



Best Practices for Replanting Blueberries in Michigan

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Why is Michigan replanting its blueberries?

Michigan's blueberry industry is undergoing a period of extensive renovation. As recently as 2018, Michigan produced 20,600 acres of blueberries. Currently, this number is closer to 16,000 acres. A recent survey conducted in the lab of Michigan State University (MSU) assistant professor Joshua Vander Weide suggested that an additional 18% of acreage (3,700 acres) will be removed by 2027. In total, nearly 40% of Michigan's blueberry acreage will be removed – and most replanted again with blueberries – over the course of eight years.

What's the reason for this change? Global competition in the blueberry market is rising, and so are consumer standards for fresh blueberry quality. Michigan and New Jersey are the two original states producing cultivated blueberries (*Vaccinium corymbosum*). Many of the important cultivars grown in both states were traditionally used for the processing market. These cultivars have inferior fruit quality characteristics compared to recent cultivars grown by newer industries representing both national and international competitors. Consumers want large, firm, and

flavorful blueberries. Michigan's blueberry producers have recognized that to meet these criteria, new cultivars with superior fruit quality should be planted on more modern production systems.

Challenges to replanting blueberries

Michigan blueberry growers have long aimed to replace older cultivars but have been faced with two major challenges.

First, how should soil be amended following plant removal? This may seem like a simple task, but early replanting attempts revealed that blueberries display symptoms similar to the "disease" experienced in replanted apple orchards – termed "apple replant disease." Vander Weide's survey revealed that many growers experience stunting of plant growth, leaf chlorosis (yellowing), and even plant death in the years following re-establishment.

Second, which cultivars should be planted? For many years, the choice of cultivars was limited to releases by a few university or U.S. Department of Agriculture breeding programs. Large plantings of these cultivars revealed prominent horticultural



or pest issues that halted replanting efforts. With the expansion of global blueberry acreage over the past decade, blueberry breeding has extended to the private sector. This has led to many new cultivar releases over the past few years that have yet to be tested at a large scale in Michigan, which limits a grower’s choice in choosing a new cultivar to plant.

In addition to these challenges, currently no best practices exist for the following questions related to replanting blueberries:

1. Which cultivars should be removed first?
2. How should plants be removed?
3. How many years should the soil be fallowed?
4. What horticulture practices are standard?

Research is being conducted at MSU to answer these questions and establish best practices for replanting blueberries on old blueberry orchard ground. However, this work will take time. This bulletin represents the summation of information collected from two sources. First, data gathered from a recent survey conducted by Vander Weide’s lab provides a glance at the current approach that many Michigan blueberry growers take during the replanting process. Second, this data is supplemented by information provided by Michigan blueberry growers with experience in the replanting process. Together, this information provides a placeholder while best practices continue to be tested and established. The following sections discuss each question presented.



Photo of a newly planted “Draper” field in southwest Michigan.

1. Priority list of cultivars to remove. (Which cultivars should be removed first?)

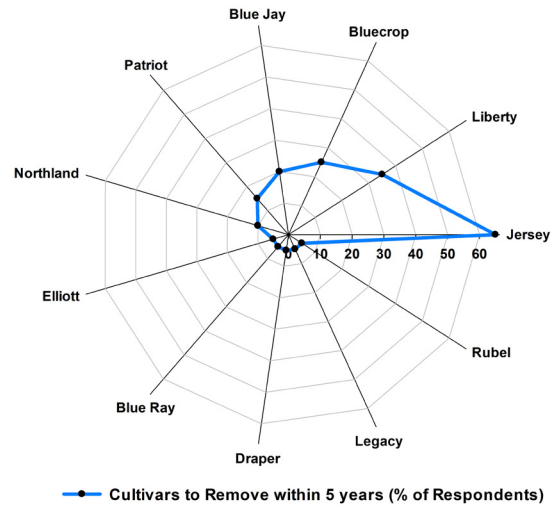


Figure 1. Michigan blueberry grower responses to the survey question: “Which cultivars are a priority for you to remove (and replant) in the next five years?”

Michigan growers produce more than 25 different northern highbush blueberry cultivars. These cultivars span in release date from 1912 to 2018 and vary widely in production traits such as harvest date, yield, fruit firmness, fruit flavor, and utility for fresh market production. It may seem that growers would have differing opinions on which cultivars to prioritize replanting; however, a specific aim is clear. The market value for processing blueberries is decreasing, and growers will benefit by focusing on replanting processing-specific cultivars with ones more suitable for fresh market production. Many older cultivars, such as ‘Jersey,’ ‘Blue Jay,’ and ‘Rubel’ are exclusively used for the processed market rather than fresh market production. As of 2014, ‘Jersey,’ ‘Rubel,’ and ‘Blue Jay’ comprised approximately 27%, 5%, and 1%, respectively, of industry acreage. Our recent survey showed that approximately 67%, 4%, and 20% of Michigan growers indicated their plan to remove ‘Jersey,’ ‘Rubel,’ and ‘Blue Jay’ plants from their production systems, respectively, over the next five years (Figure 1), which is in addition to acreage already



removed. Second on this list (36%) was ‘Liberty,’ a cultivar that has poor pollination and fruit set characteristics in addition to being highly susceptible to the stem gall wasp.

2. Methods for removing plants. (How should plants be removed?)

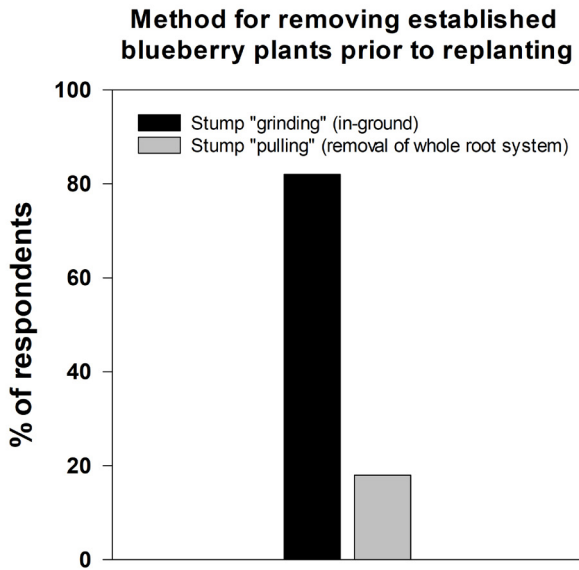


Figure 2. Michigan blueberry grower responses to the survey question: “What will be your method for removing established blueberry plants prior to replanting?”

Replanting blueberries involves a few steps to ensure that they have the best chance of survival and growth in their new location. Two primary methods exist to remove plants. One method uses a forestry head mounted to a skid steer, which grinds whole plants and root systems (stumps) to approximately 9 inches below the soil line. The second method involves whole plants being physically uprooted from the soil with a tractor or excavator. Vander Weide’s survey revealed that over 82% of Michigan growers use or plan to use the stump grinding method, while only 18% of growers intend to use the stump-pulling method (Figure 2). Farm size influenced this result to a large degree. Farms using the stump-pulling method were an average of 16 acres in size, while most farms using the grinding method were nearly 300 acres in size. Stump grinding is more costly than stump pulling, which suggests that cost of this method limits its use by

smaller growers. It is not clear if either of these two methods provides an advantage to newly established plants or greater resilience to replant disease symptoms. One advantage to stump grinding may be the greater consistency of soil composition and incorporation of organic matter into the soil compared to stump pulling. However, grinding whole plants into the soil may also be a disadvantage if the plants harbored diseases.



Figure 3. Depiction of blueberry orchard soil following blueberry plant removal using the stump-grinding method.

3. Methods and timelines for fallowing soil. (How many years should the soil be fallowed?)

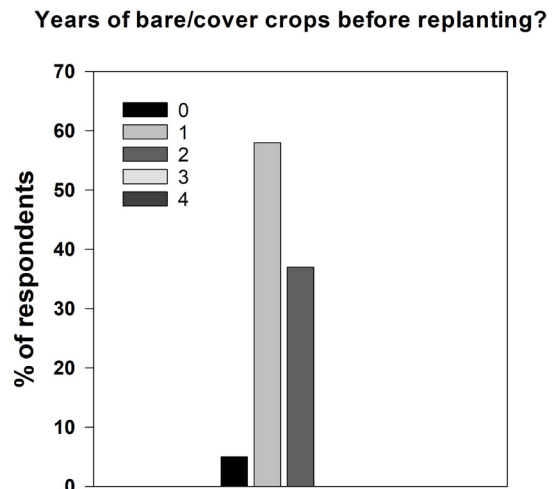


Figure 4. Michigan blueberry grower responses to the survey question: “How many years will you allow the soil to remain bare/planted with cover crops prior to replanting?” 0 = replant immediately.



Arguably the most difficult decision to make when replanting blueberries is the number of years to allow the soil to remain fallow between plant removal and replanting. An important prerequisite to this question; however, is whether soil pH has shifted outside of the optimal range for blueberries (4.5–5.5) during the planting’s lifetime. Due to the naturally low pH of soils in southwestern Michigan’s major blueberry production regions, pH adjustments are rarely required following removal and prior to replanting. However, this should still be evaluated before or during the removal process. In the case that soil pH is high (>5.5), it may take one to two years of sulfur applications to fully allow soil pH to come into balance. Plants should be established in the season following the final major sulfur addition for best growth. If soil pH is already suitable, the remaining question then centers around the following timeline. Most Michigan growers report issues when attempting to replant within the same year that old plants were removed (“0” in Figure 3). The reason for this is currently unknown and may explain why this approach is now uncommon. Most growers (58%) replant the season after removing plants, while 37% of Michigan growers wait two seasons to plant following plant removal (Figure 3). Many growers now plant a cover crop in the 1 to 2 years between removal and replanting. Cover crops add biomass to the soil after incorporation, and improve soil porosity and structure. Cereal rye and sorghum sudangrass are the two most common cover crops used; however, it should be noted that sorghum sudangrass grows very vigorously. While this will lead to greater biomass, it also requires a greater effort to maintain.

4. Methods for horticultural practices. (What horticulture practices are standard?)

When replanting a blueberry orchard, growers should consider the updated horticultural recommendations for modern production systems, such as row spacing, soil amendments, and irrigation practices.

Row spacing. The long-standing recommendation for row and plant spacing has been 10 ft and 4 ft, respectively. Modern production systems in Michigan still use a 10-ft row spacing; however, growers now aim for a higher density plant spacing between 2.5 ft and 3.0 ft to reach approximately 1,450–1,750 plants per acre. Although this will be a greater expense at the time of planting, it will result in significantly greater yields per acre over the lifetime of the planting. Despite this advantage, growers should also consider that this increase in planting density may reduce pesticide and fungicide spray coverage.

Soil amendments. Traditional plantings in Michigan were established on bare soil, but both MSU Extension researchers and Michigan blueberry growers do not advise this in lieu of modern production methods. The current industry standard is to create a raised bed using a bed shaper at a width of 2–2.5 ft and height of approximately 1 ft. This height recommendation is shorter than blueberry orchards in the Pacific Northwest. This is due to the greater volume of annual precipitation received in Michigan, which can wash away soil on the edges of raised beds above this height. Dried wood chips are a more common soil amendment in Michigan than sawdust, largely due to the lower cost. The tree species used to create the wood chips or sawdust is not particularly important, but conifer species are preferred, while walnut should be avoided due to its toxicity to plant root systems. The standard rate of wood chips incorporated into the soil row is 140 yards per acre. Sawdust is suitable at a reported rate of 140 yards per acre. Sawdust will break down more quickly than wood chips and will also require an increase in irrigation volume to maintain soil moisture. An important consideration with wood chip or sawdust amendment is the ratio between carbon and nitrogen in the soil. This ratio should be approximately 25:1. Wood chips and sawdust have a high carbon to nitrogen ratio (400:1) and absorb much of the nitrogen before it reaches plants. Young plantings will display clear symptoms of nitrogen deficiency in these cases. To



fix this, nitrogen rates should be increased during establishment to aid in wood chip decomposition. Application of slow-release urea to the ground tends to improve plant uptake of nitrogen following establishment better than fertigation. Wood chips should be added every three years at the same rate to maintain proper soil organic matter.



Figure 5. Wood chip addition to a replanted blueberry row prior to soil incorporation.

Irrigation practices. Irrigation practices have also changed considerably in recent decades. Many Michigan growers currently rely on overhead irrigation, while nearly 15–20% of orchards in Michigan remain unirrigated. Overhead irrigation provides frost protection, which can prevent

significant yield loss in some seasons. Researchers at MSU are also currently experimenting with the ability of overhead irrigation to regulate canopy temperature and maintain yields in the face of rising spring temperatures. However, overhead irrigation increases leaf wetness compared to other methods, which leaves plants more susceptible to disease pressure. Drip irrigation is the current standard for new plantings, with the current recommendation being that two driplines be installed along each row, resulting in two emitters per plant. Going forward, having both overhead and drip irrigation will be advantageous in Michigan. While installing two irrigation systems will initially be expensive, growers will benefit from increased irrigation water use efficiency and greater resilience to spring frosts and heat stress events.

In summary

As Michigan blueberry growers seek to replant and establish thousands of acres over the next years, it will be critical for growers and researchers to work together to establish and update best practices for replanting blueberries. Growers should create a priority list of cultivars to remove and replant, and utilize strategies for plant removal, soil fallowing, and horticultural practices that other growers have found to be successful.

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