Oregon State University
Western Oregon
Green Bean Irrigation Guide

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Total Seasonal Evapotranspiration [in]	10.1 (mean)
Peak Evapotranspiration Rate [in/day]	0.20
Maximum Allowable Depletion [percent]	50
Critical Moisture Deficit Period	Flowering

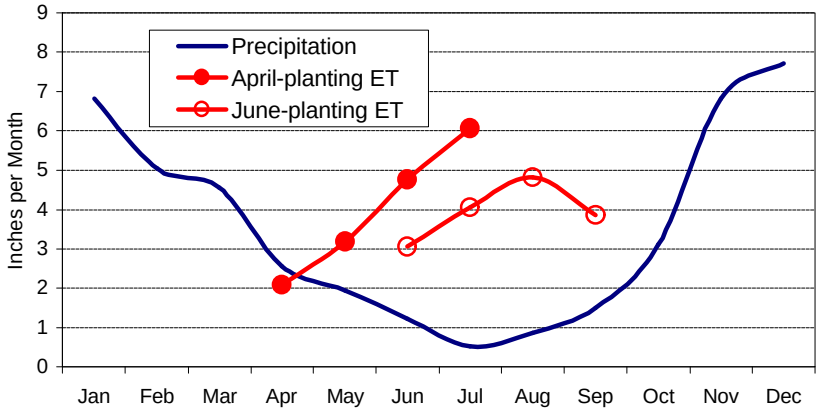

Figure 1: Typical precipitation and green bean evapotranspiration (ET) in the Willamette Valley. Tabulated values of ET are provided on the back of this sheet.

Moisture management in green beans is extremely important at all stages of plant development due to its influence on stand establishment, fungal problems and pod set and quality. Because emerging bean plants can be stressed and damaged when breaking through surface crusts, it is recommended that fields be irrigated to field capacity in the top 12 inches of soil prior to seeding and not again until after emergence whenever possible to minimize surface disturbance. In the remainder of the season, available soil moisture should not be depleted by more than 50 percent. [1] Also, on fields where root rot has been a problem, beans may require more frequent irrigation for secondary roots to establish and carry the crop through to maturity. Beans are most sensitive to moisture stress during flowering and pod sizing. Water deficit during this period will have the greatest negative impact on yields and pod quality. A balance must be struck however, between maintaining adequate moisture for pod growth while minimizing wetness in the canopy, which promotes white and gray molds. After full bloom, irrigate only early in the day to allow for rapid canopy drying whenever possible.

The peak water use for green beans is approximately 0.20 and 0.16 inches per day for April and June plantings respectively. On most soils, weekly irrigation during the peak is adequate, however with sandy and sandy loam soils, irrigation may be required as frequently as every three to four days.

On the back side of this page is a worksheet to aid in calculating irrigation schedules for green beans. These calculations are most straightforward for those using side-roll, hand-move, or solid set sprinkler irrigation. For those with linear move or center pivot systems, all information applies except for the set time, which must be gauged to the tower travel speed. For basic schedule information, sprinkler nozzle diameters, operating pressures, and spacing and soil type must be known. To more accurately describe individual systems, the uniformity coefficient of the system and available water capacity of your soil is also needed. This worksheet was designed to be progressed through sequentially starting with item *a*). Equations listed under item headings use item letters for reference. Although the rooting depth is already supplied in the worksheet, if you have reason to believe your site is an exception (e.g. shallow restrictive layer), this may be altered. Evapotranspiration rate estimates for both April and June plantings are listed in the worksheet. Use estimates from the closest planting date.

References

1. Sanders, D.C. 1993. Vegetable Crop Irrigation, Leaflet No: 33-E (North Carolina State University, Raleigh).

Note: For additional background information and references, see "Western Oregon Irrigation Guides: Background and References."

Irrigation Schedule Worksheet: Green Bean

Use values for your specific soil and depth range from the Appendix, if available.

Otherwise use Table 1 below.

Table 1

Soil Texture	AWC [in/in]
Sandy	0.07 to 0.10
Sandy Loam	0.09 to 0.15
Loam	0.14 to 0.19
Clay Loam	0.17 to 0.22
Clay	0.20 to 0.25

A. Determine Irrigation Interval

Available Water Capacity [in/in]	***a.***	
Maximum Allowable Depletion [percent]	***b.***	50
Effective Rooting Depth [in]	***c.***	18
Peak ET [in/day]	***d.***	0.20
Maximum Irrigation Interval [days]	***e.***	
e = (a * b * c) / (d * 100)		
Your Irrigation Interval [days]	***f.***	

Note: f should be equal to or shorter than e.

Table 2

Irrigation System	Uniformity Coefficient (*)	
Solid set	70	63
Hand move or Side-roll	82	74
Pivot or Linear Move	90	81
Offset Managed Handm.	90	81

B. Determine Combined Efficiency

Uniformity Coefficient	***g.***	
Combined Efficiency	***h.***	
h = (0.01583 * g) - 0.6327		

C. Determine Depth of Irrigation

		Planting	April	May	June	July	August	September
Monthly Evapotranspiration Rate [in/day]	***i.***	*Apr.15*	0.07	0.10	0.16	0.20		
		Jun.25			0.10	0.13	0.16	0.13
Depth of Irrigation per Set [in]	***j.***							
j = (i * f) / h.								

D. Determine Set Time

Application Rate [in/hr]	***k.***	

Measure or see Tables 3 and 4 below to determine your application rate.

		April	May	June	July	August	September
Irrigation Set Time [hrs]	***l.***						
l = j / k							

Table 3

Pressure [psi]	Discharge [gpm] Standard Tapered Nozzle Diameter [in] 3/32	1/8	9/64	5/32	11/64	3/16	13/64	7/32
35	1.5	2.7	3.40	4.16	5.02	5.97	7.08	8.26
40	1.6	2.9	3.63	4.45	5.37	6.41	7.60	8.87
45	1.7	3.2	3.84	4.72	5.70	6.81	8.07	9.41
50	1.8	3.1	4.04	4.98	6.01	7.18	8.49	9.88
55	1.9	3.3	4.22	5.22	6.30	7.51	8.87	10.30

How to use these tables:

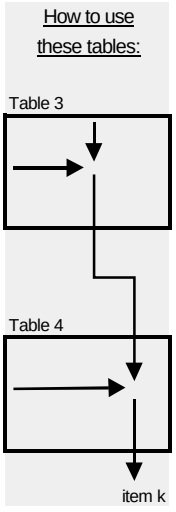

Table 4

Sprinkler Spacing [ft] -by- [ft]	Application Rate [in/hr] Discharge per Nozzle [gpm] 2	3	4	5	6	8	10
20 20	0.48	0.72	0.96	1.20	1.44	1.93	2.41
20 40	0.24	0.36	0.48	0.60	0.72	0.96	1.20
30 30	0.21	0.32	0.43	0.54	0.64	0.86	1.07
30 40	0.16	0.24	0.32	0.40	0.48	0.64	0.80
30 50	0.13	0.19	0.26	0.32	0.39	0.51	0.64
40 40	0.12	0.18	0.24	0.30	0.36	0.48	0.60
40 50	0.10	0.14	0.19	0.24	0.29	0.39	0.48
40 60	0.08	0.12	0.16	0.20	0.24	0.32	0.40

(*) If your sprinkler spacing/discharge combination falls into gray-shaded area, use uniformity coefficient from the right, also gray-shaded column. Otherwise use values from the left column.