *The Journal of Alternative and Complementary Medicine*, 1(4), 361–369. <https://doi.org/10.1089/acm.1995.1.361>
- Zakay-Rones, Z., Thom, E., Wollan, T., & Wadstein, J. (2004). Randomized study of the efficacy and safety of oral elderberry extract in the treatment of influenza A and B virus infections. *The Journal of International Medical Research*, 32(2), 132–140.

Appendices

APPENDIX A: SOURCES OF PLANTS (2015)

These were sources and prices identified in the fall of 2015. Note that sizes of pots and plants vary from one source to another so these are not necessarily prices for comparable sized plants. Be sure to ask the source about the size of the pot the plant is in. Sources, availability and pricing may differ in the future. If ordering a large number of plants or inputs, it is worth asking vendors if volume discounts are available.

VERMONT SOURCES AND COST OF PLANTS

East Hill Tree Farm

Native Seedlings	\$ 19.00
Adams	\$ 19.00
Johns	\$ 19.00
Nova	\$ 19.00
Samdal, <i>S. Nigra</i>	\$ 19.00
Samyl, <i>S. Nigra</i>	\$ 19.00
Korsor, <i>S. Nigra</i>	\$ 19.00
Sampo, <i>S. Nigra</i>	\$ 19.00

Elmore Roots Fruit Tree and Berry Nursery

Certified Organic Adams	\$ 45.00
Certified Organic York	\$ 45.00
Certified Organic Nova	\$ 45.00
Certified Organic Johns	\$ 45.00
Certified Organic Native	\$ 45.00
Certified Organic Black European, <i>S. Nigra</i>	\$ 45.00

Eleven Acre Farm

Coomer, 4" potted plant	\$ 7.00
Berry Hill, 4" potted plant	\$ 7.00
Coomer, one-gallon potted plant	\$ 12.00
Berry Hill, one-gallon potted plant	\$ 12.00
Bulk Discount 300+ plants	\$ 4.00

FEDCO Seeds

Adams	\$ 17.00
Goodbarn	\$ 18.00
York	\$ 17.00
Seedlings (unnamed variety)	\$ 15.00

Nourse Nursery

Samdal <i>S. Nigra</i>	\$ 5.40
Samyl, <i>S. Nigra</i>	\$ 5.40

Stark Brother's Nursery

York	\$ 17.99
Johns	\$ 13.99
Nova	\$ 12.99

The Farm Between

Certified Organic Adams	\$ 15.00
Certified Organic York	\$ 15.00
Certified Organic Nova	\$ 15.00
Certified Organic Johns	\$ 15.00

Walden Heights Nursery	
Certified Organic Seedlings	\$ 10.00
Certified Organic York	\$ 18.00
Certified Organic Nova	\$ 18.00

SOURCES OUTSIDE OF VERMONT

Luegger Elderberry Farm, Iowa

Nova non-rooted cuttings, 100 or less	\$ 2.75
York non-rooted cuttings, 100 or less	\$ 2.75
Bob Gordon non-rooted cuttings, 100 or less	\$ 2.75
Bertram non-rooted cuttings, 100 or less	\$ 2.75
Haschberg, <i>S. nigra</i> , non-rooted cuttings, 100 or less	\$ 2.75
Nova non-rooted cuttings, 100 or more	\$ 2.50
York non-rooted cuttings, 100 or more	\$ 2.50
Bob Gordon non-rooted cuttings, 100 or more	\$ 2.50
Bertram non-rooted cuttings, 100 or more	\$ 2.50
Haschberg, <i>S. nigra</i> , non-rooted cuttings, 100 or more	\$ 2.50
Nova potted, rooted plant, 1-quart pot	\$ 7.00
York potted, rooted plant, 1-quart pot	\$ 7.00
Bob Gordon potted, rooted plant, 1-quart pot	\$ 7.00
Bertram potted, rooted plant, 1-quart pot	\$ 7.00
Haschberg, <i>S. nigra</i> , rooted plant, 1-quart pot	\$ 7.00
Nova potted, rooted plant, 1-gallon pot	\$ 9.50
York potted, rooted plant, 1-gallon pot	\$ 9.50
Bob Gordon potted, rooted plant, 1-gallon pot	\$ 9.50
Bertram potted, rooted plant, 1-gallon pot	\$ 9.50
Haschberg, <i>S. nigra</i> , potted, rooted plant, 1-gallon pot	\$ 9.50

Musser Forests, Pennsylvania

<i>S. canadensis</i> unnamed variety, 1 yr. rootstock	\$ 2.53
<i>S. canadensis</i> unnamed variety, 3 yr. seedling 12-15"	\$ 2.86
<i>S. canadensis</i> unnamed variety, 3 yr. seedling two feet cutback	\$ 3.18

One Green World, Oregon

York	\$ 16.95
Nova	\$ 16.95
Korsor, <i>S. nigra</i>	\$ 16.95
Sutherland Gold, <i>S. nigra</i>	\$ 16.95
Thundercloud, <i>S. nigra</i>	\$ 16.95
Variegated, <i>S. nigra</i>	\$ 16.95

Raintree Nursery, Washington

Allesso, <i>S. nigra</i>	\$ 15.00
Black Beauty, <i>S. nigra</i>	\$ 22.50
Black Lace, <i>S. nigra</i>	\$ 22.50
Goldebeere, <i>S. nigra</i>	\$ 15.00

River Hills Harvest, Missouri

Adams cuttings	\$ 2.50
Bob Gordon cuttings	\$ 2.50
Eridu cuttings	\$ 2.50
Ranch cuttings	\$ 2.50
Wyldeewood 1 cuttings	\$ 2.50
Wyldeewood 2 cuttings	\$ 2.50

APPENDIX B: INTERVIEWS CONDUCTED

Retail Buyers

Lynn Ellen Schimoler, Assistant Director of Operations-Retail, City Market/Onion River Coop, Burlington, Vt.

Dan Ridgeway, Non-perishable Grocery Buyer, Brattleboro Coop, Brattleboro, Vt.

Kate Arnold, Buffalo Mountain Coop, Hardwick, Vt.

Food, Beverage, and Nutraceutical Manufacturers

Todd Hardie, founder, Honey Gardens Apiary and Caledonia Spirits, Greensboro, Vt.

Jason, Production Manager, Putney Mountain Winery, Putney, Vt.

Duncan Holaday, Owner, Dunc's Mills, St. Johnsbury, Vt.

Chris Maggiolo, Production Manager, American Crafted Spirits (Silo Distillery), Windsor, Vt.

Caitlin Jenness, Citizen Cider, Burlington, Vt.

Chris Chaisson, Owner, Wild Branch Foods & Eleven Acre Farm, Charlotte, Vt.

Guido Masé, Chief Herbalist, Urban Moonshine, Burlington, Vt.

Steve McKay, Owner, Micosta Enterprises, Inc., Hudson, N.Y.

Pamela Hathaway, Manager, Vermont Herb Growers Cooperative, Marshfield, Vt.

Jeff Weaber, Owner, Aqua Vitea, Bristol, Vt.

Iris Gage, Owner, Grian Herbs, Montpelier, Vt.

Growers

Nicko Rubin, Owner, East Hill Tree Farm, Plainfield, Vt.

David Fried, Owner, Elmore Roots Fruit Tree and Berry Nursery, Wolcott, Vt.

Gino Palmeri, Owner, Palmeri Landcare, Putney, Vt.

Stan Ward, Mad River Watershed Elderberry Planting, Waitsfield, Vt.

Terry Durham, Owner, River Hills Harvest, Hartsburg, Mo.

Marie Frohlich, Owner, Taproot Herbals, Williamstown, Vt.

John Hayden, Owner, The Farm Between, Jeffersonville, Vt.

Jeff Carpenter, Owner, Zack Woods Herb Farm, Hyde Park, Vt.

Ann Lenhardt, Co-Founder, Norm's Farms, Pittsboro, N.C.

Andy Luegger, Luegger Elderberry Farm, Mount Vernon, Iowa

Chris Patton, President, Midwest Elderberry Cooperative, Minn.

Members of the Maine Elderberry Growers Collective (Interview conducted with group at annual meeting in 2015; and Enterprise survey distributed to members electronically in Spring, 2016)

Researchers

Steve McKay, Cornell University Agricultural Experiment Station (retired), Freeville, N.Y.

Tori Lee Jackson, Extension Educator, Associate Professor of Agriculture and Natural Resources, University of Maine Cooperative Extension, Lisbon Falls, Maine

David Handley, Extension Vegetable and Small Fruit Specialist, University of Maine Cooperative Extension at Highmoor Farm, Monmouth, Maine

Erin Roche, Crop Insurance Education Program Manager, University of Maine Cooperative Extension, Orono, Maine

APPENDIX C: BUYER SURVEY QUESTIONS

Buyer: contact name, position, organization

1. Does your organization currently purchase and utilize elderberry or elderberry products?
2. If not, is it something you are considering?
3. If so, what type of product are you considering: food (jam, etc.), beverages (ready-to-drink, alcoholic, etc.), medicinal (extracts, teas, capsules, etc.)?
4. Do you purchase certified organic or non-certified/conventional elderberry?
5. Which parts of the plant do you utilize (select as many as applicable), in what quantity, and at what price?
 - Berries fresh on stem
 - Berries frozen on stem
 - Berries fresh destemmed
 - Berries frozen destemmed
 - Berries dried
 - Powdered
 - Concentrate
 - Distilled/essential oil
 - Flowers fresh
 - Flowers dried
6. Where are you currently sourcing elderberry from?
7. Would you be interested in a Vermont source of elderberry?
8. If no, why not?
9. If yes, why?
10. What features/benefits do you perceive in a Vermont grown elderberry?
11. Would you be willing to pay a premium for these features/benefits?
12. If so, what? Please quantify either a dollar figure or a percentage above what you are currently paying.
13. If so, what? Please quantify either a dollar figure or a percentage above what you are currently paying.
14. How much of your total volume would you be willing to purchase from Vermont if it were available at the price you indicate above?
15. How do you prefer to receive your elderberry products?

APPENDIX D: POTENTIAL LOCAL BUYERS (2015)

Retail Buyers - Non Specific Elderberry Needs

City Market/Onion River Coop

Burlington, Vt.

Lynn Ellen Schimoler, Assistant Director of Operations - Retail

(802) 861-9751

lynnellen@citymarket.coop

Brattleboro Co-op

Brattleboro, Vt.

Dan Ridgeway, Non-perishable Grocery Buyer

(802) 257-0236

Buffalo Mountain Coop

Hardwick, Vt.

Kate Arnold, Buyer

(802) 472-6020

kate@buffalomountaincoop.org

Fresh/Frozen Bulk Berries Wholesale

Thornhill Farm

Greensboro, Vt.

Todd Hardie, Owner

todd@thornhillfarmvermont.com

Putney Mountain Winery

Putney, Vt.

Jason, Production Manager

(802) 387-5925

Citizen Cider

Burlington, Vt.

Caitlin Jenness

(802) 448-3278

caitlin@citizencider.com

Wild Branch Foods & Eleven Acre Farm

Charlotte, Vt.

Chris Chaisson, Owner

chris@wholefarmservices.com

Urban Moonshine

Burlington, Vt.

Guido Masé, Chief Herbalist

guido@urbanmoonshine.com

Micosta Enterprises, Inc.
Hudson, N.Y.
Steve McKay, Owner
(518) 451-0109
info@emicosta.com

River Hills Harvest
Terry Durham, Owner
Hartsburg, Mo.
(855) 662-3779
info@riverhillsharvest.com

Norm's Farms
Pittsboro, NC
Ann Lenhardt, Co-Founder
(919) 929-3004
ann@normsfarms.com
www.normsfarms.com

Bulk Dried Elderberry

American Crafted Spirits/Silo Distillery
Chris Maggiolo, Production Manager
Windsor, Vt.
(802) 674-4220

Vermont Herb Growers Cooperative
Marshfield, Vt.
Pamela Hathaway, Manager
plhathaway.vt@gmail.com

Bulk Elderberry Juice

Aqua Vitea
Bristol, Vt.
Jeff Weaber, Owner
(802) 453-8590

Bulk Fresh or Dried Elder Flower

Dunc's Mills
Duncan Holaday, Owner
St. Johnsbury, Vt.
(802) 745-9486

Grian Herbs
Montpelier, Vt.
Iris Gage, Owner
(802) 223-0043

APPENDIX E: ADDITIONAL RESOURCES

UVM Extension's Center for Sustainable Agriculture Elderberry Project has a webpage. You can find it by using the search words: "UVM Elderberry" If you would like to be added to the Elderberry project's listserv, contact sustainable.agriculture@uvm.edu. Below is a list of additional resources you may find helpful as you explore starting an elderberry business.

HORTICULTURAL INFORMATION FOR SMALL FRUIT GROWERS

University of Vermont Vegetable and Berry Grower Webpages <http://www.uvm.edu/vtvegandberry>

New England Small Fruit Management Guide: Managing Diseases, Insects and Weeds in Small Fruit Crops. Available through UMass Amherst: <https://ag.umass.edu/fruit/publications>

Cornell University's Spotted Wing Drosophila website <http://www.fruit.cornell.edu/spottedwing>

Oregon State University Extension Protecting Garden Fruits from Spotted Wing Drosophila <http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20883/em9026.pdf>

BUSINESS PLANNING ASSISTANCE

AgPlan: Free online business planning tutorial for agriculture and fisheries businesses <https://www.agplan.umn.edu>

UVM Extension New Farmer Project: a central point of information on all services, and educational opportunities for Vermont's new and aspiring farmers, filled with helpful information on getting your product into markets and managing your business. <https://www.uvm.edu/newfarmer>

Growing Places: A UVM Extension course for people considering starting an agriculture or natural resource based business, but who aren't sure where to start. https://www.uvm.edu/newfarmer/?Page=classes/growing_places.html&SM=classes/sub-menu.html

Building a Sustainable Business: This course guides participants through developing a business plan for farms businesses. Open to people who have completed **Growing Places** <https://www.uvm.edu/newfarmer/?Page=classes/basb.html&SM=classes/sub-menu.html>

Vermont Farm & Forest Viability Program. Farmers and planning consultants meet and work together for approximately one year to assess the farm's strengths and weaknesses and explore enterprise changes that could increase net profitability. To be eligible for the program, farmers must: have at least two years' experience managing the current farm, and have grossed at least \$15,000 on the farm in the most recent tax year. <http://www.vhcb.org/Farm-Forest-Viability> Contact Liz Gleason, Program Coordinator, for further information at 828-3370 or by email, liz@vhcb.org.

UVM Extension Farm Viability Clinics: Business owners make an appointment, bring in their budgets statements and balance sheets (you can send your business plan in ahead of time) and meet with a farm viability provider for a 1.5 hour consultation. For more information contact: mark.canella@uvm.edu.

Vermont Small Business Development Center (VTSBDC): provides advising services, and a wide range of training programs both online and in-person, as well as industry research and tools. To contact the VtSBDC Agribusiness Program Director: Steve Paddock at (802) 388-7953 or spaddock@vtsbdc.org.

MARKET DEVELOPMENT

Understanding Market Trends: A great resource for understanding food and agricultural markets: <http://www.agmrc.org/markets-industries/food>

MarketMaker: searchable database to see who is looking to buy certain products <https://foodmarketmaker.com>

Consultants: There are many public and private market development consultants in Vermont – one way to identify them is to use the Vermont Farm to Plate Food Atlas <http://www.vtfarmtoplate.com/atlas> and search under the Marketing Category for “market consultants”.

DEVELOPING AND MARKETING A VALUE-ADDED PRODUCT

Starting a Value-Added Food Business: A Guidebook of the Northeast Network of Immigrant Farming Projects. This is a great, easy-to-follow resource— developed for non-English speakers but the material is useful for anyone: https://nesfp.org/sites/default/files/uploads/pl_value_added.pdf

Penn State Extension – Starting a Value-Added Enterprise: has a number of resources on developing value-added products, from the legal aspects, to regulations and packaging <http://extension.psu.edu/business/farm/guide/value-added/planning-marketing/starting>

Northeast Center for Food Entrepreneurship: Provides comprehensive assistance to beginning and established food entrepreneurs. <https://necfe.foodscience.cals.cornell.edu>

UVM Extension Food Safety Specialist, Omar Oyarzabal: Training and consultations in Food safety programs and HACCP (Hazard Analysis and Critical Control Points); Identification and typing of bacterial foodborne pathogens; Microbial source tracking and traceability; Food safety regulations https://www.uvm.edu/extension/food_safety_producers_and_processors

Online Support for New England Food Entrepreneurs This website, convened by the New England Extensions, is designed to help you start, maintain, or expand a food business. <http://extension.unh.edu/nefe/index.html>

University of Maine Food Science and Human Nutrition Process and Produce Review Testing Services offers a variety of food testing services for

food businesses that are interested in product development. <https://umaine.edu/foodandagriculture/process-product-review-testing>

Vermont Specialty Foods Association: An industry association to support and promote Vermont made value-added products. The website has a free online Vermont Specialty Foods Manual, includes information on issues ranging from packaging and labeling to “Real Business Mistakes”. <http://www.vermontspecialtyfoods.org>

Vermont Food Venture Center: a multi-use processing facility, provides one-on-one [consultation and business advising](#); 3 kitchens, each with different specialty industrial equipment for rent; also cold, frozen and dry storage rental for your farm or food business needs. Call (802) 472-5362.

REGULATIONS

The [Vermont Agency of Agriculture](#) and the [Vermont Department of Health](#) regulate agricultural products and food in Vermont. Their websites provide information regarding regulations related to: selling food and food products; weights and measures; labeling requirements; processing restrictions, water testing, facility standards, etc.

UVM Extension Food Safety for Producers and Processors webpage also has information on Food Safety Regulations in Vermont: https://www.uvm.edu/extension/food_safety_producers_and_processors

INFORMATION ON COOPERATIVES AND OTHER WAYS OF SHARING RESOURCES

Cooperative Development Institute: mission is to build a cooperative economy through the development of successful cooperative enterprises and networks in New England and New York. <http://www.cdi.coop>. Their website has a **Resource Section** with lots of helpful information on cooperatives.

Minnesota Elderberry Cooperative: This cooperative is for elderberry growers in the upper Midwest. The co-op is still in early stages of development, but the website has numerous resources for elderberry growers, including the summary of the feasibility study for their cooperative <http://minnesota-elderberry.coop>.

Spoonful Herbs: Spoonful Herbs is the collaborative effort of community herbalists Kara Buchanan, Kate Elmer Westdijk, and Rachael Keener. They coordinate [“herb mobs”](#) medicinal plant gleaning events to harvest surplus or unwanted herbs and donate them for educational use and/or community health access. <http://spoonful.webstarts.com>.

SUPPLIES AND EQUIPMENT

Small Mesh Exclusion Netting for Spotted Wing Drosophila

The Berry Patch
Stephentown, N.Y.
(518) 733-6772
rberriesgreat@fairpoint.net

Destemming Machines

Andy Luegger
(319) 360-6487
aluegger@gmail.com

Dehydrators

[Excalibur](#) makes both small-scale dehydrators for home use (starting at \$130) and dehydrators appropriate for commercial use (starting at \$1,000).

[The Sausage Maker](#) also sells commercial scale dehydrators (starting at \$3,500).

[Commercial Dehydrator](#) also sells commercial dehydrators (starting at \$15,000 for the [Harvest Saver](#)).

Both Commercial Dehydrator and [Nyle](#) make very large dehydrators for producers who have a high volume of product.

The [Pleasant Hill Grain Company](#) carries many dehydrators from table-top to commercial scale models.

MICROBIOLOGICAL TESTING LABORATORIES

Covance Laboratories
(888) 268-2623
(Multiple locations)

Silliker
(312) 938-5151
111 E. Wacker Drive, Suite 2300
Chicago, IL 60601

Labs-Mart Laboratories
(248) 957-6880
24469 Indoplex Circle
Farmington Hills, MI, 48335-2527



