

# Hops Irrigation



## MSU Hop Spring Kickoff Meeting 2022

<https://msu.zoom.us/j/9LzavCB0GEEwYCjT9c9Ke>



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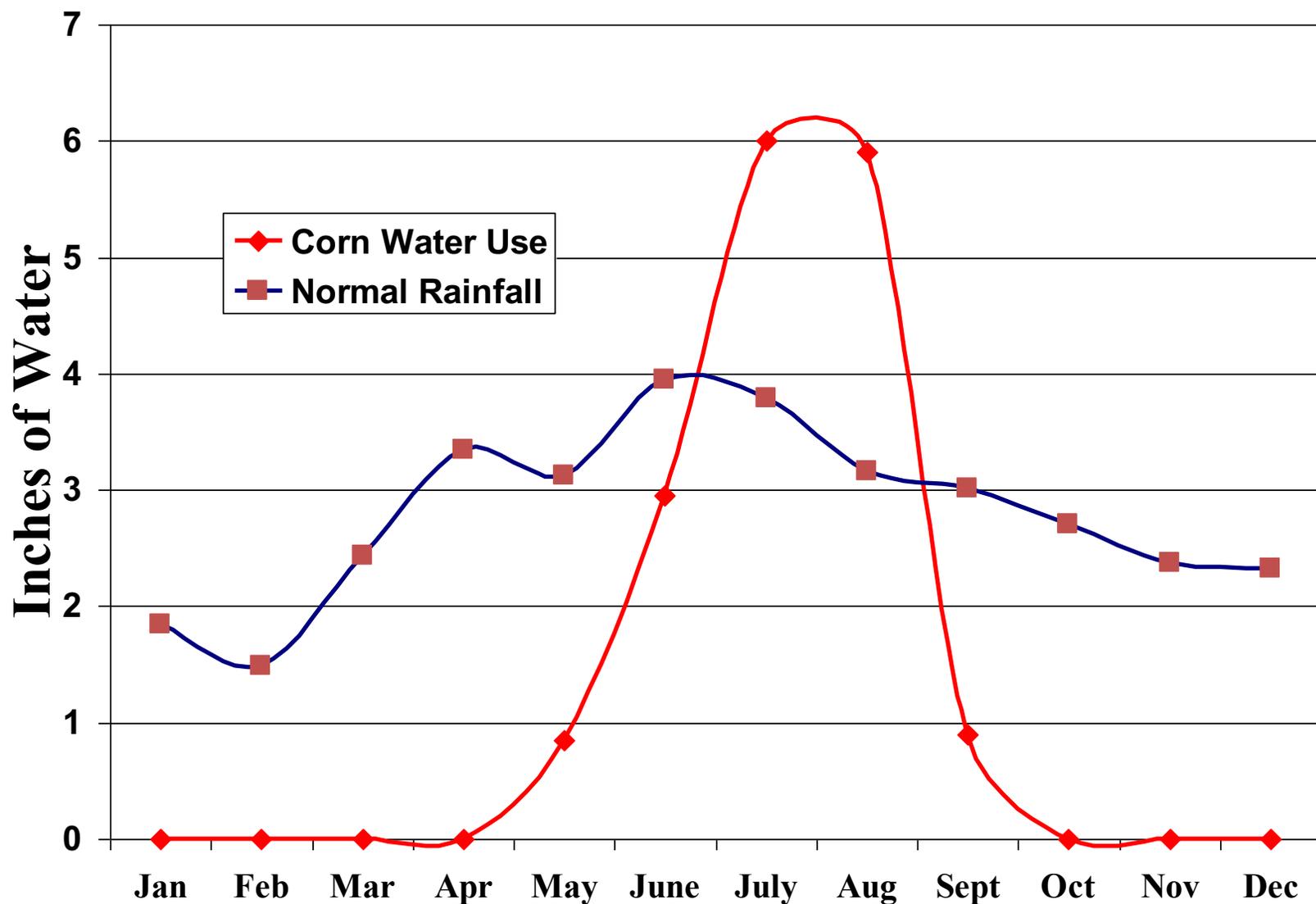




Sandy soil of Michigan: the right place to raise irrigated high value crops.

Well drained increasing rainfall

-  
more sporadic



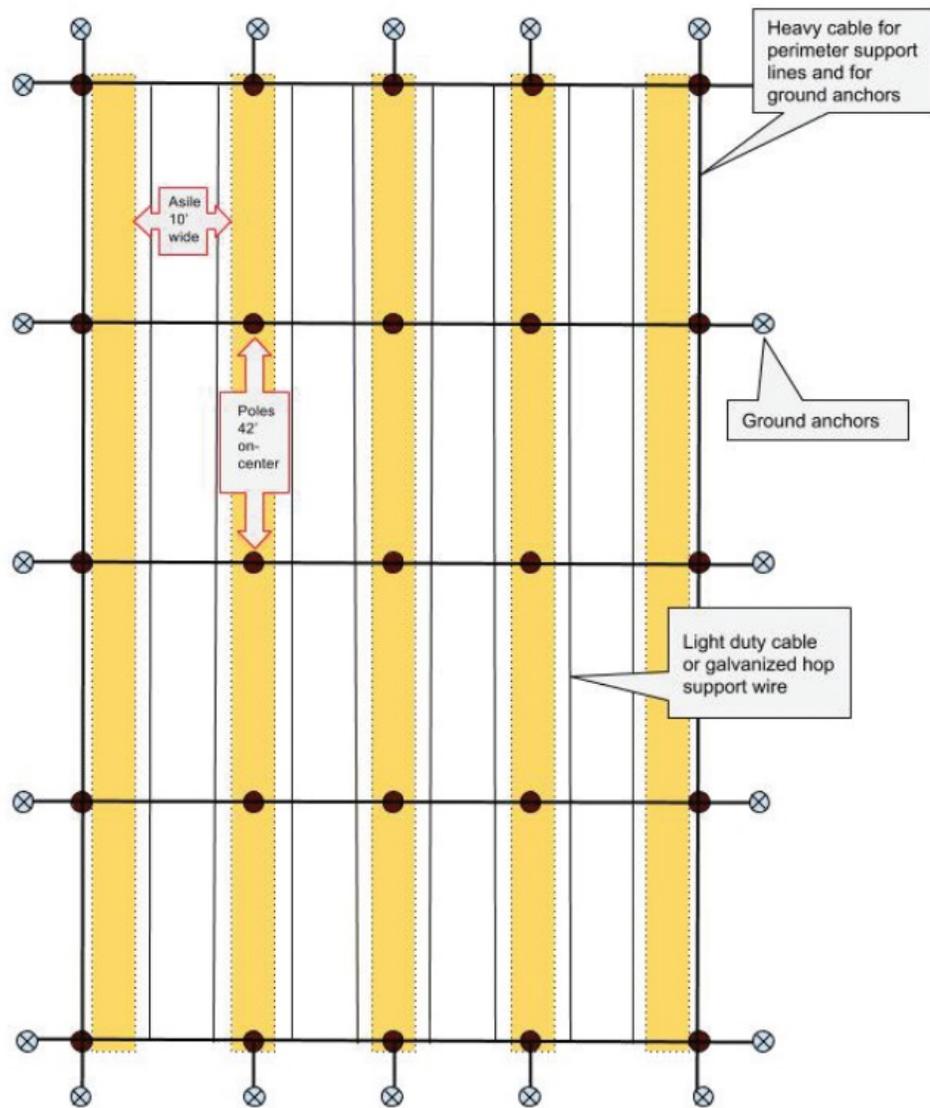


Figure 3. Quarter-acre trial plot showing planting beds, poles, anchor supports, main cable, and hop support wire placement. [Agronomy.unl.edu](http://Agronomy.unl.edu)

- Drip irrigation allows application to only the planted area.
- At full growth Hops production about will intercept about half of the total light and thus use half of the water area.

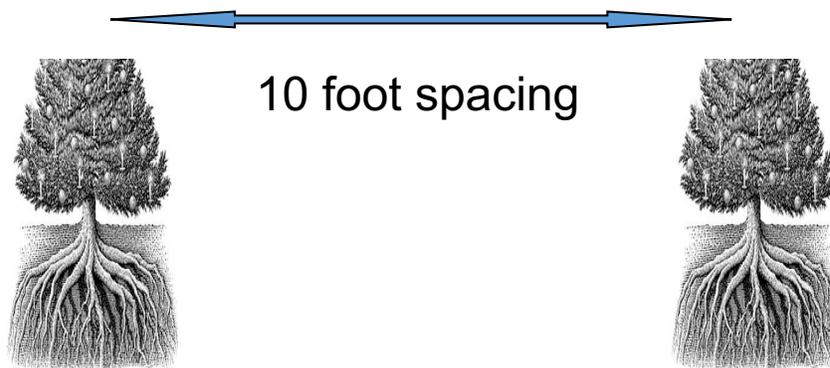
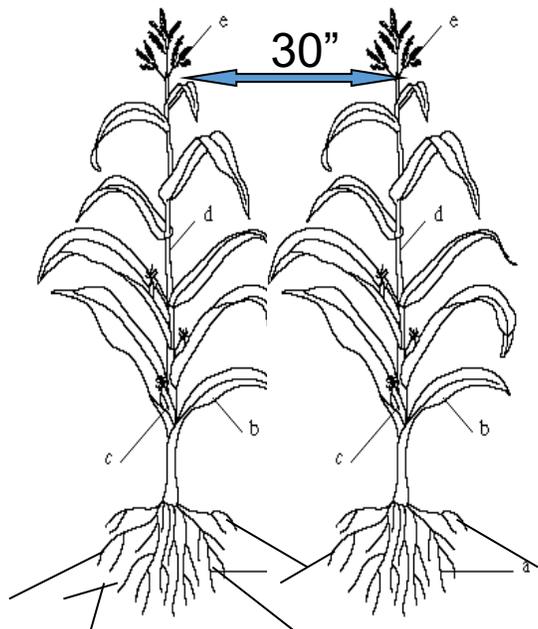
Overhead coverage - Field Scale -Maximum water use for most crops is .27 - .32 in./day

- 3 gal/minute/acre pump capacity = 1"/week
- 5 gal/minute/acre pump capacity = .25 in./day
- 7 gal/minute/acre pump capacity =.33 in./day, 1"every 3 days
- 500 gal/minute pump can provide 1" every 4 days on 100 acres



# Comparing overhead and Drip Irrigation

- Drip irrigation excels where watering only the root is desired or when total root saturation of soil is not achieved.
  - **avoids wetting plant foliage and much of the soil surface**
- Overhead irrigation excels where total root saturation of soil exist and crop benefit from exterior cooling is high.
  - **wets plant foliage and all of the soil surface with each application**

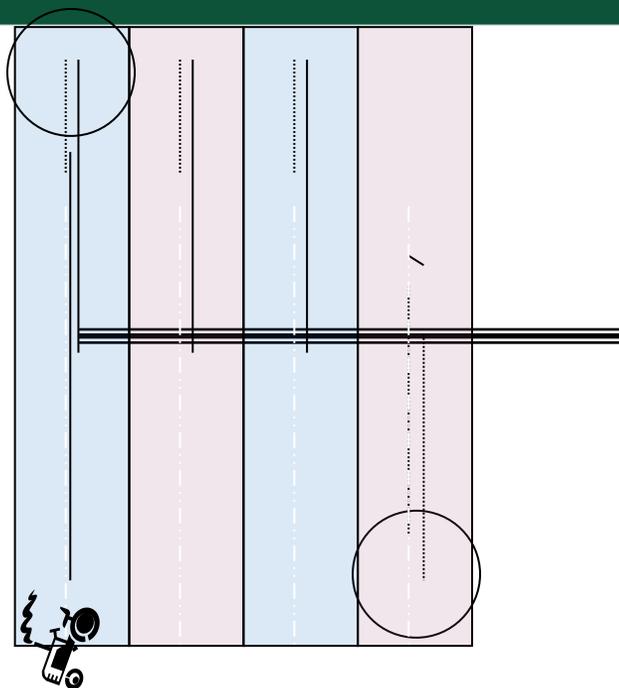


Example:  
 Overhead irrigation -planting year  
 4 square ft. rooted  
 50 square ft. total  
 8% recovery (92% loss)

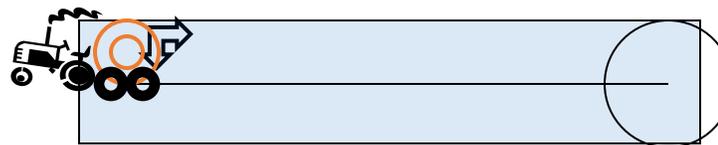


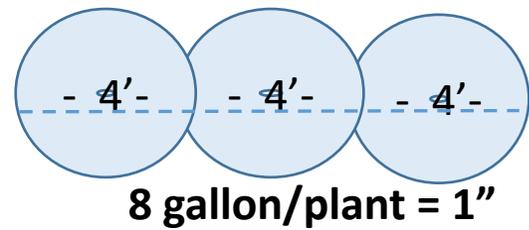
# Big Gun Travelers

- Fairly standard design 1320' x 300' = 10 acres
- Flexible for future use in other fields.
- Lots of used equipment available
- >400 gpm @10 psi is needed to get 300' coverage width
- Limited hose life – replacement hose cost are often higher than used equipment cost

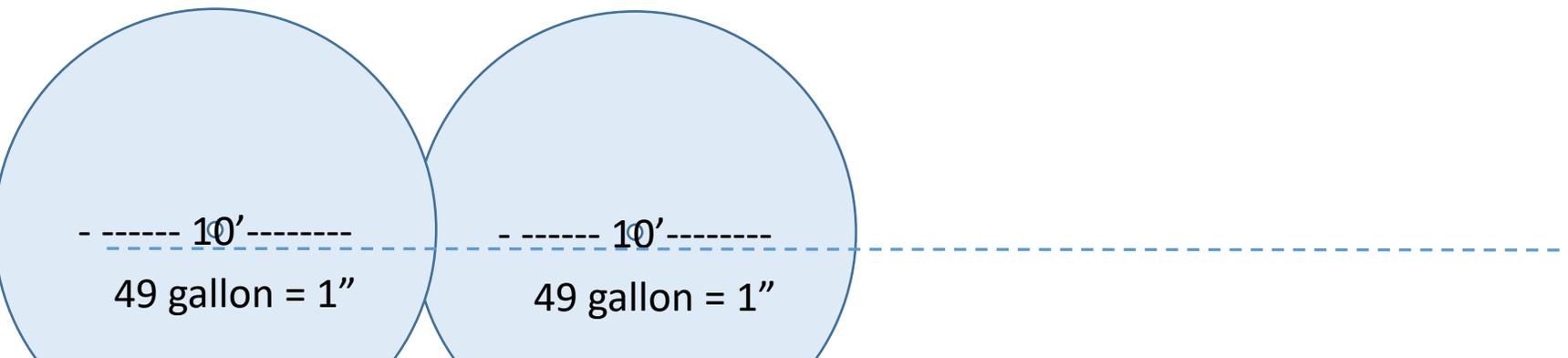


- Wets foliage, increase disease potential
- High pressure requirements
- High energy and labor cost





Water needs start small and increase with canopy



Gallons required to provide 1 inch of water to a given area

diameter (feet)	area sq. ft.	acre	acre inch gallons
1	0.79	0.0000	0.49
2	3.14	0.0001	1.96
3	7.07	0.0002	4.40
4	12.56	0.0003	7.83
5	19.63	0.0005	12.23
6	28.26	0.0006	17.62
7	38.47	0.0009	23.98
8	50.24	0.0012	31.32
9	63.59	0.0015	39.64
10	78.50	0.0018	48.93



**Gallons of water equal to one inch, by row width/ 100' of row**

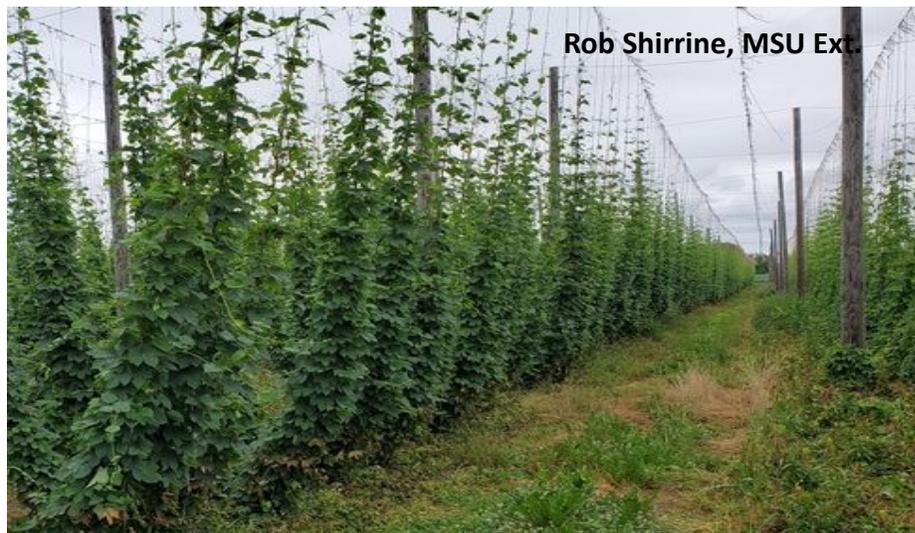


Agronomy.unl.edu

Row width	acre	gallons	Hours / Inch single .42 gpm, 12" emitter spacing	Hours / Inch double .42 gpm, 12" emitter spacing
1	0.002	62.34	1.48	0.74
2	0.005	124.67	2.97	1.48
3	0.007	187.01	4.45	2.23
4	0.009	249.35	5.94	2.97
5	0.011	311.69	7.42	3.71
6	0.014	374.02	8.91	4.45
7	0.016	436.36	10.39	5.19
8	0.018	498.70	11.87	5.94
9	0.021	561.03	13.36	6.68
10	0.023	623.37	14.84	7.42



Rob Sherrine, MSU Ext.



Rob Sherrine, MSU Ext.

Small plant may need watered every third day.

Larger plant daily



# Typical trickle application chart

Drip Irrigation						
7/10/1996						
Hours to Run Irr at 10 p.s.i. to apply 'X' inches of water:						
Drip Tape	Bed Spacing	0.1"	0.2"	0.3"	0.4"	0.5"
		(HH:MM)				
Hardie Bi-Wall 18" x 72"	6 ft.	1:45	3:35	5:20	7:05	8:55
	7 ft.	2:05	4:10	6:15	8:20	10:25
Netafim .38 gph, 12" + .60 gph, 18"	7 ft.	0:35	1:05	1:40	2:15	2:50
Roberts .24 gph, 12"	5 ft.	1:20	2:40	3:50	5:10	6:30
	6 ft.	1:35	3:05	4:40	6:15	7:50
	7 ft.	1:50	3:40	5:25	7:15	9:05
Example calculation for Roberts 24 gph/100 ft.						
6 ft. bed spacing: 7260 lbf/A or 72.6 hundred feet						
72.6 hundred ft./A X 24 gph/hundred ft. = 1742 gph/A						
(1742 gph/A) / 27154 gal. per acre-inch = .0642 acre-inch per hour						
For 5 ft. bed spacing, 2091 gph/A = .077 acre-inch per hour						

Adapted from Dr. Ron Goldy, MSUE Southwest Michigan Research and Extension Center



## Converting acre inches to gallons for trickle irrigation

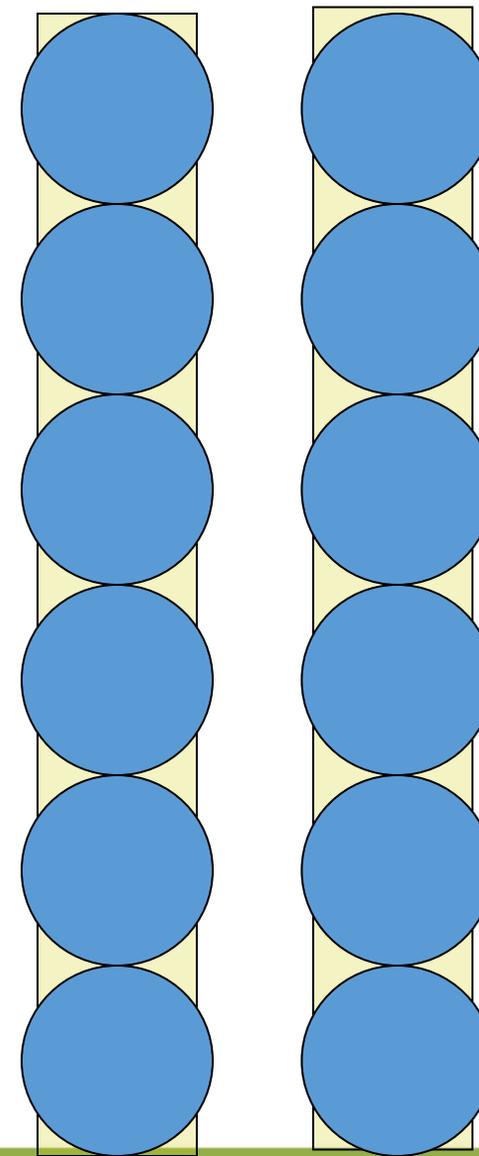
- **Calculate the % of area covered by plant**  
(% of area you intend to water / plant )
- **One acre = 43,560 sq.ft.**
- **One acre inch = 27,154 gallons**

### Example:

The plants you are watering have a diameter of 6.5 ft.

6.5 ft. x 6.5 ft. = 42 sq.ft. roughly 1/1000 of an acre  
26 to 27 gallon / tree = 1" of irrigation

(include uncontrolled grass or weed area that is watered in plant area)

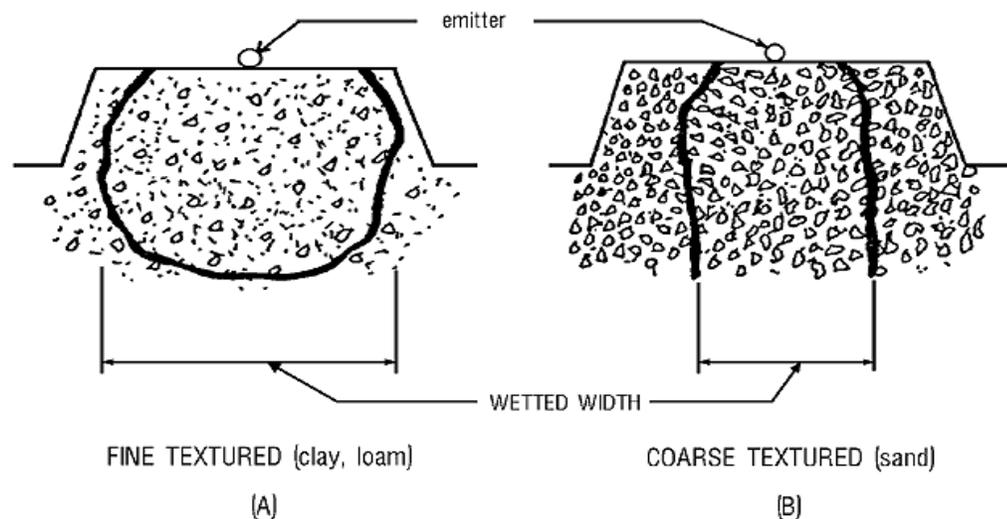




# Trickle Irrigation Strategy???

**Sand:** a little at a time, but often, fast application

**Silt/Clay:** slow application, longer time, less frequently



To reduce risk of root disease

- Minimize the number of application per week
- Keep application large , but not so large as to leach out the root zone
- Core or monitor soil to 2-3 ft. to assure you are using as much of the root depth as possible without over filling the root zone

# Drip line placement



## Suspended

+Easy to observe

- Requires a wire
- Must prevent water running down the line



## Surface

+Only require stakes

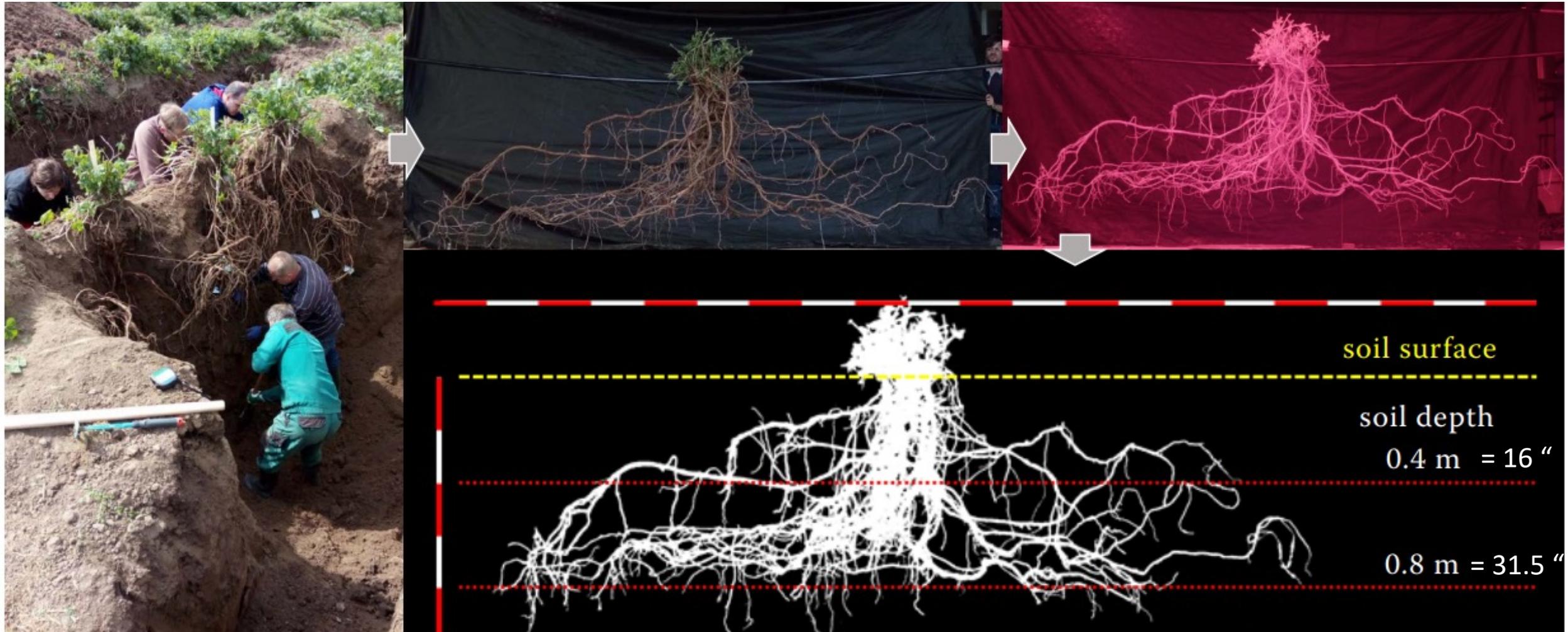
- Rodent damage



## Sub-Surface

-In sands most transmission is down

- Difficult to identify & resolve problems
- Expensive



[https://www.agriculturejournals.cz/publicFiles/672\\_2019-PSE.pdf](https://www.agriculturejournals.cz/publicFiles/672_2019-PSE.pdf)



## Sweet Corn – Dye Testing



- Sands and sandy loam soil have very little transmission of water up
- Most plants have 70% root activity in the top 1/3 of the root zone, 20% in the mid 1/3 of root zone and 10% in the bottom 1/3 of the root zone.



Subsurface drip irrigation thrives in clay/heavy soils  
Or  
where a less permeable layer at the bottom of the root zone hold water up



0.46 acres  
NE of shop

**INDIANA IRRIGATION CO., INC.**

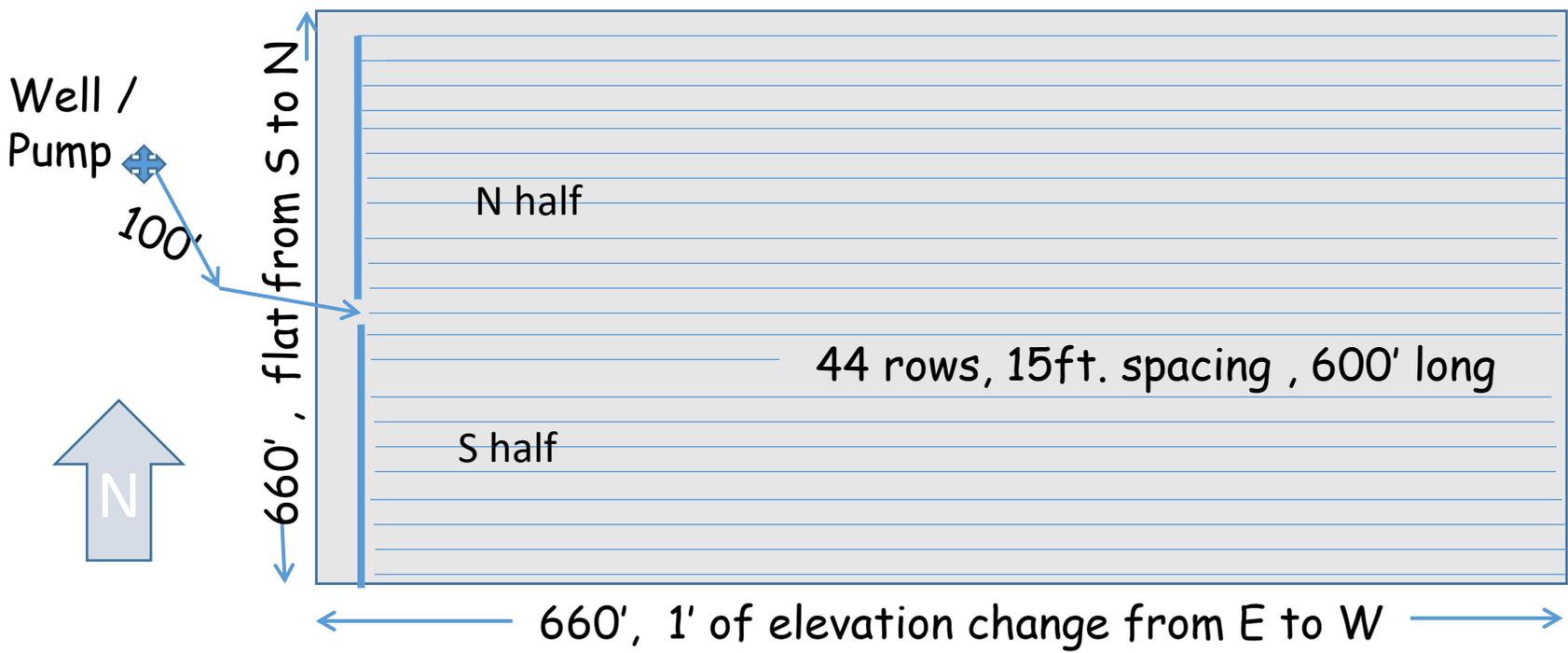
12 MAIN STREET ONWARD, IN 46967  
Phone (574) 626-3398 ~ Fax (574) 626-2378  
[WWW.INDIANAIRRIGATION.COM](http://WWW.INDIANAIRRIGATION.COM)

IRRIGATION SYSTEM PLANNING SHEET

12. What is the direction of the prevailing wind? SW

13. Sketch of land to be Irrigated

Include:	1. Water Location	2. Pump Location	3. Highest Point	4. Dimensions of field in feet	5. Distance from pump to field	6. Shape of the field(s)
	7. Direction & number of rows	8. Distance between the rows	9. Show the elevations	10. Indicate North & South	11. Orchards- between trees	Distance trees



To run 1/2 of field at one time  
13,200 ft. of drip tube  
0.45 gpm/100'  
= 59.4 gpm  
60 gpm at 25 psi at pump  
Will provide 15 psi in field  
(with no elevation change)



## 10 acre drip example ( 15 ft row spacing)

**Make sure to do your own homework....**

10 yr. item	\$
6" well, 50' deep	15,000
Back flow preventer	600
Filter	400
Control valve	200
100' of 4" pipe to field	100
Header pipe and 22 drip tape valves connectors	450
<b>Total</b>	<b>16,750</b>

- The long life item will cost \$1,675/year over 10 yr. (\$167/yr)
- There will be 26,400' (44 x 600') of drip tape used each season
- Long life tape cost of \$160/1000' = \$4480 /5yrs. (\$896/yr.)
- Short life tape cost of \$212/7500' =\$848/1yr. (\$848/yr.)
- Energy cost estimated \$400
- Total of \$1463/ yr./10 acres = \$ 146 /acre /yr.

167  
896  
+400  
1463



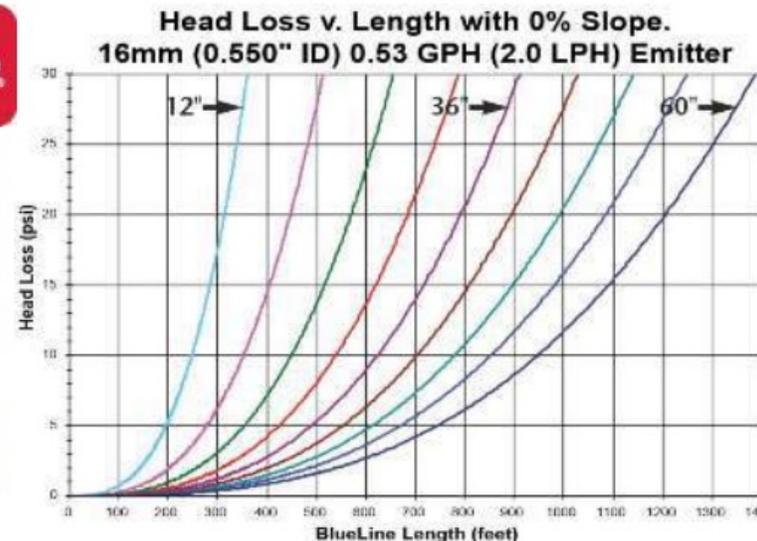
## BlueLine® PC Pressure Compensating Dripline



### 18MM (½") Orchard Tubing with Built-In Emitters

Features a unique, built-in flow regulated emitter, providing a constant discharge over a pressure range of 15-60 PSI. The emitter is inseparably welded to the inside wall of the tubing as it is extruded in the manufacturing process. Emitters are factory installed at pre-determined intervals. This one-piece construction prevents damage and loss of drippers, eliminates hole punching and handling damage, reduces installation costs.

BlueLine™ PC may be hung on a wire, laid on the surface or buried. Typically used in orchards, vineyards, over top of containers/mum pots, nurseries, or buried in fields for subsurface applications. **Stock Flow: 0.53 GPH per emitter.**



Item #	Description	Emitter Spacing	Price
DRP1812	18 MM (½") x 1000'	12" spacing	\$160.00
DRP1818	18 MM (½") x 1000'	18" spacing	\$150.00
DRP1824	18 MM (½") x 1000'	24" spacing	\$135.00
DRP1830	18 MM (½") x 1000'	30" spacing	\$133.00
DRP1836	18 MM (½") x 1000'	36" spacing	\$130.00
DRP16	Plastic Stake to secure ½" tubing		\$0.22



Raised inlets ensure that sediment deposits at the bottom of the tube do not enter the emitter.



Streamlined nature of the emitter encourages debris to pass by rather than enter the inlets.



# Irrigation for a few plants?



**Rain Bird® 2.0 GPH Drip Irrigation Emitter - 30 Pack**  
 Model Number: A50805 | Menards® SKU: 6902644

Final Price:  
**\$7.47**

You Save \$0.92 with Mail-In Rebate ⓘ

**ADD TO CART**



**Rain Bird® 1.0 GPH Drip Irrigation Emitters - 30 Pack**

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<https://www.menards.com/main/outdoors/watering-irrigation/drip-irrigation>