

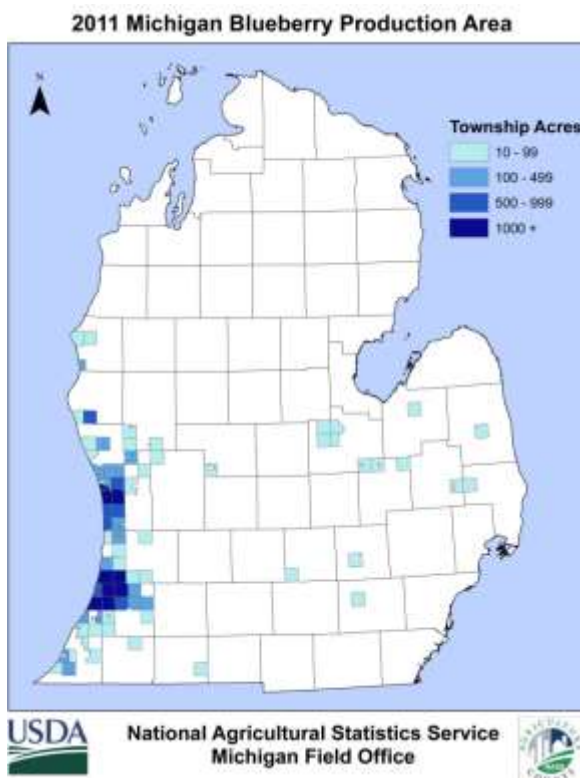
## The Michigan Blueberry Industry

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Blueberries are native to Michigan. Lowbush blueberries are common in the Upper Peninsula and the northern forests of the Lower Peninsula. Highbush blueberries are more common in the lower half of the Lower Peninsula. Blueberries were gathered by native populations long before European settlers arrived. The development of the modern blueberry industry began in the early 1900s. In Michigan, Dr. Stanley Johnston led the development of the Michigan industry. He established a test planting in the 1920's on Michigan State University's South Haven Agricultural Research Farm. Commercial planting soon followed. Blueberry acreage reached 2,200 acres by 1950 and 9,700 acres by 1976. Today Michigan has almost 21,000 acres of blueberries on about 600 farms. About 600 additional acres are located in northern Indiana, just south of the state line.

**Soils:** Michigan's blueberry industry is concentrated in southwest Michigan where there are abundant, naturally acidic "blueberry soils". Typical sites are in low topographic positions, with a shallow water table. Soils are mostly acidic sandy loams and loamy sands. These mineral soils form on sandy outwash plains or ancient lake bottoms. Some blueberries are on acidic muck soils formed when small lakes filled with organic matter. Many of these soils are poorly drained. These low, cold sites with wet, acidic soils are poorly suited for crops other than blueberries or cranberries.

**The Lake Effect:** Another reason blueberries thrive in southwest Michigan is the moderating effect of Lake Michigan. This large body of open water has important effects throughout the year. In winter, open water moderates winter air temperatures. Areas near the lake shore experience -13°F (-25°C) once in 10 years, whereas this temperature is reached 3-5 years out of 10 just 80 miles inland. These warmer winter low temperatures are why most Michigan blueberries are grown within a few miles of the Lake Michigan shore. The lake also produces abundant snow (as much as 90 inches, 250 cm) along the lakeshore, providing additional protection against winter cold injury. In the spring, the colder lake water delays plant growth, reducing the risk of spring frost injury. Summer temperatures along the lakeshore are cooler than inland or on the Wisconsin side. The lake waters warm by late summer, prolonging the growing season and delaying the first frosts of autumn. Since Lake Michigan warms and cools more slowly than the Michigan shore, the Michigan growing season is shifted about a month later in time. This allows late season cultivars to be grown in one of the northern most blueberry growing regions in the world.

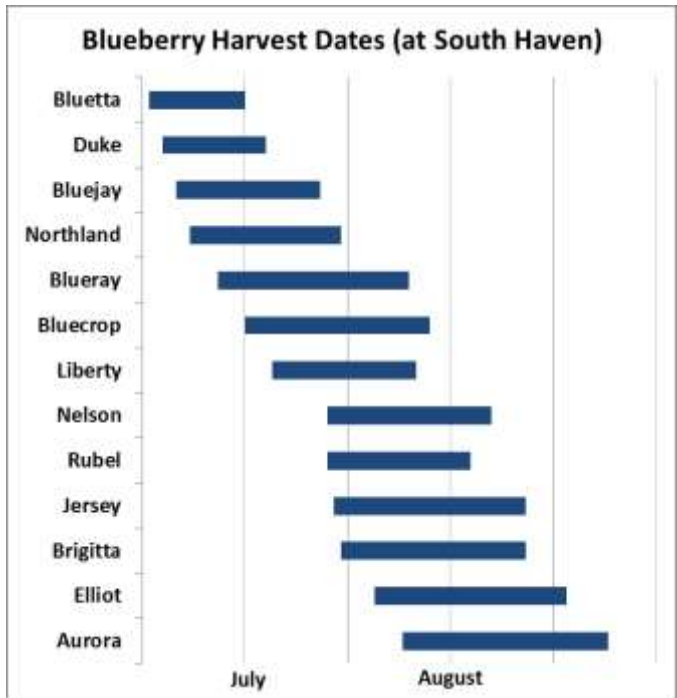


Distribution of Michigan blueberries in 2011.  
(2011 Michigan Fruit Rotational Survey, 2012)

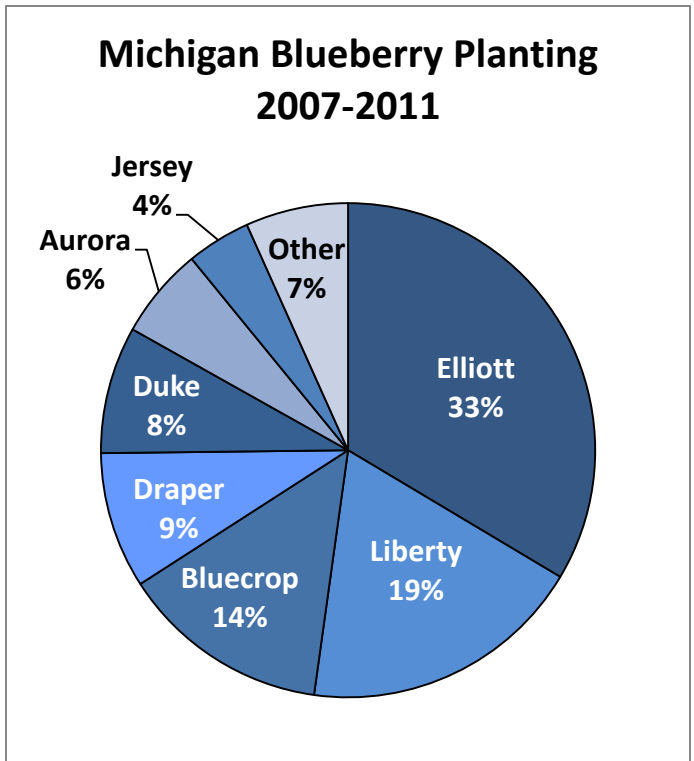
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**Production:** The Michigan blueberry industry has a long history and many mature plantings. About half the acreage is over 40 years old, and some plantings are over 60. Michigan blueberry yields average about 5,000 pounds per acre. There is a wide disparity between older, minimally managed fields (2-3,000 pounds) and newer, irrigated, well-managed fields (10,000 pounds or more). There are differences in varietal yields. Earlier harvesting varieties generally yield less than late season varieties where the fruit remains on the bush longer. Current production is between 75 and 110 million pounds a year from almost 20,000 bearing acres. Several environmental factors influence blueberry yields every year. The growing conditions determine flower or fruit bud set which occurs in the late summer and early fall. The number of flower clusters in the spring determines the crop potential early in the spring. Spring freezes, poor pollination due to cool rainy weather during bloom, and summer drought significantly influence the blueberry crop each year on different farms or production regions in the state.



**Varieties:** Many different varieties of blueberries are grown in Michigan. Blueberries are long lived and planting can be productive for many years. The most numerous varieties and 2011 acreages in order of ripening are; Duke (725 A), Bluejay (445 A), Bluecrop (5,500 A), Rubel (1,500 A), Jersey (6,600 A), Liberty (440 A) and Elliot (3,450 A). Rubel was one of the earliest varieties planted in Michigan and remains popular for processing. Jersey, an old adaptable variety, is the backbone of the Michigan industry (32% of acreage). The mid-season variety Bluecrop is the second most common variety (26%). Most new plantings are of early and late season varieties. Duke and Draper are the most planted early varieties. With the increase in US blueberry production, the price advantage of early Michigan berries has declined and growers are more interested in planting late season varieties. The late-ripening, highly productive variety Elliott has been very important for years. Liberty and Aurora are two new late-season varieties being planted. Other new varieties developed by both public and private breeding programs are also being planted to test their suitability to Michigan conditions. Many growers will plant small plot to determine a variety’s strengths and weaknesses before planting thousands of plants on many acres.



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**Michigan blueberry acres by year of planting (Mich. Ag. Stat. Serv.)**

Variety	Year planted				Totals
	Pre-1981	1982-91	1992-2001	2002-11	
Aurora	0	0	0	180	180
Bluecrop	2,530	1,645	715	610	5,500
Blueray	280	114	39	12	445
Bluejay	49	176	37	28	290
Bluetta	93	41	9	12	155
Brigitta	3	8	58	1	70
Burlington	105	30	25	7	165
Draper	3	2	5	200	210
Duke	5	109	280	320	725
Elliott	250	955	890	1,305	3,450
Jersey	5,370	830	265	135	6,600
Liberty	0	0	20	420	440
Nelson	0	1	79	60	165
Northland	30	53	28	39	150
Rancocas	120	4	11	0	135
Rubel	1,160	178	82	80	1,500
Michigan acreage	10,440	4,250	2,610	3,600	20,900

**Planting:** Blueberries require acid soils with a pH of 4.5 to 5.5 with an optimum pH of about 4.8. Preparing the site for planting may take several years. Most growers plant two-year old plants. These are purchased from established wholesale nurseries. Some growers propagate their own plants from cuttings. Planting occurs in the spring or fall. Fall planting is preferred because spring planting is often delayed by wet field conditions. In Michigan, it takes 8 to 12 years for blueberries to reach full size and maximum yields. It is recommended that flowers and fruit be removed for the first 2 to 3 years to promote bush growth by preventing the fruit from stunting growth. Replanting blueberries is rare due to the cost and the long establishment period.

**Irrigation/nutrition:** Irrigation is needed for maximum yields. About 79% of Michigan acreage is irrigated. Solid set overhead sprinklers are very common (53%) because they can also be used for spring frost protection during bloom. Drip irrigation is used on less than 15% of acres, usually on farms with limited water supplies. Traveling guns (8%) and sub-irrigation (3%) are also used. Most new plantings are irrigated with overhead sprinklers or drip irrigation. Some new plantings utilize dual systems, with both overhead sprinklers and drip irrigation systems.

Plant nutrition is monitored by soil testing to determine the soil pH and soil potash levels, and tissue analysis to determine the plant nutrient levels and to diagnose problems. Most growers apply 50-80 lbs. per acre of actual nitrogen as ammonium sulfate if the soil pH is above 5 or urea if the soil pH is below 5. Micronutrient foliar sprays are common.

**Insect and Disease Pests:** Since blueberries are native to Michigan, a variety of native pests and diseases are common. Fields may be sprayed 2 to 12 times with pesticides depending on pest pressure and the grower's management intensity. Serious insect pests include direct pests of the fruit such as blueberry maggot, cranberry and cherry fruitworms and indirect pests such as leafrollers, tussock moth, Japanese beetle, and blueberry aphids. As in other blueberry production regions, the invasive insect pest, the spotted winged drosophila has

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become a major problem in recent years. Mummyberry, anthracnose and alternaria fruit rots, and phomopsis canker and twig blight are the most serious fungal diseases. Typically spray programs include pre-bloom and bloom fungicides for mummyberry, postbloom sprays for cherry and cranberry fruitworm and anthracnose fruit rot, midseason fungicides to reduce fruit rots, and pre-harvest and harvest treatments for fruit rots, blueberry maggot and spotted winged drosophila. Late treatments near harvest may be applied with aircraft because tractors and sprayers in the field knock ripening fruit off the bush.

Virus diseases have a significant impact on the Michigan blueberry industry. Many older blueberry fields are infected with viruses and yields can be reduced to about half that of uninfected plantings. Shoestring is the most common virus disease in Michigan. Shoestring is spread by the blueberry aphid. Mechanical harvesters increase the disease by carrying infected aphids down the row and throughout the field. Necrotic ringspot (tobacco ringspot) is a nematode vectored virus. This virus common in many weeds and is found in patches in infected fields. Other virus diseases include blueberry leaf mottle and blueberry mosaic. A serious source of infection is the unintentional use of virus infected cuttings to propagate new plantings by growers propagating their own plants. Michigan has a quarantine restricting the importation of blueberry plants to prevent the importation of new viruses such as blueberry scorch and blueberry shock.

**Harvesting:** Blueberry harvest in Michigan usually runs from early July to mid-September. Harvest begins in the southwest and moves northward. The northern production areas lag several weeks behind the south in harvest timing. Peak volumes are harvested from mid-July to mid-August. Many Michigan blueberries (and nearly all processed berries) are harvested with machines. Mechanical harvesters straddle the row shaking the bushes to remove ripe berries. Berries are caught and conveyed into plastic field lugs that carry about 20 lbs. of fruit. Lugs are transported by truck to processing facilities. Fields are machine harvested 2 or more times.

Fruit that is to be marketed fresh is generally harvested by hand. Hand harvesting is done almost entirely by migrant labor. Hand harvest allows pickers to select ripe fruit with little bruising. Picking crews may move from farm to farm harvesting the fruit. A blueberry packer may employ a large picking crew and purchase fruit “on the bush” from small growers when it is harvested. Fruit for the fresh market are harvested more frequently to avoid soft overripe fruit. Some fresh market fruit is also machine picked, and technology to do this is improving. The ability to machine harvest fruit for the fresh market depends on the fruit firmness of the variety, the weather conditions before and during harvest, and the design of the harvester and the skill of the operator.

Sometimes the first picking is by hand for fresh fruit and later the field will be harvested by machine for either the fresh or process market depending on the fruit condition of and the current fresh market price. About half the Michigan blueberry crop is marketed in the fresh market and half is frozen. Many growers focus on the frozen process market.

**Grading and Packaging.** Berries are graded at the receiving station. Containers of berries are dumped onto conveyors that carry the berries to blowers that remove leaves, sticks, and underweight berries. Berries for the fresh market are air cleaned and sorted. Berries for the processing market are surface sterilized in a water dump. Berries are run through specialized equipment such as blowers, tilt belts, destemmers, sizers, and color sorters. Most Michigan fresh and process lines use electronic sorting machines to grade fruit and remove over and under ripe fruit. Berries for the fresh market are packed in several sizes of plastic clamshells and 2.5, 5 and 10 pound boxes. Process berries are frozen in 30 pound boxes. Some berries are individually quick frozen (IQF) before being boxed.

**Marketing:** Currently less than half of Michigan blueberry growers belong to MBG Marketing – The Blueberry People, which originated as the Michigan Blueberry Growers Association. MBG provides off-farm marketing

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for their grower members. Many MBG growers have on-farm retail sales. Large independent growers market their berries with large berry marketers, brokers or in produce trade publications for large volume sales.

Many Michigan blueberry growers sell their berries directly to packers or processors. In the case of small farms, the berries are sold on the bush to the harvesting grower or picked and delivered directly to the packer or processor. Many growers offer on farm sales as U-pick or picked fruit at farm stands. Some growers also do wholesale sales to produce stands and other farm markets. Many small growers participate in farmers markets. Packers of fresh fruit distribute their berries either through MBG's marketing chain, alliances with other berry marketing firms, independent brokers or by direct sales to grocery stores and chains. Distribution of berries is almost entirely by refrigerated trucks. Fresh berries are often in mixed loads with other summer produce, so the temperature is warmer than the optimum for blueberries. Late season berries may be stored for several weeks in modified atmosphere to capture the higher prices at the end of the season in October.

#### Michigan Blueberry Production 1994 to 2012, acres, yields and prices

Michigan Blueberries			Production			Fresh Market		Processed		Percent Fresh
Year	Harvested. Acres	Yield	Million (lb.)	Price (lb.)	Value (\$1,000)	Million (lb.)	Price	Million (lb.)	Price	
2012	19,700	4,420	87	\$ 1.41	\$ 122,700	49	\$ 2.00	60	\$ 1.05	56%
2011	19,200	3,750	72	\$ 1.65	\$ 118,700	34	\$ 2.15	38	\$ 1.20	47%
2010	18,600	5,860	109	\$ 1.23	\$ 134,300	49	\$ 1.70	60	\$ 1.23	45%
2009	18,500	5,350	99	\$ 1.03	\$ 101,850	50	\$ 1.65	49	\$ 0.42	51%
2008	18,600	5,910	110	\$ 1.13	\$ 124,000	40	\$ 1.70	70	\$ 0.80	36%
2007	18,500	5,030	93	\$ 1.78	\$ 164,456	30	\$ 2.05	63	\$ 1.65	32%
2006	18,100	4,970	90	\$ 1.66	\$ 149,655	29	\$ 2.15	61	\$ 1.43	32%
2005	16,800	3,930	66	\$ 1.27	\$ 83,500	25	\$ 1.70	41	\$ 1.00	38%
2004	17,400	4,600	80	\$ 1.22	\$ 97,210	36	\$ 1.60	44	\$ 0.90	45%
2003	15,900	3,900	62	\$ 1.02	\$ 63,120	24	\$ 1.30	38	\$ 0.84	39%
2002	16,900	3,790	64	\$ 0.82	\$ 52,240	22	\$ 1.21	42	\$ 0.61	34%
2001	16,800	4,170	70	\$ 0.78	\$ 54,660	21	\$ 1.09	55	\$ 0.55	30%
2000	16,700	3,710	62	\$ 0.89	\$ 55,160	19	\$ 1.25	43	\$ 0.73	31%
1999	16,600	4,220	70	\$ 0.78	\$ 54,660	18	\$ 1.13	52	\$ 0.66	26%
1998	16,400	2,990	49	\$ 0.62	\$ 30,260	16	\$ 0.86	33	\$ 0.50	33%
1997	16,500	4,360	72	\$ 0.70	\$ 50,042	19	\$ 0.99	53	\$ 0.59	26%
1996	16,500	2,550	42	\$ 0.87	\$ 36,330	15	\$ 1.00	27	\$ 0.79	36%
1995	16,300	4,110	67	\$ 0.50	\$ 33,450	19	\$ 0.75	48	\$ 0.40	28%
1994	15,500	3,030	47	\$ 0.54	\$ 25,180	15	\$ 0.74	32	\$ 0.44	32%
1993	15,500	5,610	87	\$ 0.40	\$ 34,650	19	\$ 0.75	68	\$ 0.30	22%
1992	13,000	2,620	34	\$ 0.80	\$ 27,100	10	\$ 1.15	24	\$ 0.65	29%
Ave		4,232	73	\$ 1.00	\$ 76,820	27	\$ 1.38	48	\$ 0.80	36%

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