Trickle Irrigation Design for Blueberries

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Blueberries with Drip Irrigation
Irrigation

- Soil should be damp but not wet
- ¼”/day
- Insufficient moisture will reduce the bud formation for next year’s crop
- Drip irrigation with point source emitters.
Site Development

- Rows in a North-South direction
- Raised bed (6-8 inches high) prior to planting.
- Recommend 9-14’ (12’) between rows and 4-6’ (5’) between plants.
  - a 5’ by 12’ spacing was used for the ½ ac and 4 ac irrigation designs
Site Development

- Raised beds
  - Better drainage
  - Roots develop above compacted wet zones
Prior to Planting

- High organic matter soils.
- Distribute peat or composted pine bark down row
- Do not substitute sawdust, hay or compost as this will stunt or slowly kill your plants.
- Incorporate peat with soil
  - Peat tilled uniformly into entire bed
- Dig a deep hole
  - 24” wide x 18” deep
  - Mix 1 gal peat in bottom of hole with soil
Planting

- Plant in late fall or early spring
- Set plants at the same depth that they grew in the nursery and firm soil around the roots.
- Set plants ~ 2 to 3 inches above level ground to enhance drainage
- Water plants to settle soil around the root system.
Mulching

- Apply to a depth of 4-6 inches and reapplied when it rots to a depth of 3 inches.
- Remulching is necessary every year or two.
- Blueberry roots grow at the mulch/soil interface and if the mulch decomposes too much and is not replaced the roots will be exposed.
- Mulch is applied in a 3-4’ wide band down the row.
Mulching

- Moderates soil temperature,
- Conserves moisture,
- Releases nutrients,
- Helps with weed control.

Use
- woodchips,
- sawdust,
- pine needles,
- straw
Mulching
Laurel Fork

BIOSYSTEMS & AGRICULTURAL ENGINEERING
Simple Designs

- Home water supply
  - outdoor faucet for ½ ac plot
  - 5/8-in water meter for up to 4 ac
- Pond water supply
Advantages

- Simple to install
- Simple to operate
- Ability to automate
  - Reduce operation man-hours
  - Employ “pulse drip irrigation”
  - Decrease water usage
  - Potential increase in yield

BIOSYSTEMS & AGRICULTURAL ENGINEERING
Half Acre Blueberry Drip Irrigation System
Overall schematic

Near Faucet Components

¾” PE pipe or (3/4 hose)

Near Plot Components

½ Acre drip lines

BIOSYSTEMS & AGRICULTURAL ENGINEERING
Near Faucet Components

- Faucet (supply)
- One Station controller
  Battery powered (optional)
- Atmospheric vacuum breaker
- ¾” 150 mesh screen **filter** and Flush valve
- ¾” x ¾” FHS comp (or ¾” hose)
- ¾” comp. elbow
- ¾” PE pipe
- 7.2 gpm
- To ¾” PE or ¾” hose
Overall schematic

Near Faucet Components

Near Plot Components

¾” PE pipe

½ Acre drip lines
Near Plot Components

¾” PE or ¾” hose

¾” x ¾” comp. MHT

25 psi pressure reducer

¾” x ¾” FHS comp.

To drip irrigation
Drip Lines for ½ acre

- 360’
- ½" PE pipe
- 1 gph emitters
- ½" figure 8 ends
- Slope 0 – 3%
- ½" x ¾” comp. “T” reducer
- 1.2 gpm
- ½’ compression T piece
- ½” compression elbow

Near Plot Components
Operating Time

- ¼” water/day (*maximum*)
- 3 gal/day/plant (5 ft plant spacing)
- 1 gal/hr emitter – 3 hours
- Options
  - 2 times per day for 1 ½ hour
  - 3 *times per day for 1 hour*
  - 6 *times per day for ½ hour*
  - 12 times per day for 15 min (pulse irrigation)

*Note these are expected to be the maximum irrigation rates during critical growing conditions*
Maximum Water Usage
½ Ac Plot

- 1/4 in/day – max. application rate
- ~ 1,300 gal/day
4 Acre Blueberry Drip Irrigation System
House Water supply

- 5/8” water meter (15 gpm)
- Connect to water line (usually 3/4” copper)
- Use 1” PVC or PE for main line (15 gpm)
  - lose ~ 5 psi/100 ft
  - depending on pressure at the house (usually 60 to 90 psi) restrict house to plot distance to ~ 400 ft
Pond Water Supply

- ~ ½ BHP electric pump
- 1 ¼” to 1 ½” main pipe (@14.4 gpm)
  - 1 ¼” PVC Sch. 40 pipe ~ 1.5 psi loss/100 ft
  - 1 ½” PVC Sch. 40 pipe ~ ¾ psi loss/100 ft
- OR
- ¾ BHP electric pump
- 1 “ PVC or PE pipe (~5 psi loss/100 ft @ 14.4 gpm)
Four station controller (optional)
1" PVC Schedule 40 pipe
1" 150 mesh screen filter

14.4 gpm

¾" x 1" T reducer
25 psi pressure reducer
To ½ acre drip line system

½ acre drip line

½ acre drip line

½ acre drip line

½ acre drip line

½ acre drip line

½ acre drip line
Drip Lines for ½ acre

360’

5’

1 gph emitters

½” PE pipe

½” figure 8 ends

12’

Slope 0 – 3%

½” x ¾” comp. “T” reducer

1.2 gpm

½’ compression T piece

½” compression elbow

near plot components
Automation Components

- Irrigation controller
- Solenoid valves and valve box
- Direct burial underground wire and water-proof connector
- Pump start-switch (if pump used)
- Electricity
Irrigation Controller

- Brain of the irrigation system
- Tells each valve
  - when to come on
  - how long to run
- In a nutshell
  - sophisticated clock
- Reduces voltage from 120V to 24V
How a Controller Works

- Sends an electric signal to the valve in each zone
- Solenoid valve receives the signal and tells valve to open
- Following scheduled duration of operation, controller sends another signal
- Solenoid valve turns off
- Proceed to next irrigation zone
Programmed Information

- Set of watering instruction
  - Watering days
  - Time of day to start
  - Sequence of operation (zone 1, 2, . . . 12)
  - Length of time in each zone
  - Multiple start times per day
  - Run times from 1 to 60 minutes (alternatively, 0.5 to 18 hours)
  - Activates pump
Solid-state Controller
Solenoid Valve
## Pressure Loss – 1”

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<th>Globe</th>
<th>Angle</th>
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Valve Boxes
Type of Wire

- Direct burial wire (identified as UV wire)
- Must carry 24V to 30V
  - Safety
  - Controller (transformer) reduces 120V to 24V
- Plastic coated
- Solid copper
- Single or multi-strand
- Multiple colors (white for common wire)
Wire Sizing

- Distance between controller and valve

***Only good if common and control wires are same gauge***

<table>
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<tr>
<th>Gauge</th>
<th>Allowable Distance (ft)</th>
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<tr>
<td>18</td>
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<td>7,700</td>
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Wire Layout

Controller

Solenoid Valve

Common Wire
Control
Control
Control
Wire Connectors

- Caution! Placing electric tape around a wire nut will **NOT** provide a waterproof seal!
- Two basic types of wire connectors
  - Wire nut with self-contained epoxy seal
  - Wire nut without self-contained epoxy seal (user must add epoxy)
Irrigation Scheduling

- Traditionally, $\frac{1}{2}$ hours to 3 hours per zone
- Problem
  - Field observations show some of the irrigation water infiltrates below root depth if watering last more than 20 minutes
  - Due to macropores (cracks in soil from decayed roots, worm holes, etc.)
  - Macropores enable water to quickly infiltrate to depths of 1 ft to 3 ft (or greater)
Pulse Irrigation

- Ideal when used with an Automatic Irrigation System
- Water is applied for 15 minutes at a time
- Water is applied many times throughout the day

Benefits
- Reduce water usage
- Reduce loss of fertilizer
- Potentially increase yield
Questions?