

Effects of Subsurface  
Micro-irrigation on  
Water Use Efficiency  
and Hazelnut Tree  
Growth

SARE Grant Project

FW19-351

# Pictures from SARE Grant Project for ZD Farms

- ◆ These pictures, tables and graphs represent the work and progression of the Subsurface Irrigation system being studied at ZD Farms
- ◆ The study compares common surface drip to 2 types of subsurface drip irrigation.
- ◆ After installation, our team measured each tree in the study to evaluate tree growth characteristics
- ◆ The study includes 2 rows of common surface drip to 2 rows of a white PVC pipe subsurface drip to 2 rows of a DRI Subsurface drip emitters.



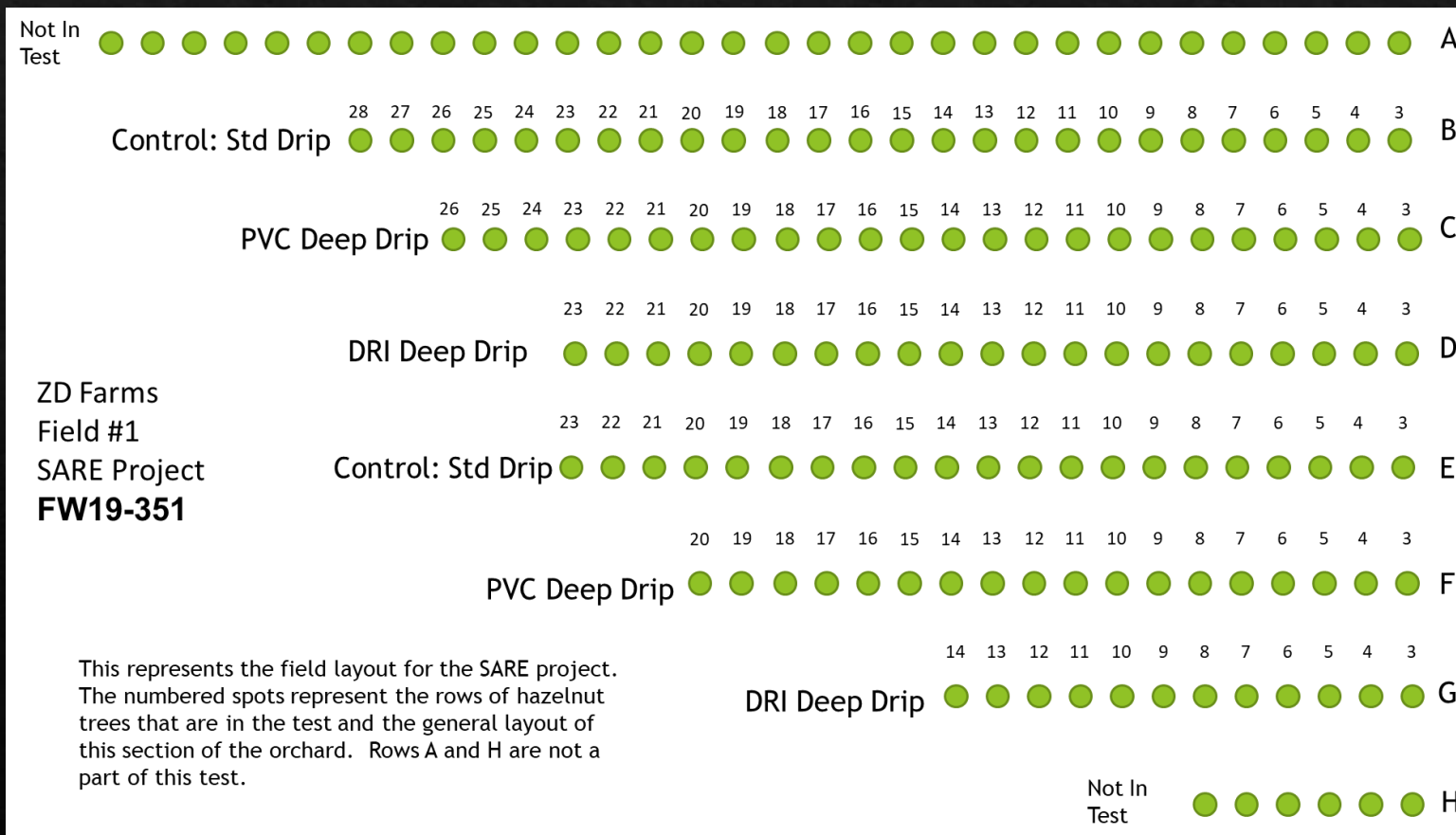
Controller, pressure control, flow meter arrangement for each tree row.

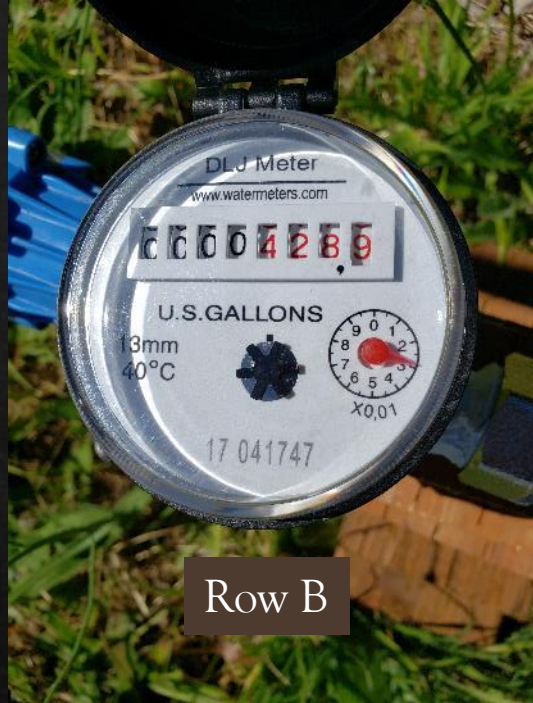
Built on the bench and taken to install in the field



# Water Meter # and Drip Type

Row B	Row C	Row D	Row E	Row F	Row G
17041747	17041697	17041750	17041763	17039368	17041698
Surface Drip	PVC Pipe Drip	DRI Drip	Surface Drip	PVC Pipe Drip	DRI Drip





Row B



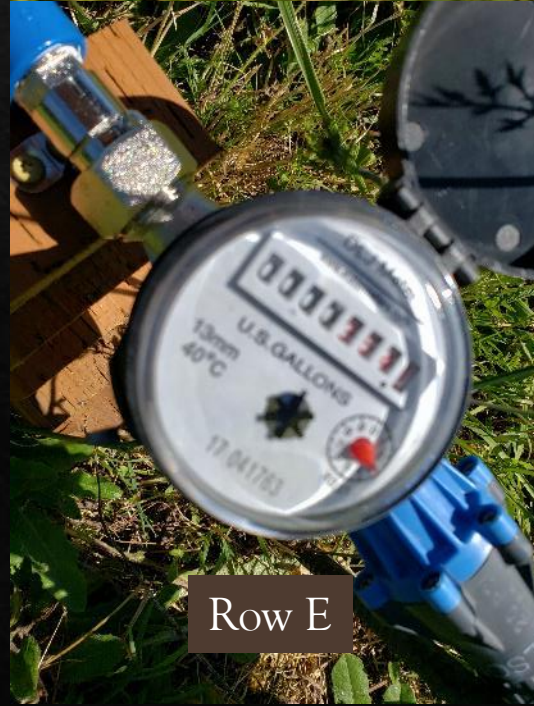
Row D



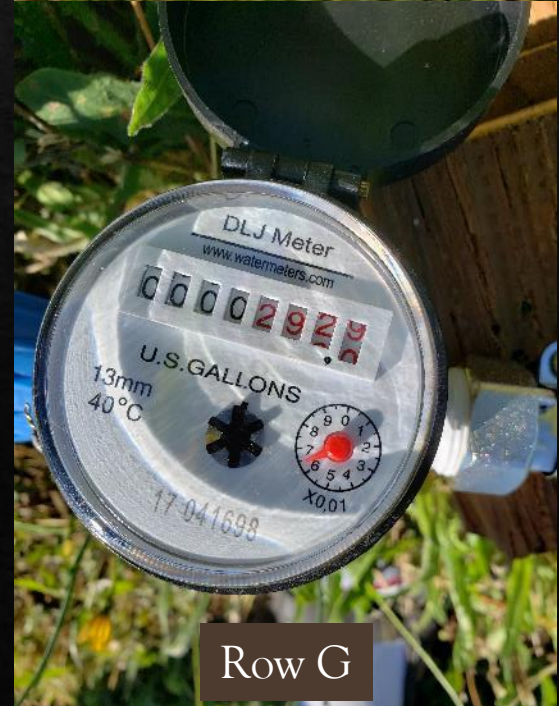
Row F



Row C



Row E



Row G



Row B



Row D



Row F



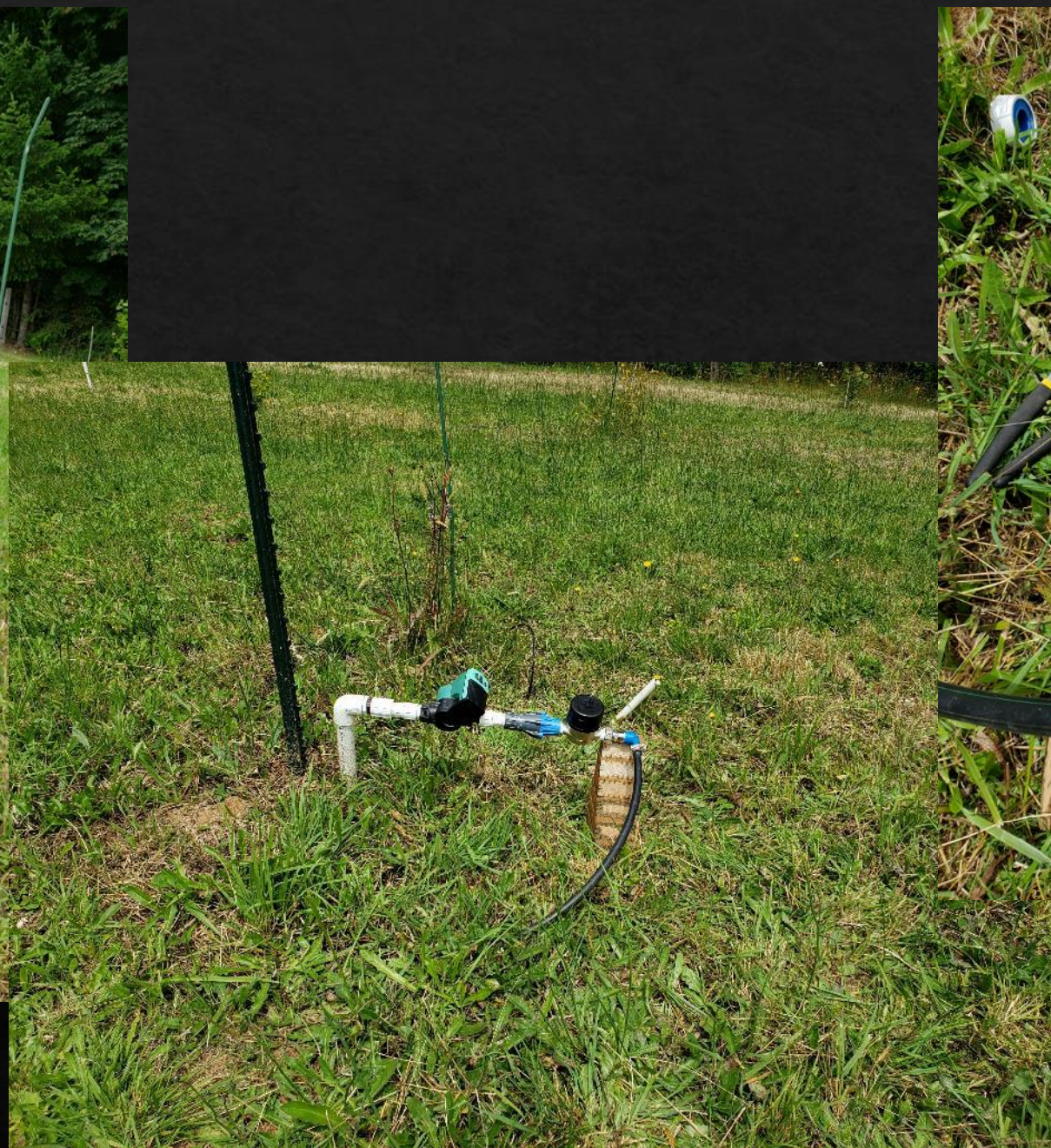
Row C



Row E



Row G



Row	Status	# Trees	Drip Type	Emitters/Tree	Emitters Size
A	Not in Test	34	Standard	1	2.5 GPH
B	In Test	28	Standard	2	2.5 GPH
C	In Test	26	PVC Deep Drip	2	2.5 GPH
D	In Test	23	DRI Deep Drip	2	2.5 GPH
E	In Test	23	Standard	2	2.5 GPH
F	In Test	20	PVC Deep Drip	2	2.5 GPH
G	In Test	14	DRI Deep Drip	2	2.5 GPH
H	Not In Test	5	Standard	2	2.5 GPH

Field	1	White PVC Deep Drip Row																	
Row	F																		
					Condition				# Nuts										
Tree	Mic Ht	Mic Read	Height	Diameter	Good	Med	Mod	Poor	Good	Med	Mod	Poor	Notes		Thk % Chg	Ht % Chg	Dia % Chg		
3	24	0.84	71	37		x						x							
	24	1	81	39		x						x			19.0%	14.1%	5.4%		
4	24	1.63	104	60	x				x										
	24	1.8	119	55	x				x				tons of nuts		10.4%	14.4%	-8.3%		
5	24	0.95	92	39	x							x							
	24	1.23	108	57	x				x						29.5%	17.4%	46.2%		
6	24	1.04	78	40		x						x							
	24	1.4	82	58	x					x					34.6%	5.1%	45.0%		
7	17	0.93	72	41		x						x							
	17	1.24	87	51		x			x						33.3%	20.8%	24.4%		
8	16	0.87	64	33			x				x								
	16	1.04	68	41		x					x				19.5%	6.3%	24.2%		
9	13	0.71	66	34			x					x							
	13	1.38	89	47			x				x				94.4%	34.8%	38.2%		
10	18	0.92	71	37		x						x							
	18	1.26	87	50		x					x				37.0%	22.5%	35.1%		
11	20	0.97	92	44		x						x							
	20	1.28	108	42	x				x						32.0%	17.4%	-4.5%		
12	24	1.12	92	56		x				x									
	24	1.3	104	68	x				x						16.1%	13.0%	21.4%		
13	24	1.3	93	55	x				x										
	24	1.63	101	60	x				x						25.4%	8.6%	9.1%		
14	24	1.42	89	53	x						x								
	24	1.5	101	53	x				x						5.6%	13.5%	0.0%		
15	24	1	72	45		x						x							
	24	1.2	85	51		x				x					20.0%	18.1%	13.3%		
17	17	0.95	71	47			x					x							
	17	1.1	82	58		x				x					15.8%	15.5%	23.4%		
19	24	0.95	85	48		x					x								
	24	1.1	99	61	x				x						15.8%	16.5%	27.1%		
20	18	1	81	48	x							x							
	18	1.3	92	58	x				x						30.0%	13.6%	20.8%		
															27.4%	15.7%	20.1%		

Example of  
Data from  
Row F 2020  
to 2021

# Summary of Tree Growth Percentage 2020 to 2021

Row	Drip Type	Thk % Chg	Ht % Chg	Dia % Chg
B	Surface Drip Control Row	48.0%	35.6%	28.3%
C	White PVC Deep Drip Row	29.6%	18.8%	22.8%
D	DeepDrip Black Foam Row	23.0%	15.2%	27.8%
E	Surface Drip Control Row	33.1%	15.5%	23.8%
F	White PVC Deep Drip Row	27.4%	15.7%	20.1%
G	DeepDrip Black Foam Row	21.6%	19.7%	27.5%







# Budget Worksheet

Budget and Other Funding Sources				
Approved By: Amanda Wagar CAHNRS	Year 1 FY	Year 2 FY	Year 3 FY	
GRANTS				
Date: 11/05/2018	Jul 19 – Jun 20	Jul 20 – Jun 21	Jul 21-Jun 22	
Item				
Salaries	1,500	1,500	1,500	
Benefits	0	0	0	
Wages	2,500	0	0	
Benefits	0	0	0	
Equipment	300	0	0	
Supplies	7,097	200	200	
Travel	1,172	1,172	1,172	
Plot Fees	0	0	0	
Miscellaneous	350	550	750	
Total Requested	12,919	3,422	3,622	
Footnotes:				
Total Project Request (entire project duration):		\$	19,962	
Current Year Request:	\$	12,919	(beginning 7/01/2019)	



# Title Lorem Ipsum

Dolor Sit Amet

Consectetuer Elit

Nunc Viverra

Pellentesque Habitant

Lorem Ipsum