



Hops Irrigation



By Trevor Hardy
Brookdale Fruit Farm Inc



Brookdale History

Brookdale Fruit Farm

Irrigation & Row Crop Supply

Hollis NH (603) 465 2240

- 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



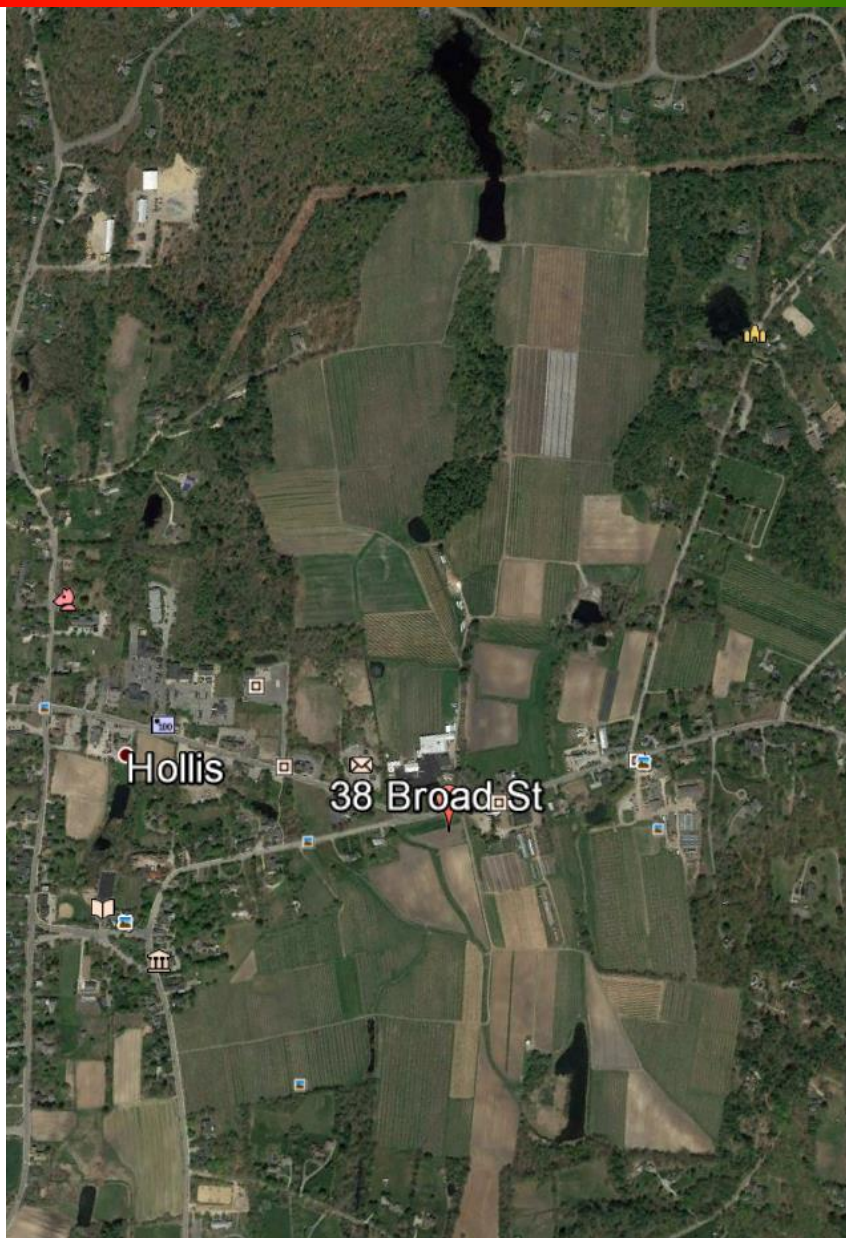


Brookdale

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Brookdale Supplies

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Types of drip Systems

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- 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

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- 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 $\frac{1}{4}$ amount of water compared to overhead
- Requires less pump capacity and fuel to operate
Saves \$\$\$\$\$\$



Yard Irrigation

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Need to know

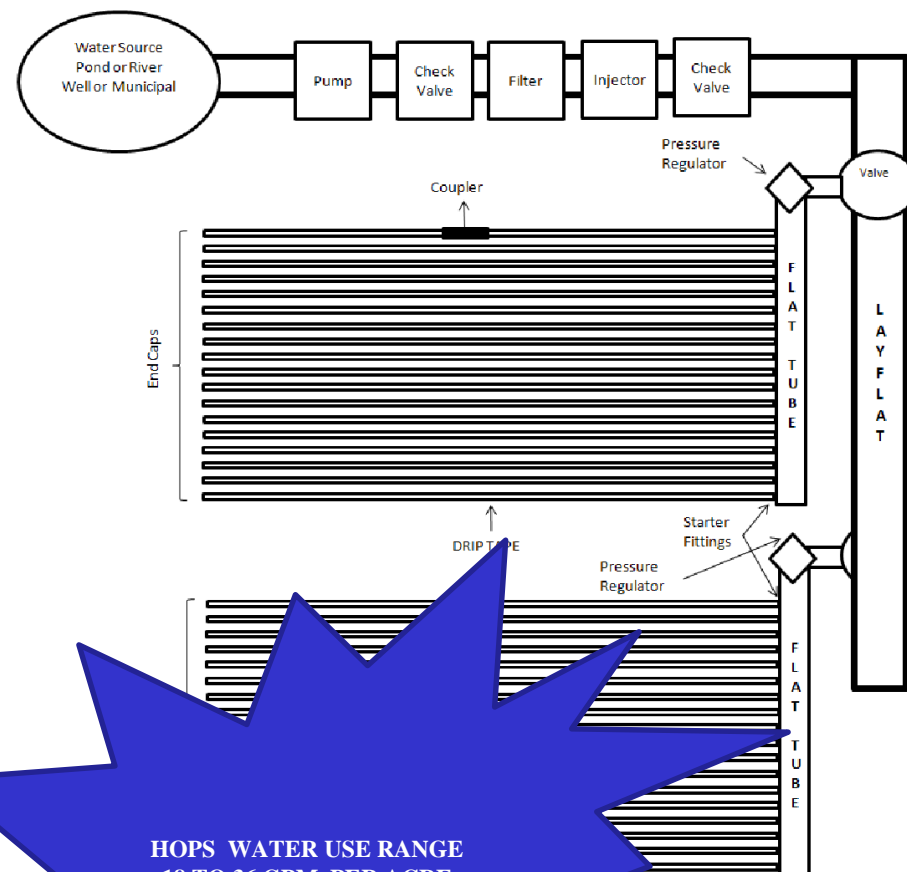
- # acres to irrigate at once
- Water source
- Max Row length
- Elevation and distance from source
- 10 year view

1 acre of high density orchard 12' rows

2 foot tubing approx. 20 gpm

Size Pipe Inches Flow Gal per Min.

1/2	3
3/4	9
1	15
1 1/2	30
2	80
3	150
4	450



**HOPS WATER USE RANGE
18 TO 36 GPM PER ACRE**



			FIELD	# rows	LENGTH	ROW FT	spacing	flow	gpm
	3 way valve tower	crop	A	6	420	2520	2	0.53	11.1
		apples	B	11	210	2310	2	0.53	10.2
		apples	C1	8	500	4000	2	0.53	17.7
	2 way valve tower	apples	C2	10	300	3000	2	0.53	13.3
		apples	D1	10	450	4500	2	0.53	19.9
		apples	D2	10	360	3600	2	0.53	15.9
	well	xmas	E	42	100	4200	2	0.53	18.6
		xmas	F	40	150	6000	2	0.53	26.5
		apples	G	7	250	1700	2	0.53	7.5
	main line	xmas	H	42	160	6720	2	0.53	29.7
	sub main								
	gravity drain								
			186 totals			38550			



Orchard Tubing

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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 $\frac{3}{4}$ inch drill bit to make hole. Insert rubber gromet in hole, and push tubing on barb. This fitting can handle 80 PSI



Orchard Tubing

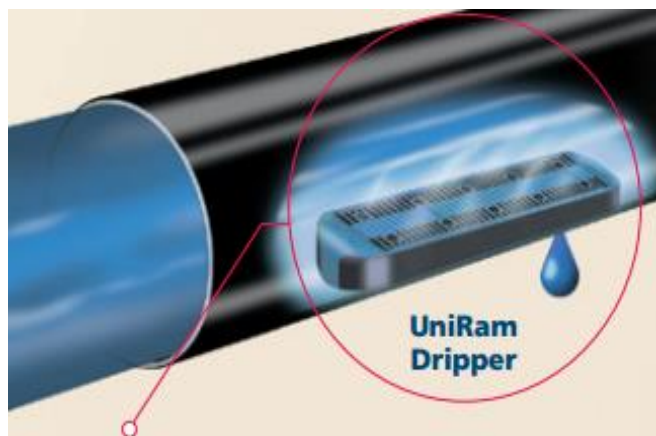
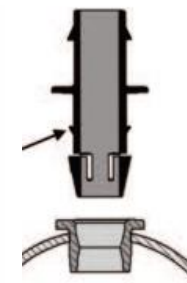
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Ag Irrigation



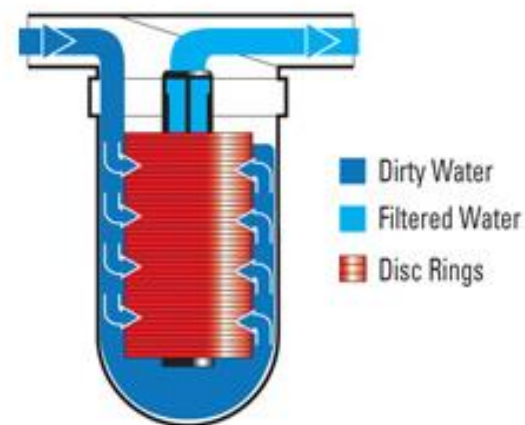
Planting Spacing	Row Length	Dripper Spacing	GPM per Acre
3' x 12'	<500	12 inch spacing	36 gpm
3' x 12'	500+	24 inch spacing	18 gpm
4' x 12'	<500	24 inch spacing	18 gpm
4' x 12'	500 +	24 inch spacing	18 gpm
4' x 14'	<500	24 inch spacing	18 gpm
4' x 14'	500+	24 inch spacing	18 gpm
6' x 14'	500+	36 inch spacing	11 gpm



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





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



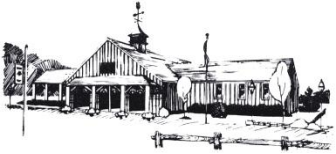
Temp hook up

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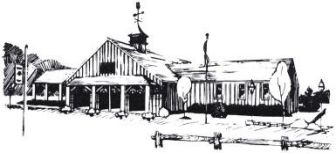




Curlie vs clip



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



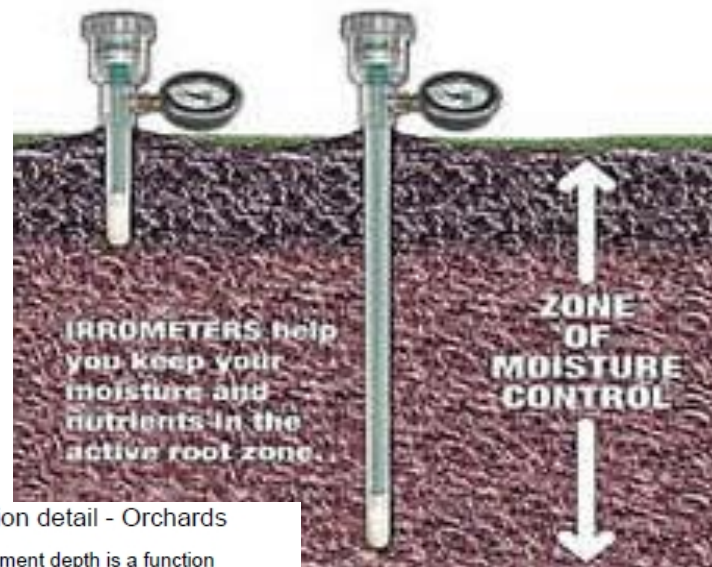
Water Application

- 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



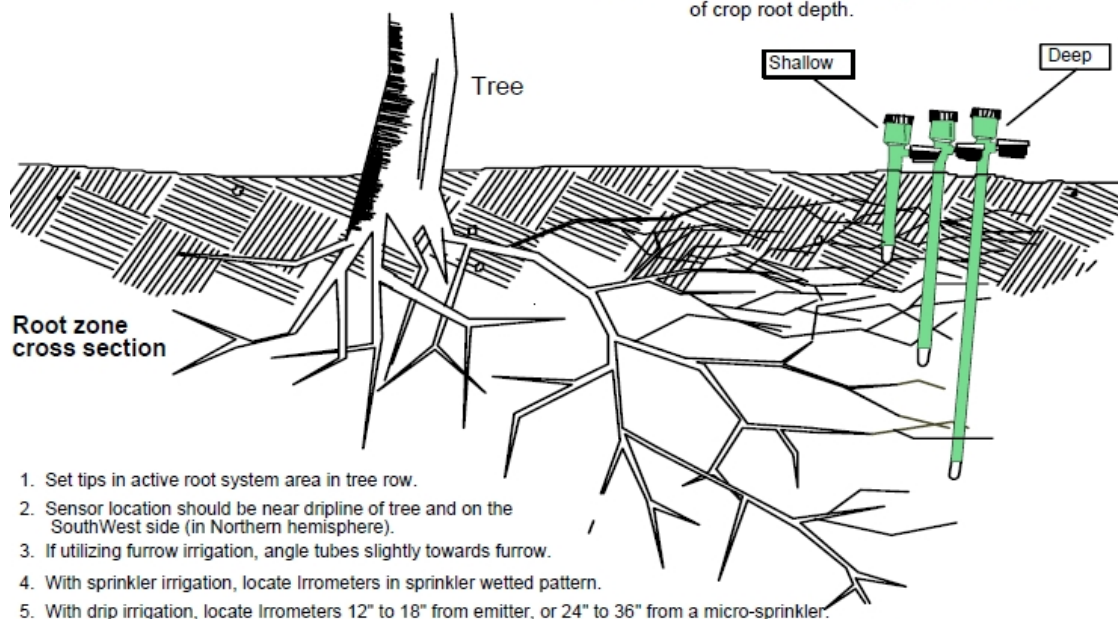


Moisture Meters



Irrrometer installation detail - Orchards

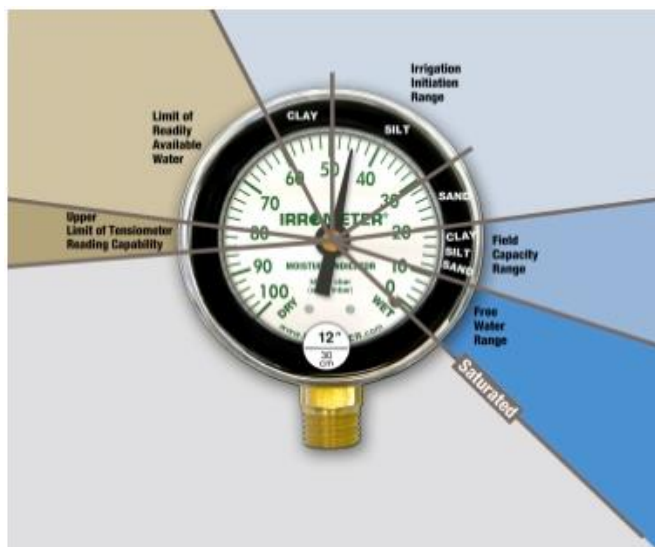
NOTE: Irrrometer placement depth is a function of crop root depth.



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 Irrrometers in sprinkler wetted pattern.
5. With drip irrigation, locate Irrrometers 12" to 18" from emitter, or 24" to 36" from a micro-sprinkler.



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



CROP	SHALLOW INSTRUMENT (INCHES)	DEEP INSTRUMENT (INCHES)	FOR EXTRA DEPTH, SET AT (INCHES)	CROP	SHALLOW INSTRUMENT (INCHES)	DEEP INSTRUMENT (INCHES)	FOR EXTRA DEPTH, SET AT (INCHES)
ALFALFA	18-24	36-48	60-70	MELONS	18	36	
ALMONDS	24	48	72	MILO	24	48	
APPLES	20	40	60	MINT	12	24	
APRICOTS	24	48	72	MONTEREY PINES, FIRS	12	24	
ARTICHOKES	18	36		MUMS	4-6		
ASPARAGUS	18-24	36-48		MUSTARD	18	36	
AVOCADOS	12	24	36	NECTARINES	18	36	
BANANAS	12	24		OATS	18	36	
BARLEY	18	36		OKRA	18	36	
BEANS (bush)	10		18	OLIVES	24	48	60
BEANS (Lima)	18	36		ONIONS	12		
BEANS (Pole)	18	36		PAPAYA	12	24	
BEEFS (sugar)	18	36		PARSNIPS	18	36	
BEEFS (table)	12-18	24-36		PEACHES	18	36	60
BLUEBERRIES	12	24		PEANUTS	12	24	
BROCCOLI	12	20		PEARS	18	36	48
CABBAGE	12	20		PEAS	18	36	
CANAIGRE	18	36	48	PECANS	18	36	48
CANTALOUPE	18	36		PEPPERS	15	30	
CARNATIONS	4-6			PERMANENT PASTURES	8-15		24-30
CARROTS	12	24		PERSIMMONS	18	36	
	12	24		PINEAPPLE	15	30	
	10	20		PISTACHIO NUTS	24	48	60
	12	24		POMEGRANATES	18	36	
	24	48		POTATOES (Irish)	8-10	18	
	12	24		POTATOES (sweet)	18	36	
	18	36		PLUMS	24	48	72
	18-24	36-48		PRUNES	24	48	72
	12	30		PUMPKIN	18	36	48
	18	36		RADISHES	12		
CORN (field)	18	36	48	RASPBERRIES	18	36	
COTTON	18	36		SORGHUM	18	36	
CRANBERRIES	18	36		SOY BEANS	18	36	60
CUCUMBERS	18	36		SPINACH	12	24	
DATE PALM	24	48	60	SQUASH (Summer)	15	30	
EGGPLANT	12	24		STRAWBERRIES	6	12	
FIGS	18	36		SUDAN GRASS	18-24	36-48	
GARLIC	12	24		SUGAR CANE	18	36	
GRAIN and FLAX	18	36		SUNFLOWERS	24	48	60
GRAPES	24	48	60	TEA	12	24	
HOPS	24	48	60	TOBACCO	8-15	30	
JOJOBA	18	36		TOMATOES	18	36	
KIWI	18	36	48	TURNIPS	18	36	
LADINO CLOVER	10	20		WALNUTS	24	48	72
LETTUCE	12			WATERMELON	18	36	48
MACADAMIAS	12	24	36	WHEAT, HAY	18	36	
MAIZE	18	36					

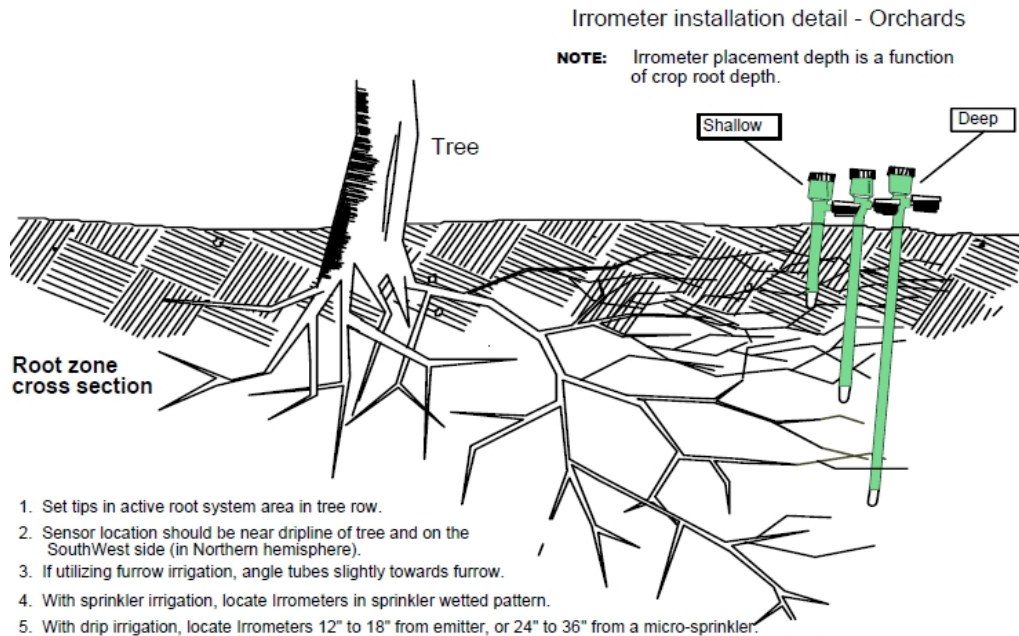


Sensor placement

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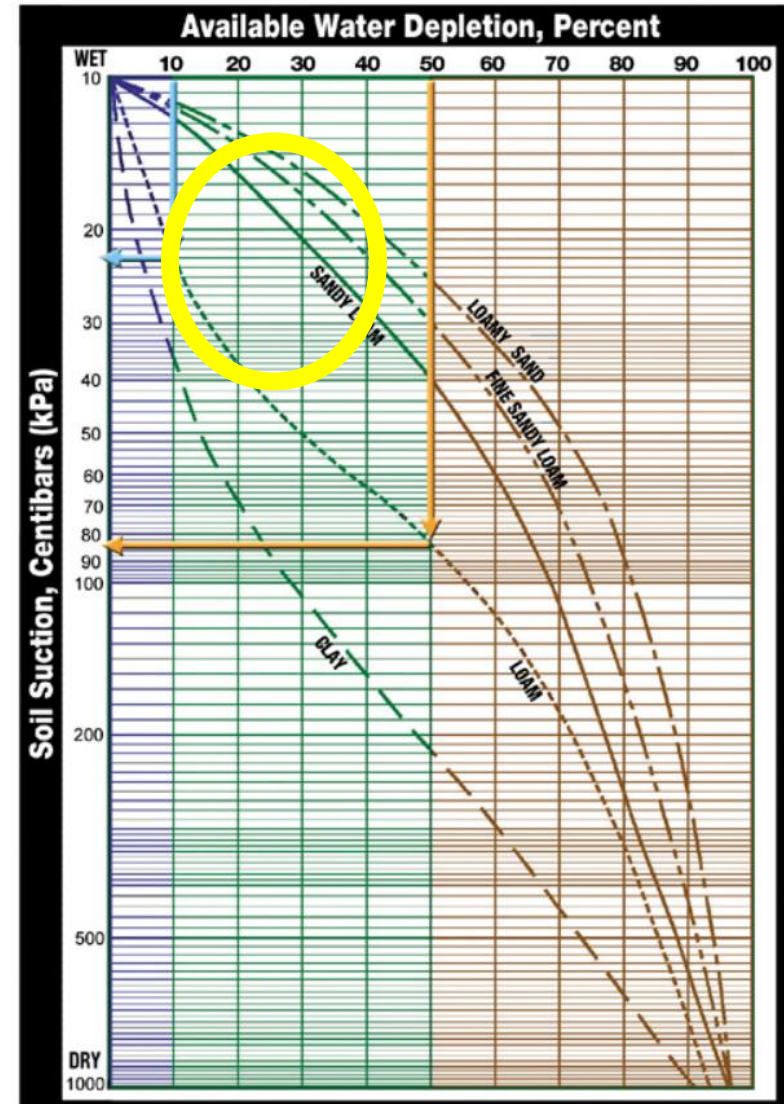
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Need 2 sensors

Placement with soil sample probe



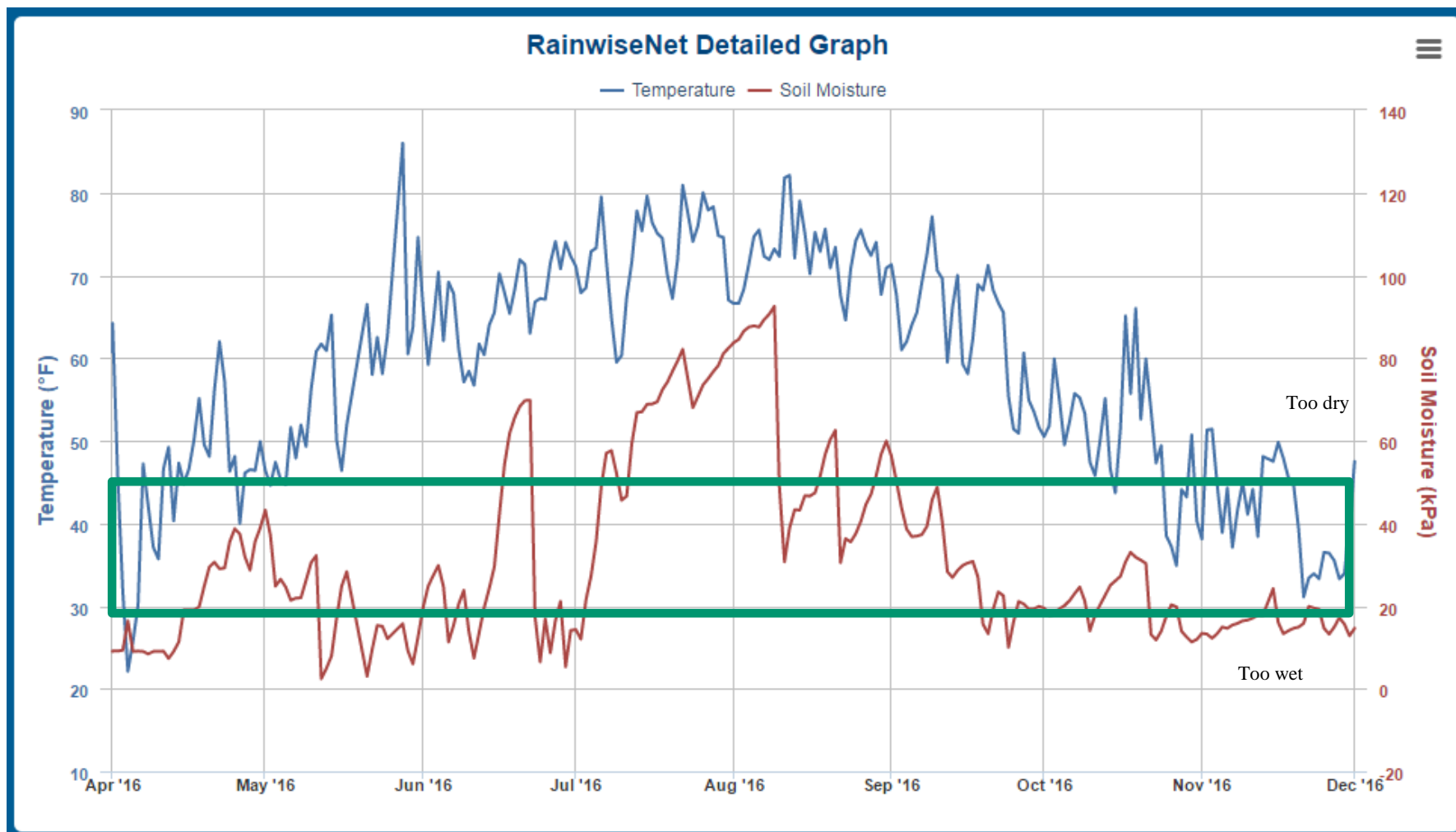


Temp vs Soil Moisture

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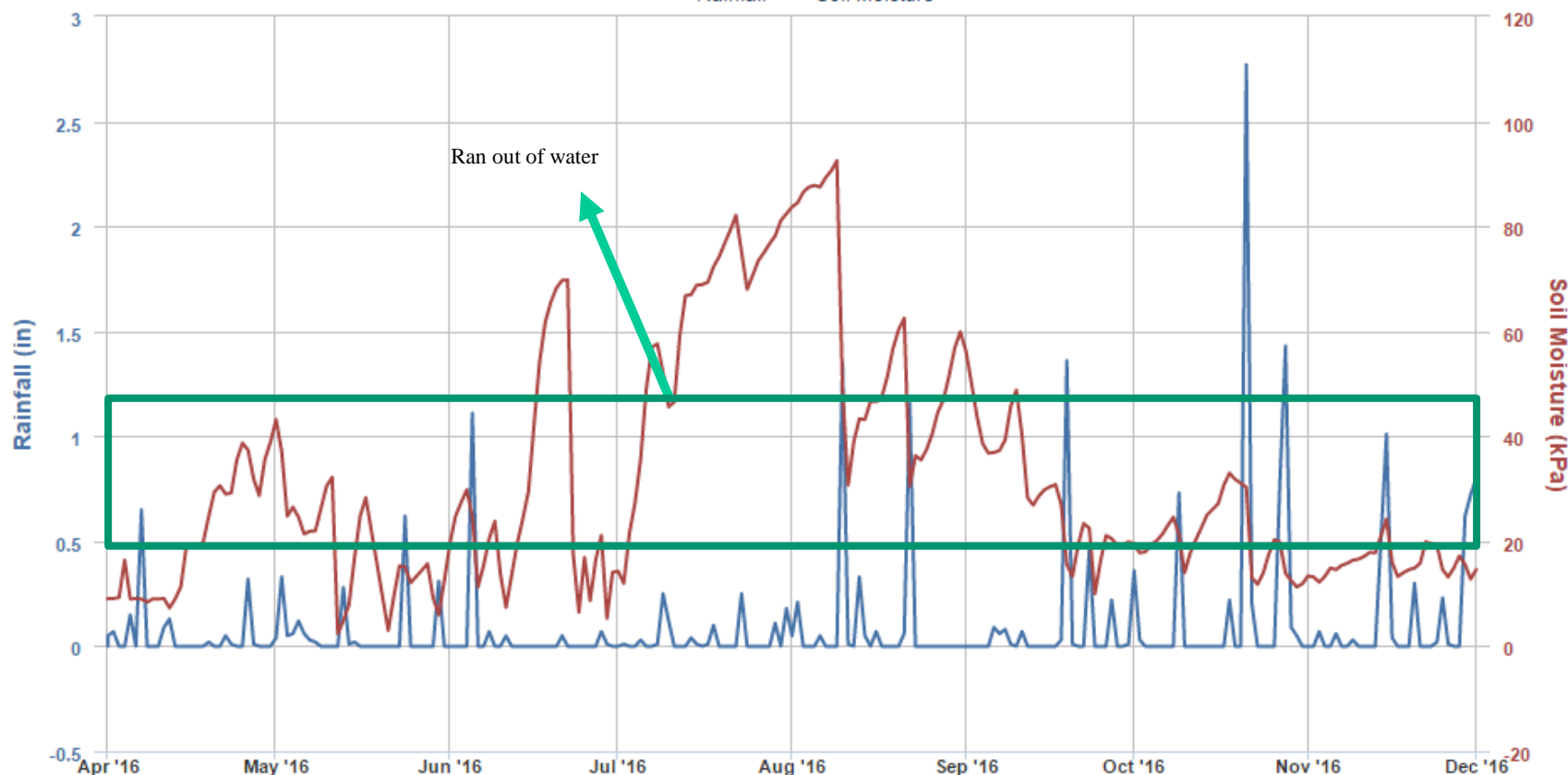




Rainfall vs Soil Moisture

RainwiseNet Detailed Graph

— Rainfall — Soil Moisture





NEWA

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- Newa.cornell.edu
- Apple irrigation model reference
 - Looks at ET data and gallons replaced

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Apple Irrigation Model

Weather station:
Hollis

Select Date:
07/19/2017
Continue

Change green tip date or tree density and click "Calculate" to recalculate results. Changing "Age of Orchard" will automatically recalculate table.

Green tip date	In row spacing	Between row spacing	Trees per acre	Age of orchard	Water balance
04/05/2017	4 feet	12 feet	908	Mature	

Apple Evapotranspiration Model Results

Date	Orchard ET (gallons)	Rainfall (gallons/acre)	Irrigation (gallons/acre)	Water Balance (gallons/acre)
	per tree	per acre	inches	Daily
Jul 12	-150.6	-136704	-	0
Jul 13	2.5	2262	-	-2262
Jul 14	-150.6	-136704	-	0
Jul 15	-150.6	-136704	-	0
Jul 16	-150.6	-136704	-	0
Jul 17	-150.6	-136704	-	0
Jul 18	-150.6	-136704	-	0
Jul 19	-150.6	-136704	-	0
Jul 20	-150.6	-136704	-	0
Jul 21	5.9	5383	0.00	-5383
Jul 22	3.5	3139	0.00	-3139
Jul 23	-150.6	-136704	-	0
Jul 24	2.3	2094	1.04	17674
Jul 25	-150.6	-136704	-	0

You can enter your own rainfall or irrigation amounts and click the "Calculate" button which will appear



Fertilizer Injectors

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- 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





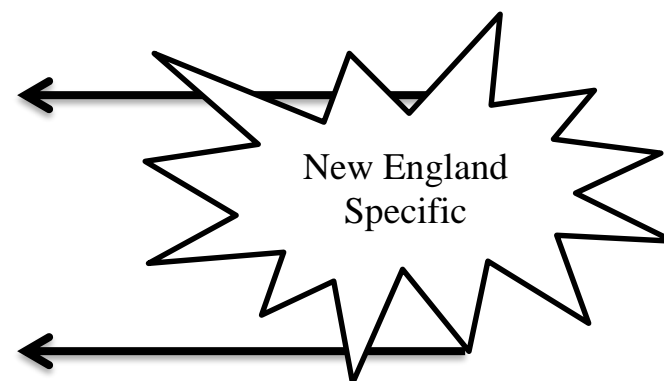
Fertigation



Vegetable Specific Nutriculture Water soluble Fertilizer 25 lb Bags

Plant Starter	12-45-10	\$51.00
General Purpose	20-20-20	\$41.00
Cal Mag	14-4-14	\$38.00
Veg Grow Special	12-5-19	\$40.00
Calcuim Nitrate	15-0-0	\$31.00
K Mag Fruit Size	15-5-30	\$42.00
Potassium Nitrate	13-0-44	\$44.00
Tree Fruit Starter	18-6-15	\$38.00

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





Fertilizer



Organic Hop Foliar Recommendation

Every 2-3 weeks throughout the season, beginning with the first environmental conditions conducive to weakened plant health

CuTEN @ 1 quart/acre

Early vegetative applications: 3 applications, every three weeks beginning with 4 leaf pairs to early lateral shoot growth

Enviro 12-0-1 @ 5 lb/acre

Enviro Manganese @ 1 quart/acre

Enviro Zinc @ 1 quart/acre

Pre-inforescence emergence: 2 applications at 70% to 80% of total bine height extension, and just prior to anticipated inflorescence emergence

Enviro 5-0-20 @ 5 lb/acre

Enviro Calcium @ 1 quart/acre

Enviro Magnesium @ 1 quart/acre

Full flowering

Enviro Boron @ 16 ounces/acre

Enviro Zinc @ 1 quart/acre

Full cone set

Enviro 5-0-20 @ 5 lb/acre

Enviro Zinc @ 1 quart/acre

Enviro Calcium @ 1 quart/acre

Cone bulking and compacting

Enviro 12-0-1 @ 3 lb/acre

Enviro Calcium @ 1 quart/acre



Weed Matt

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- 1.77 OZ Black Row Cover Fabric
- UV Stabilized
- Pinned every 3 feet with staples
- 3 to 5 year life span
- Lay with raised bed plastic machine
- 1 acre hops around \$650

- Brookdale Fruit Farm exclusive product
- Permeable for rain water filtration
- Cost effective weeding solution
- 3, 4 and 5 foot widths





Mum Fabric

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- 3.2 oz woven poly fabric
- White or black in color
- 3 foot to 15 feet wide
- 300 feet long
- Acre hops approx. \$875
- Does not let rain thru





Pictures

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Questions

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Contact

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