

US EPA ARCHIVE DOCUMENT

Sub-surface Drip Irrigation Cost Calculator



This Cost Calculator is designed to help commercial landscape managers estimate the cost of irrigating using an environmentally beneficial sub-surface drip irrigation with a rain-shutoff device, rather than a conventional sprinkler system. The Cost Calculator demonstrates that sub-surface drip irrigation methods are very cost competitive with conventional methods.

Based on the values that you enter, the Cost Calculator tab estimates cost for both sub-surface drip irrigation and a conventional sprinkler irrigation. To use the Cost Calculator, enter the following into the blue "Input" boxes at the top of the worksheet: square footage of the irrigated area, information on your water rate, an estimate of the amount of days per month with over a half inch of rain, the length of your growing season, and the frequency of irrigation. This is the only information that you need to provide to use the calculator.

In the Cost Data tab, EPA provides national averages of the range of costs for both sub-surface drip irrigation systems and conventional sprinkler systems. If you prefer, you can substitute your own cost data into the green cells. If you have a single cost estimate instead of a range, input it in both the Low Cost Estimate and High Cost Estimate cells.

The Maintenance Cost Data provides a year-by-year summary of the typical cost requirements for the upkeep of both sub-surface drip irrigation systems and sprinkler systems.

The Rain-Shutoff tab contains of a reference table that was generated from a five-thousand-day computer simulation of an irrigation system with a rain-shutoff device. It estimates irrigations per month with a rain shut-off device installed.

The EHS Benefits tab provides a summary of the environmental, health and safety benefits of using a sub-surface drip irrigation system with a rain-shutoff device instead of a conventional sprinkler system.

Please direct questions or comments on this Cost Calculator to: Jean Schwab, U.S. EPA GreenScapes Program Manager, schwab.jean@epa.gov or 703-308-8669.



Sub-surface Drip Irrigation Cost Calculator

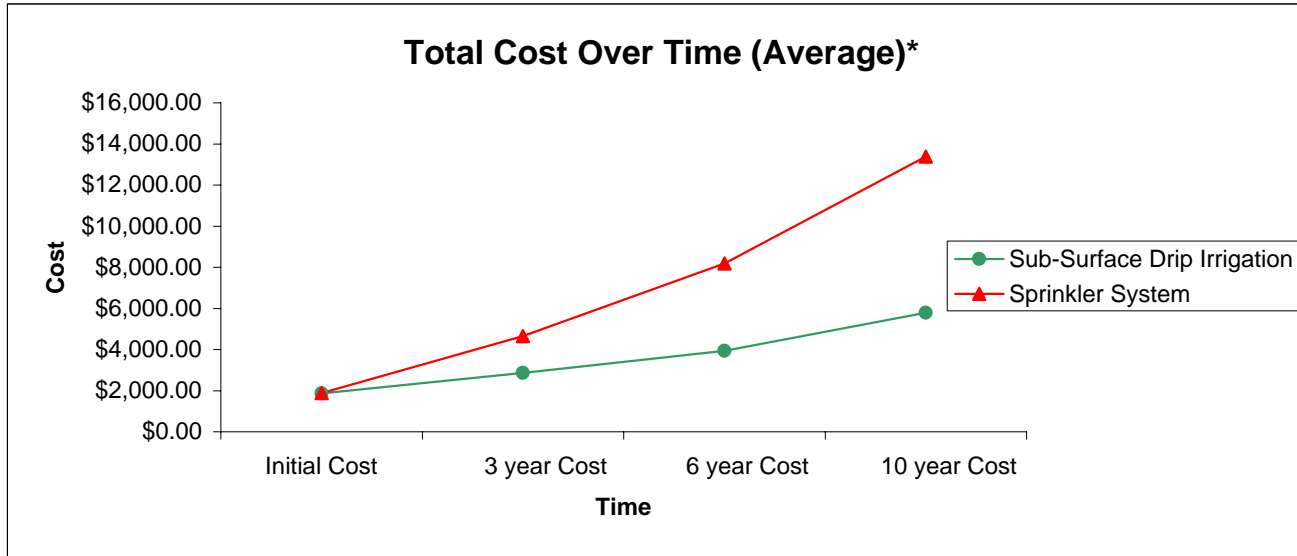


Inputs	
Irrigated Area (Sq. Feet)	7000
Does your facility pay for water?	Yes
What type of rate do you have?	Per Gallon
Cost per 1000 gallons (\$)	\$2.00
-	
-	
Estimate the amount of days with rain over 1/2" per month during growing season.	2
How long is your growing season? (months)	6
How often will you irrigate without rain? Once every ____ days. (Assumes 2/3 - 3/4 inches per irrigation)	4

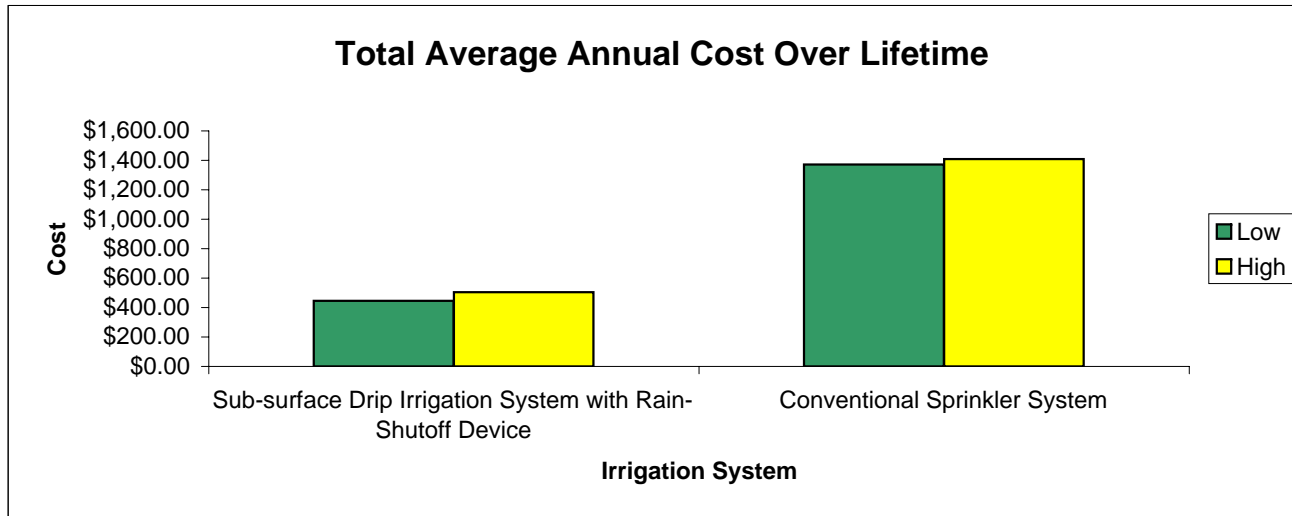
Sub-surface Drip Irrigation System with Rain-Shutoff Device	Low Cost Estimate	High Cost Estimate
Rain Sensor	\$27.00	\$69.99
Sub-surface Drip Irrigation Materials and Installation Cost	\$1,680.00	\$1,960.00
Initial Cost	\$1,707.00	\$2,029.99
Number of Irrigations Per Year Without Rain-Shutoff Device	45.00	45.00
Gallons of Water Used Annually Without Rain-Shutoff Device Per Year	128,898	154,184
Average Number of Irrigations Saved by Rain-Shutoff Device Per Year	8.40	8.40
Gallons of Water Used Annually With Rain-Shutoff Device Per Year	104,837	119,133
Water Cost (annual)	\$209.67	\$238.27
Annual Maintenance and Repair Cost (average over lifetime)	\$168.00	\$165.00
Average Annual Maintenance and Water Cost over Lifetime	\$377.67	\$403.27
Lifespan (years)	25	20
3 year Cost	\$2,661.02	\$3,069.79
6 year Cost	\$3,690.04	\$4,184.59
10 year Cost	\$5,478.74	\$6,087.65
Total Average Annual Cost over Lifetime	\$445.95	\$504.77

Conventional Sprinkler System	Low Cost Estimate	High Cost Estimate
Initial Cost	\$1,540.00	\$2,240.00
Gallons of Water Used Annually	171,864	195,300
Water Cost (annual)	\$343.73	\$390.60
Annual Maintenance and Repair Cost (average over lifetime)	\$951.00	\$831.67
Average Annual Maintenance and Water Cost Over Lifespan	\$1,294.73	\$1,222.27
Lifespan (years)	20	12
3 year Cost	\$4,231.18	\$5,071.80
6 year Cost	\$7,702.37	\$8,683.60
10 year Cost	\$12,797.28	\$13,966.00
Total Average Annual Cost over Lifetime	\$1,371.73	\$1,408.93

Sub-surface Drip Irrigation Cost Graphs



*This graph is generated using the average of the high and low cost estimates.



Sub-surface Drip Irrigation Cost Data



Water Data	Low Value	High Value	Sources	Data Explanation
Inches of Water Per Irrigation	0.66	0.75	<i>Watering Wisely: Irrigation Ideas to Help You Save Water & Money.</i> City of Sarasota Public Works Department. Sept. 5, 2006. < www.sarasotagov.com/LivingInSarasota/Contents/PublicWorks/PWPDFFiles/WaterBrochure.pdf >	This source recommended that a good volume of water per irrigation is between 2/3 and 3/4 of an inch.
Inches to Gallons/Sq. Foot Conversion Factor	0.62	0.62	<i>Landscape Irrigation Formulas.</i> Oct. 3, 2006. < http://www.irrigationtutorials.com/formulas.htm >	
Gallons of Water Per Square Foot Per Irrigation	0.4092	0.4650		

Sub-surface Drip Irrigation System	Units	Low Cost Estimate	High Cost Estimate	Sources	Data Explanation
Water Efficiency	%	100%	95%	James, Lamar. <i>Drip Irrigation Techniques Helping Fine-Tune Scheduling Recommendations, Say Scientists.</i> Delta Farm Press. April 29, 2005. http://deltafarmpress.com/mag/farming_drip_irrigation_techniques/index.html	
Materials and Installation					Mr. Elmers provided a spreadsheet with expected costs for sub-surface drip systems. His suggestions on varying labor, overhead and profit values were used to create high and low estimates.
Less than 1 Acre	\$/Sq. Foot	\$0.24	\$0.29		
More than one acre	\$/Sq. Foot	\$0.24	\$0.28	Data provided by Art Elmers, District Sales Manager, Netafim USA. October 18, 2006.	
Rain Sensor	\$	\$27.00	\$69.99	Rainbird Irrigation; Rain Sensors for Lawn Sprinklers. Do-It-Yourself Irrigation. Accessed October 20, 2006. http://www.lawnh2o.com/rainbird/rainbird_sensors.htm	The least expensive rain sensor offered by Rainbird is \$27; the most expensive is \$69.99.
Lifespan	years	25	20	High: Data provided by Art Elmers, District Sales Manager, Netafim USA. October 18, 2006. Low: Swezey, Lauren Bonar. <i>Drip Irrigation for Lawns.</i> Sunset. June, 1995. http://findarticles.com/p/articles/mi_m1216/is_n6_v194/ai_17149317	

Conventional Sprinkler System	Units	Low Cost Estimate	High Cost Estimate	Sources	Data Explanation
Water Efficiency	%	75%	75%	Colorado Agricultural Experiment Station 2002 Annual Report. <i>Digging Deeper: Subsurface Drip Irrigation Boosts Efficiency and Crop Yields.</i> Accessed October 20, 2006. http://www.colostate.edu/dept/aes/Pubs/AnnRpt/2002/Larson.html	
Materials and Installation					Mr. Elmers provided a spreadsheet with expected costs for conventional sprinkler systems. His suggestions on varying labor, overhead and profit values were used to create high and low estimates.
Less than 1 Acre	\$/Sq. Foot	\$0.22	\$0.32		
More than one acre	\$/Sq. Foot	\$0.16	\$0.22	Data provided by Art Elmers, District Sales Manager, Netafim USA. October 18, 2006.	
Lifespan	years	20	12	Low: Data provided by Art Elmers, District Sales Manager, Netafim USA. October 18, 2006. High: REMAS Home Inspections, Inc. Remas Inspections, Inc. Accessed October 20, 2006. http://www.remasinspections.com/life.html	

Sub-surface Drip Irrigation Maintenance and Repair Cost Data



Sub-surface Drip Irrigation	Less than 1 acre	Greater than 1 acre	Source	Comments
Year 1	\$0.00	\$0.00	Data provided by Art Elmers, District Sales Manager, Netafim USA. Oct. 18, 2006.	Sub-surface drip irrigation needs: activation and winterization service every year; repairs of cut dripperline every other year; replacement of 5% of the control valves every other year starting in year 3; and replacement of the irrigation controller in year 10.
Year 2	\$75.00	\$150.00		
Year 3	\$250.00	\$425.00		
Year 3 Total	\$325.00	\$575.00		
Year 4	\$75.00	\$150.00		
Year 5	\$250.00	\$425.00		
Year 6	\$75.00	\$150.00		
Year 6 Total	\$725.00	\$1,300.00		
Year 7	\$250.00	\$425.00		
Year 8	\$75.00	\$150.00		
Year 9	\$250.00	\$425.00		
Year 10	\$375.00	\$650.00		
Year 10 Total	\$1,675.00	\$2,950.00		
Year 11	\$250.00	\$425.00		
Year 12	\$75.00	\$150.00		
Years 13 - 25	Repeat years 11-12			
Total 20-Year Lifespan Cost	\$3,300.00	\$5,825.00		
Total 25-year Lifetime Cost	\$4,200.00	\$7,400.00		
Average Annual Cost Through 20-Year Lifespan	\$165.00	\$291.25		
Average Annual Cost Through 25-Year Lifespan	\$168.00	\$296.00		

Conventional Sprinkler System	Less than 1 acre	Greater than 1 acre	Source	Comments
Year 1	\$0.00	\$0.00	Data provided by Art Elmers, District Sales Manager, Netafim USA. Oct. 18, 2006.	Conventional sprinkler systems need: activation and winterization services every year; adjustment and setting of sprinklers every year; replacement or repair of 5% of sprinkler heads every year until year 11 when 10% will need replacement or repair every year; replacement of 5% of the control valves every other year starting in year 3; and replacement of irrigation controller in year 10;
Year 2	\$780.00	\$1,010.00		
Year 3	\$880.00	\$1,110.00		
Year 3 Total	\$1,660.00	\$2,120.00		
Year 4	\$780.00	\$1,010.00		
Year 5	\$880.00	\$1,110.00		
Year 6	\$780.00	\$1,010.00		
Year 6 Total	\$4,100.00	\$5,250.00		
Year 7	\$880.00	\$1,110.00		
Year 8	\$780.00	\$1,010.00		
Year 9	\$880.00	\$1,110.00		
Year 10	\$1,180.00	\$1,610.00		
Year 10 Total	\$7,820.00	\$10,090.00		
Year 11	\$1,130.00	\$1,335.00		
Year 12	\$1,030.00	\$1,235.00		
Years 13 - 20	Repeat year 11			
Total 12-Year Lifetime Cost	\$9,980.00	\$12,660.00		
Total 20-Year Lifetime Cost	\$19,020.00	\$23,340.00		
Average Annual Cost Through 12-Year Lifespan	\$831.67	\$1,055.00		
Average Annual Cost Through 20-Year Lifespan	\$951.00	\$1,167.00		

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Rain Shutoff Chart



Rain Days/Mo.	Frequency of irrigation without rain (every _____ days)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Irrigations Per Month														
0	30.00	15.00	10.00	7.50	6.00	5.00	4.29	3.75	3.33	3.00	2.73	2.50	2.31	2.14	2.00
1	29.03	14.27	9.38	6.94	5.34	4.43	3.65	3.19	2.75	2.46	2.23	1.95	1.76	1.69	1.48
2	27.97	13.57	8.67	6.10	4.93	3.88	3.21	2.69	2.33	1.98	1.73	1.58	1.41	1.26	1.06
3	26.91	12.70	8.13	5.85	4.23	3.45	2.75	2.20	1.91	1.61	1.43	1.17	1.03	0.95	0.85
4	26.09	12.21	7.45	5.23	3.82	3.02	2.31	1.89	1.52	1.29	1.06	0.94	0.67	0.67	0.56
5	25.02	11.27	6.90	4.53	3.23	2.61	1.82	1.58	1.17	0.98	0.80	0.66	0.46	0.44	0.30
6	23.92	10.75	6.42	4.16	2.87	2.15	1.57	1.18	0.99	0.71	0.52	0.39	0.32	0.31	0.24
7	23.13	9.96	5.74	3.86	2.52	1.83	1.26	1.11	0.61	0.49	0.40	0.28	0.20	0.17	0.13
8	22.06	9.39	5.15	3.31	2.26	1.62	1.04	0.76	0.50	0.39	0.25	0.19	0.13	0.09	0.08
9	21.09	8.97	4.48	2.94	1.87	1.15	0.75	0.57	0.43	0.27	0.20	0.12	0.10	0.04	0.03
10	19.82	8.19	4.13	2.55	1.41	1.01	0.66	0.37	0.27	0.16	0.14	0.06	0.04	0.03	
11	18.97	7.34	3.85	2.12	1.25	0.79	0.51	0.26	0.17	0.11	0.07	0.03	0.02		
12	17.78	6.60	3.52	1.83	1.05	0.64	0.35	0.19	0.11	0.08	0.04	0.01			
13	17.01	6.01	2.78	1.48	0.90	0.47	0.28	0.11	0.07	0.03	0.03				
14	16.11	5.54	2.60	1.14	0.53	0.32	0.18	0.08	0.04	0.02					
15	14.84	4.92	1.95	1.02	0.46	0.22	0.12	0.04	0.02						

Values in this table are extrapolated from a 5000-day simulation of an irrigation system with a rain-shutoff device. Contact EPA for information on modeling approach (use cover sheet for contact information).

Sub-surface Drip Irrigation Environmental, Health and Safety Benefits

Irrigating with a sub-surface drip irrigation system with a rain-shutoff device:

Conserves water because sub-surface drip irrigation applies water directly to the roots, which minimizes runoff and evaporation. Rain-shutoff devices minimize over-watering after significant rainfall.

Reduces runoff and non-point source pollution because drip irrigation systems and rain-shutoff devices control the application rate to meet the plants' need for water, minimizing water and subsequent runoff.

Improves groundwater recharge because sub-surface drip irrigation systems and rain-shutoff devices calibrate the rate and amount of water to match the absorption rate of the soil. This will minimize runoff and improve groundwater recharge.

Improves soil quality and retards erosion because reducing runoff can prevent degradation of soil structure and reduce erosion, depending on the surrounding landscape.

Supports local ecology because sub-surface drip irrigation systems deliver water directly to the plants' roots, which encourages strong root growth.

Preserves wildlife habitat because sub-surface drip irrigation systems promote healthy plant life, which contributes to wildlife habitat.

Conserves fossil fuels because reduced water usage can lead to decreased energy needed to pump and treat irrigation water.

Reduces air pollution and improves air quality because improved plant health promotes plant absorption of air pollutants. Also, water conservation can lead to decreased energy use and associated air pollution associated with pumping and treating less irrigation water.

Reduces human exposure to hazardous material because controlling the amount of water administered to plants improves plant health, reducing the need for fertilizers and pesticides.



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