BLUEBERRY GROWERS
PRESENTATION OCTOBER 2012

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Advantages of a Properly Designed Drip Irrigation System

- Labor savings
- Increases Yields
- Improves Water Penetration
- Water Savings
- Equipment Cost Savings
- Power Saving
- Most Efficient Means of Fertilization
- Promotes Better Growth on Slopes
Crop Needs

Heat and Sunlight

Hard to manage air and sunlight

Drip gives a grower the most control over water and nutrients.
Misconceptions

“I can’t apply enough water with drip”

Water is applied directly to roots instead of entire soil volume

Water not available for plant uptake
The Benefits of Drip: Water Savings

Irrigate to match Daily Crop Water Use

Minimize deep percolation
AVAILABLE WATER

• The water must be in the plant root zone.

• The soil water holding capacity must be between Field Capacity and the Permanent Wilting Point.
Drip irrigation is the only way to keep soil moisture at an Optimum Moisture Level.
<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Maximum Infiltration Rate</th>
<th>Wetting Pattern</th>
<th>Maximum Wetted Diameter</th>
<th>Available Water (AW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse (sandy loam)</td>
<td>0.72 - 1.25 inches per hour</td>
<td>Coarse</td>
<td>1.0 - 3.0 feet</td>
<td>1.4 inches per foot</td>
</tr>
<tr>
<td>Medium (loam)</td>
<td>0.25 - 0.75 inches per hour</td>
<td>Medium</td>
<td>2.0 - 4.0 feet</td>
<td>2.0 inches per foot</td>
</tr>
<tr>
<td>Fine (clay loam)</td>
<td>0.13 - 0.25 inches per hour</td>
<td>Fine</td>
<td>3.0 - 6.0 feet</td>
<td>2.5 inches per foot</td>
</tr>
</tbody>
</table>
70% of water is taken up in the top 50% of the root zone.
Water Movement in Soils

This discussion of water movement in soils is a summary of pages 70 through 74 in the text, *Irrigation 5\textsuperscript{th} Ed.*

During irrigation, initial water movement at the point of entry is caused by gravity. Beyond that point, water moves in all directions due to capillary forces, and downward due to gravity.
Figure 1.2-9. Soil water movement following irrigation or rainfall.
.18gph Emitter Flow rate @ 24” Emitter Spacing @ 14” deep
<table>
<thead>
<tr>
<th>SOIL TEXTURE</th>
<th>MAXIMUM PRECIPITATION RATES: INCHES PER HOUR (MILLIMETERS PER HOUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 5% slope</td>
</tr>
<tr>
<td></td>
<td>cover</td>
</tr>
<tr>
<td>Course sandy soils</td>
<td>2.00 (51)</td>
</tr>
<tr>
<td>Course sandy soils over compact subsoils</td>
<td>1.75 (44)</td>
</tr>
<tr>
<td>Light sandy loams uniform</td>
<td>1.75 (44)</td>
</tr>
<tr>
<td>Light sandy loams over compact subsoils</td>
<td>1.25 (32)</td>
</tr>
<tr>
<td>Uniform silt loams</td>
<td>1.00 (25)</td>
</tr>
<tr>
<td>Silt loams over compact subsoil</td>
<td>0.60 (15)</td>
</tr>
<tr>
<td>Heavy clay or clay loam</td>
<td>0.20 (5)</td>
</tr>
<tr>
<td>ZONE #</td>
<td>BLUEBERRIES</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>AVERAGE ROW LENGTH (FT)</td>
<td>200</td>
</tr>
<tr>
<td>NUMBER OF ROWS</td>
<td>20</td>
</tr>
<tr>
<td>WIDTH OF ROW (feet)</td>
<td>4</td>
</tr>
<tr>
<td>Inches Per Week</td>
<td>1</td>
</tr>
<tr>
<td>Crop Factor</td>
<td>1</td>
</tr>
<tr>
<td>Gallons Per Day Per Field</td>
<td>11075.56</td>
</tr>
<tr>
<td>Gallons Per Day Per Row</td>
<td>553.78</td>
</tr>
<tr>
<td>Tubing Amount (ft)</td>
<td>4,000</td>
</tr>
<tr>
<td>WATER PER HOUR</td>
<td></td>
</tr>
<tr>
<td>Emitter Spacing(inches)</td>
<td>24.00</td>
</tr>
<tr>
<td>Emitter Output (gph)</td>
<td>0.55</td>
</tr>
<tr>
<td>Output Per Row (gph)</td>
<td>55.00</td>
</tr>
<tr>
<td>Output Per Row (gpm)</td>
<td>0.92</td>
</tr>
<tr>
<td>Output Per Field (gph)</td>
<td>1100.00</td>
</tr>
<tr>
<td>Output Per Field (gpm)</td>
<td>18.33</td>
</tr>
<tr>
<td>ZONE ANALYSIS</td>
<td></td>
</tr>
<tr>
<td>Zone Run Time (hours)</td>
<td>10.07</td>
</tr>
</tbody>
</table>
OTHER WAYS TO CONTROL SOIL MOISTURE

• Controllers that measure ET
• Soil moisture sensors
GUIDELINES ADAPTED FROM:
Tensiometer Use in Irrigation Scheduling
Irrigation Management Series
Kansas State University
Agricultural Experiment Station and Cooperative Extension Service
Mahbub Alam and Danny Rogers
Information Needed Before a System Can Be Designed

• Water Source
  – Lake/Pond/River
  – Well
  – Municipal Water Supply

• Water Quality
  – A Water Test Will Be Needed to Determine Water Quality

• Water Quantity
  – 10 to 15 GPM per Acre per Zone
Information Needed Before a System Can Be Designed

• Layout Schematic
  – Number of Rows
  – Distance Between Rows
  – Distance Between Plants
  – Distance of Water Source from Field
  – Elevation Differences
Information Needed Before a System Can Be Designed

• Power
  – Is Electrical Service Available?
  – 110v, 220v ?
  – If 220v, is it 1Phase or 3 Phase
Information Needed Before a System Can Be Designed

- Soils
  - Clay
  - Loam
  - Sandy
PUMP STATION

• Centrifugal – Lake or Pond
• Submersible – Well, Lake
FILTRATION

- Manual Clean or Automatic Backflush
- Disc Filter
- Screen Filter
- Media Filter
- 120 to 200 Mesh Filtration Needed Depending on Filtration Needs of Emitter.
Fertilizer-Chemical INJECTORS

- Electrical / Non-Electrical
- Venturi type
- Pump type
- Combination of Both
BACKFLOW PREVENTION

• Check Valves
  – Inline Check Valve to Prevent Water Flowing Back Through System.

• Chemical Backflow Preventers
  – Chemigation Check Valves
  – Atmospheric Vacuum Breakers
  – Double Check Assemblies
  – Reduced Pressure Backflow Preventor
MAIN LINE PIPING

- Main Line Valve
- Main Line Flush
- Main Line Drain
- Main Line Sizing is a Different Procedure Than Sub-main Line.
ZONE CONTROLS

• Valves
• Pressure Regulators
• Air Vents
• Disconnects
  – Unions
  – Flanges
  – Cam-loc
  – Grooved (vitauletic) fittings
SUB-MAIN

• Risers
• Flush Valves
• Drain Valves
• Air Vents
DRIPPERLINE

- Inline vs Online
- Pressure Compensating vs Non-Pressure Compensating
CONTROLLERS

• Any Good Quality Outdoor Turf Controller
  – Electric
  – Battery operated
COSTS?

• In Field Products: filter, main & sub-main piping, valves, pressure regulators, air vents, risers, dripperline, all fittings, etc
  – $500 - $1000 per acre
  – $1.50 - $2.00 per vine
COSTS?

• Additional Costs
  – Labor / Installation
  – Electrical Service
    • Getting Electric Service to Field
    • Electrician
  – Pump Station
    • Well drilling
    • Pump house
    • Water tap
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<table>
<thead>
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<th>REFERENCE BOOKS</th>
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<tbody>
<tr>
<td><strong>Drip and Micro Irrigation for Trees, Vines, and Row Crops</strong></td>
</tr>
<tr>
<td>Authors: Charles M. Burt, PE, Ph.D, Stuart W. Styles, PE</td>
</tr>
<tr>
<td><strong>Fertigation</strong></td>
</tr>
<tr>
<td>Authors: C. Burt, K. O'Conner, T. Ruehr</td>
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