Orchard Irrigation

By Trevor Hardy
Brookdale Fruit Farm Inc
Brookdale History

• Brookdale Fruit Farm established in 1847
• Currently Operated by the 5th, 6th, and 7th generations of the Hardy and Whittemore families
• Farming hundreds of acres
  – Certified Organic 10+ Acres
• 4 major business units
  – Wholesale, Retail, Pick Your Own, Supplies
Types of drip Systems

• Permanent systems (Left outside all year)
  – Ram Tubing or Orchard Tubing
  – Installed below and above ground
  – Used on apples, blueberries, cherries, peaches…

• Annual systems (Pick up before winter)
  – Drip Tape
  – Yearly application (Tomatoes or Vegetables)
  – Above ground system
  – Ability to drive over lines Does Not Restrict Field Access
Why Drip

• Delivers water directly to plant
  – Consistent amounts throughout field
  – Not weather dependant
• Incorporate fertilizers and chemicals into system
• 1 time set up per year
• Start it and leave it operating design
• Only waters plant, not weeds
• Conserves water uses ¼ amount of water compared to overhead
• Requires less pump capacity and fuel to operate
  Saves $$$$$$$
Need to know
• # acres to irrigate at once
• Water source
• Max Row length
• Elevation and distance from source
• 10 year view

1 acre of high density orchard 12’ rows
2 foot tubing approx. 20 gpm

<table>
<thead>
<tr>
<th>Size Pipe Inches</th>
<th>Flow Gal per Minut</th>
</tr>
</thead>
<tbody>
<tr>
<td>½</td>
<td>3</td>
</tr>
<tr>
<td>¾</td>
<td>9</td>
</tr>
<tr>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>1 ½</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>150</td>
</tr>
<tr>
<td>4</td>
<td>450</td>
</tr>
</tbody>
</table>
# System Design

**Brookdale Fruit Farm**
Irrigation & Row Crop Supply
Hollis NH (603) 465 2240

## Irrigation Sales Slip

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Units</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3400 feet</td>
<td>2 inch poly pipe 100 psi</td>
<td>3</td>
<td>$0.97</td>
<td>$3,296.00</td>
</tr>
<tr>
<td>3</td>
<td>filter 1</td>
<td>2 inch single disc filter built to backflush on cam lock</td>
<td>1</td>
<td>$490.00</td>
<td>$490.00</td>
</tr>
<tr>
<td>4</td>
<td>injector 1</td>
<td>4 x 3/4 fertilizer injector</td>
<td>1</td>
<td>$305.00</td>
<td>$305.00</td>
</tr>
<tr>
<td>5</td>
<td>fittings 30</td>
<td>2 inch red layflat hose connect filter and injector well</td>
<td>30</td>
<td>$1.25</td>
<td>$37.50</td>
</tr>
<tr>
<td>6</td>
<td>4 each 2 inch cam lock</td>
<td>2 inch cam lock c</td>
<td>4</td>
<td>$7.50</td>
<td>$30.00</td>
</tr>
<tr>
<td>7</td>
<td>5 each 2 inch cam lock</td>
<td>e</td>
<td>5</td>
<td>$4.50</td>
<td>$22.50</td>
</tr>
<tr>
<td>8</td>
<td>60 each 2 inch super clamps 56-59</td>
<td>f</td>
<td>60</td>
<td>$5.00</td>
<td>$300.00</td>
</tr>
<tr>
<td>9</td>
<td>12 each gravity drain assembly</td>
<td>g</td>
<td>12</td>
<td>$38.00</td>
<td>$456.00</td>
</tr>
<tr>
<td>10</td>
<td>15 each 2 inch insert caps</td>
<td>h</td>
<td>15</td>
<td>$2.25</td>
<td>$33.75</td>
</tr>
<tr>
<td>11</td>
<td>20 each 2 inch couplers</td>
<td>i</td>
<td>20</td>
<td>$1.55</td>
<td>$31.00</td>
</tr>
<tr>
<td>12</td>
<td>10 each 2 inch elbows</td>
<td>j</td>
<td>10</td>
<td>$1.85</td>
<td>$18.50</td>
</tr>
<tr>
<td>13</td>
<td>5 each 2 inch ball阀</td>
<td>k</td>
<td>5</td>
<td>$4.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>14</td>
<td>39 coils 24 inch o.53 spacing orchard tubing</td>
<td>l</td>
<td>39</td>
<td>$165.00</td>
<td>$6,045.00</td>
</tr>
<tr>
<td>16</td>
<td>200 each</td>
<td>spinclap starter with grommet</td>
<td>m</td>
<td>$1.60</td>
<td>$320.00</td>
</tr>
<tr>
<td>17</td>
<td>200 each</td>
<td>figure 6 end cap</td>
<td>n</td>
<td>$0.20</td>
<td>$40.00</td>
</tr>
<tr>
<td>18</td>
<td>100 each</td>
<td>ram coupler</td>
<td>o</td>
<td>$0.35</td>
<td>$35.00</td>
</tr>
<tr>
<td>19</td>
<td>3 assembly 2 way plug valve tower with pressure gauge and air vent</td>
<td>p</td>
<td>3</td>
<td>$175.00</td>
<td>$525.00</td>
</tr>
<tr>
<td>21</td>
<td>1 assembly 2 way plug valve tower with pressure gauge and air vent</td>
<td>q</td>
<td>1</td>
<td>$225.00</td>
<td>$225.00</td>
</tr>
<tr>
<td>23</td>
<td>1 assembly 2 way plug valve tower with pressure gauge and air vent</td>
<td>r</td>
<td>1</td>
<td>$110.00</td>
<td>$110.00</td>
</tr>
</tbody>
</table>

| Notes: | | | | | Total: $12,342.20 |
Pressure Pump

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# Filter assemblies

<table>
<thead>
<tr>
<th>Description</th>
<th>Price</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 inch disc filter on 2 inch system</td>
<td>$490.00</td>
<td>1.5</td>
</tr>
<tr>
<td>2 2 inch disc filters on 2 inch system</td>
<td>$1,200.00</td>
<td>3</td>
</tr>
<tr>
<td>2 3 inch disc filters on 3 inch system</td>
<td>$1,500.00</td>
<td>5</td>
</tr>
<tr>
<td>3 3 inch disc filters on 3 inch system</td>
<td>$2,200.00</td>
<td>8</td>
</tr>
</tbody>
</table>
Filter System

Orchard tubing requires filtering to 100 micron or 150 mesh to prevent clogging. Disc filters are best option even from well or city water.
Fertilizer Injectors

- Mazzei injector
  - Venturi action
  - Regulated by flow of water
- Mix Rite or Dosatron
  - Pump Style
  - Varying flow rates, Constant feed, precise measure
- Only use WATER SOLUBLE FERTILIZER
Fertilizer Injection

Mazzei Injectors work off of FLOW RATE
NEED CORRECT FLOW TO MAKE INJECTOR WORK
Note: 24 inch orchard tubing 0.61 gph per dripper

24 inch 12 foot row spacing is 18 GPM per acre
Terminology

- **Main line**
  - High pressure line pushes water to field
- **Valve or zone station**
  - Taps into main line
  - Reduces water pressure with regulator
  - Directs water to specific location of field
- **Header pipe**
  - Low pressure line that all drip lines connect into
Black poly pipe is sub main that is connected to valve station pictured on the right. The orchard tubing for tall spindle applications hanging from a wire requires a CNL (check valve dripper) That way all drippers emit the same amount of water and work better with fertigation for feeding the trees fertilizer. The 3rd insert fitting pictured will be used to install tube into poly header. Use a ¾ inch drill bit to make hole. Insert rubber gromet in hole, and push tubing on barb. This fitting can handle 80 PSI.
## Orchard Tubing

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<table>
<thead>
<tr>
<th>Planting Spacing</th>
<th>Row Length</th>
<th>Dripper Spacing</th>
<th>GPM per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>3’ x 12’</td>
<td>&lt;500</td>
<td>12 inch spacing</td>
<td>36 gpm</td>
</tr>
<tr>
<td>3’ x 12’</td>
<td>500+</td>
<td>24 inch spacing</td>
<td>18 gpm</td>
</tr>
<tr>
<td>4’ x 12’</td>
<td>&lt;500</td>
<td>24 inch spacing</td>
<td>18 gpm</td>
</tr>
<tr>
<td>4’ x 12’</td>
<td>500+</td>
<td>24 inch spacing</td>
<td>18 gpm</td>
</tr>
<tr>
<td>4’ x 14’</td>
<td>&lt;500</td>
<td>24 inch spacing</td>
<td>18 gpm</td>
</tr>
<tr>
<td>4’ x 14’</td>
<td>500+</td>
<td>24 inch spacing</td>
<td>18 gpm</td>
</tr>
<tr>
<td>6’ x 14’</td>
<td>500+</td>
<td>36 inch spacing</td>
<td>11 gpm</td>
</tr>
</tbody>
</table>
Field Valve Station
Trench prep Flat
Drip line lead
Gravity Drain

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Orchard Tubing

Water can be hooked up on surface temporarily prior to burying the header pipe with flat tube. This allows for water to be hooked up just after transplant. This temporary system can be used for a few years as planting blocks fill in.
Temp hook up

Note that on tall spindle or tight dwarf plantings tubing can be woven between trees to help keep in place from mowers etc or tie it to trellis poles.
H valves

Temporary Surface Hook UP
Water quick to plantings
Allows easy expansion as trees become available
Can be installed same day when transplanted
Operates at 35 psi
The curlie holder on the left picture has 4x the surface area gripping the wire than the grape vine clip pictured on the right. They also don’t break in the cold and are a lot easier to put on with your hands than the vine clips. Case of 1000 curlies is $50.00 Case 1000 vine clips $90.00
First year TS

- Tubing High Side
- Poles every 25 feet
- H braces at end
- Temp Feed inside trellis
- Tie to poles
Water Application

• Right Time Right Pressure Right Amount
  – Group crop families
  – Gauges before regulators or point application
  – Moisture sensors to turn on
    • More important when to Turn OFF
**Moisture Meters**

**Irrrometer** installation detail - Orchards

**NOTE:** Irrrometer placement depth is a function of crop root depth.

1. Set tips in active root system area in tree row.
2. Sensor location should be near dripline of tree and on the SouthWest side (in Northern hemisphere).
3. If utilizing furrow irrigation, angle tubes slightly towards furrow.
4. With sprinkler irrigation, locate irrometers in sprinkler wetted pattern.
5. With drip irrigation, locate Irrrometers 12" to 18" from emitter, or 24" to 36" from a micro-sprinkler.

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Sensor Information

- **0-10 Centibars** = Saturated soil
- **10-30 Centibars** = Soil is adequately wet (except coarse sands, which are beginning to lose water)
- **30-60 Centibars** = Usual range for irrigation (most soils)
- **60-100 Centibars** = Usual range for irrigation in heavy clay
Temp vs Soil Moisture

RainwiseNet Detailed Graph

- Temperature
- Soil Moisture

Too dry
Too wet
Rainfall vs Soil Moisture

RainwiseNet Detailed Graph

Ran out of water
Goal with Apples

- High Density get trees to top wire End of year 2.
- Feed to promote growth and branching
Fertigation

Tree fruit starter is specific for transplants and designed for New England use. Also can inject calcium nitrate for early growth. Barney at sunrise had great success using this on new planting last year.

<table>
<thead>
<tr>
<th></th>
<th>Water soluble Fertilizer</th>
<th>25 lb Bags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Starter</td>
<td>12-45-10</td>
<td>$51.00</td>
</tr>
<tr>
<td>General Purpose</td>
<td>20-20-20</td>
<td>$41.00</td>
</tr>
<tr>
<td>Cal Mag</td>
<td>14-4-14</td>
<td>$38.00</td>
</tr>
<tr>
<td>Veg Grow Special</td>
<td>12-5-19</td>
<td>$40.00</td>
</tr>
<tr>
<td>Calcium Nitrate</td>
<td>15-0-0</td>
<td>$31.00</td>
</tr>
<tr>
<td>K Mag Fruit Size</td>
<td>15-5-30</td>
<td>$42.00</td>
</tr>
<tr>
<td>Potassium Nitrate</td>
<td>13-0-44</td>
<td>$44.00</td>
</tr>
<tr>
<td>Tree Fruit Starter</td>
<td>18-6-15</td>
<td>$38.00</td>
</tr>
</tbody>
</table>
Low Pond Problems
Sediment build up
Low water problems

- Dirty Filters
- Reduced operating pressure
- Clogged impellars in pumps
- Muck build up main lines
- Clogged drippers in tubing

TO DO BEFORE 2017 Growing season
Perform Maintenance on equipment and
Flush Irrigation Lines
Disc Filter System
Create low sump point
Flow over Foot Valve
Too much suction
Trellis Work
Contact

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