Irrigating Blueberries, May 2012

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With all the rain we received in April and all the irrigation that has been used for freeze protection it seemed that we would never need to irrigate flooded blueberry fields. Irrigation is vital for maintaining high yields in commercial blueberries. Blueberries grow best in moist soil. Good soil moisture levels optimize both vegetative and fruit growth. Blueberries perform best when less than half of the availble water has been depleted. Blueberries are shallow-rooted and sensitive to drought stress, and most Michigan plantings are on sandy soils that hold very little water. Drought prior to harvest reduces berry size and yield. For established plants, the goal is optimizing fruit production for current and subsequent seasons.

Soil Moisture

Soil water reserves depend on soil texture and plant rooting depth (Table 1). You can assume the rooting depth of a blueberry is 12 inches for young plants and 18 inches for older plants. Sandy soils may hold less than 1 inch of available water in the root zone, and half of this can be lost in two warm summer days. Loamy sands and sandy loams are also common Michigan blueberry soils and can hold from 1.3 to 2.3 inches in the top 18 inches of the soil. Many blueberry fields have slightly elevated areas that dry out more quickly than other areas. Hardpan or a shallow water table may limit rooting in other areas of fields. This can be seen in older fields where the plants on sandy high spots and wetter low spots are smaller than the rest of the field. These variables complicate irrigation scheduling. As a rule, you should irrigate to maintain the drought-prone areas of your field.

Table 1. Available water in a blueberry root zone as affected by soil texture and rooting depth.

	Available water (inches)	
Soil texture	**Per inch of depth**	**In root zone (12-18 inch depth)**
Sands	.03	.4 - .6
Loamy sand	.07	.8 - 1.3
Sandy loam	.13	1.6 – 2.3
Loam	.17	2.0 – 3.1

Evapo-transpiration (ET) is the evaporation from the field, plus the water lost by the plant (transpiration). Under the hot conditions we will see in June and July, blueberry fields in can lose 0.18 to 0.24 inches per day. Daily Potential ET values are available on the Enviroweather website. They are located at the bottom of the individual station home pages under irrigation tools. Maximum water use during the preharvest fruit growth stage is probably 0.20 to 0.25 inches per day.

Table 2. Blueberry Water Use in Southern Michigan			
Month	**Monthly Use**	**Weekly Use**	**Daily Use**
May	0.48	0.12	0.02
June	2.87	0.72	0.10
July	5.09	1.26	0.17
August	2.13	0.53	0.07

Allowable soil moisture depletion in blueberries is considered to be 50%, so irrigate when half of the available water is used. This means that irrigation should be applied before 0.2 to 0.6 inches water is lost (3 days of 0.20 inches ET) from sands and loamy sands, or 0.8 to 1.5 inches (4 to 7 days) are lost on sandy loam or loam soils.

Irrigation scheduling allows you to replenish the soil water while reducing the amount of water used and loss of nutrients. You need to how much water the soil can hold. If you know how much water the plants are using, you should irrigate when the plants has used half the available water. For example, a root zone of 18 inches on a loamy sand soil (0.07 inches water per inch of depth) holds 1.3 inches of available water:
(18 inches) x (0.07 inches water/inch) = 1.3 inches water
If the root zone were depleted by 50%, you would need to apply 0.65 inches:
(0.5 depletion) x (1.3 inches) = 0.65 inches to apply
If the ET for the last several days was 0.25 inches you would need to irrigate every 2 days; for 0.2 inches every 3 days. The evapotranspiration rate varies during the year depending on the amount of leaves on the plant and the heat and relative humidity. Temperature is the most important factor; heat increases ET much more than humidity decreases ET.

Sprinkler Systems

The amount of water applied by sprinkler systems is determined by the sprinkler spacing, the size of the nozzle and the water pressure at the nozzle. For example a 9/64-inch nozzle at 45 psi will deliver about 0.15 inches an hour. A system that delivers 0.15 inches water per hour, delivers 0.6 inches in 4 hours. However, about 20 to 30 % of water from overhead sprinklers may be lost to evaporation, so increase the operating time accordingly. Also, irrigation systems are not completely uniform; they apply more water in some areas than others. The uniformity of sprinkler systems can be measured, but they usually have only 70% uniformity. This means to recharge all areas of the field, 30% more water than calculated needs to be applied. In our example, operating time should be increased 20% for evaporation losses, plus 30% due to non-uniformity. So, increase the operating time of 4 hours by 50% to 6 hours to ensure that all areas receive 0.6 inches. With the importance of GAP inspections and certification this year, sprinkler systems are of increased concern. Because the irrigation water comes in contact with the fruit GAP certifiers require tests of the irrigation water. Irrigation water from open ponds or other surface water sources can easily be contaminated with bacteria and if water tests indicate that the bacteria levels are higher than the levels in the growers GAP plan then irrigation should be delayed until after harvest or the problem is remedied

Trickle Irrigation

Trickle irrigation systems can be run daily, or on the same schedule as sprinkler irrigation systems. The area wet by a trickle system is much smaller than the entire field wet by sprinkler systems.

The application rate for lower volume trickle systems (48" spacing, 0.42 gph emitters) is about 0.17 inches/hr. The more common moderate flow systems (24" spacing, 0.42 gph emitters) deliver about 0.3 inches/hr. Since evaporation and uniformity are not significant in trickle systems we do not need to increase the application time. We would need to run the lower volume system twice as long to apply the same amount of water. These systems can be run at one to two hours every day to replace plant water use.

There are several rules of thumb for trickle irrigation systems.

For young plants apply 20 gallons/day per 100 feet of row.

Mature plantings apply 35 gallons/day per 100 feet of row.

Ontario Canada estimates that peak daily demand of highbush blueberry is about 4.5 G/day (18 liters/day)