



# Oregon State University

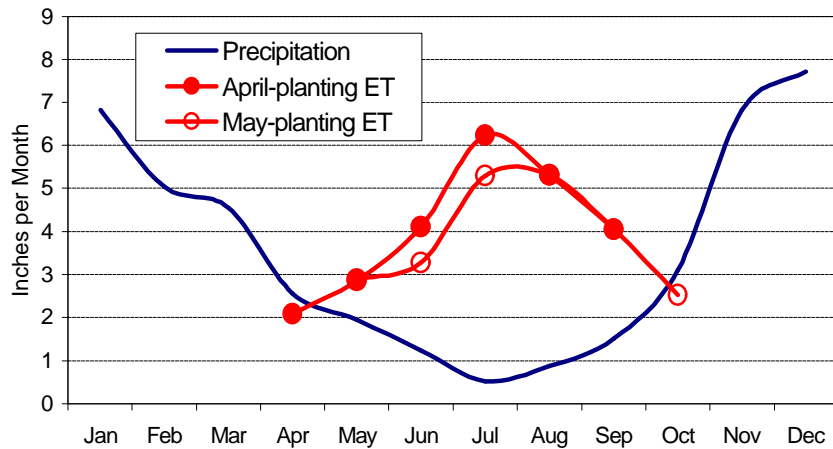
## Western Oregon

### Carrot Irrigation Guide

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Total Seasonal Evapotranspiration [in]	21.4 (mean)
Peak Evapotranspiration Rate [in/day]	0.20
Maximum Allowable Depletion [percent]	50
Critical Moisture Deficit Period	Seedling emergence, root expansion



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

Moisture management in carrots is especially important during stand establishment and during root expansion. Since small carrot seeds are unable to emerge when surface crusting occurs and can be burnt-off, if surface temperatures are too high, irrigation during the pre-emergence period revolves around maintaining a moist and cool, loose soil surface. This often requires frequent, light irrigation. Conversely, deep, excessive irrigation during this period promotes problems with damping off of emerging seedlings. In the remainder of the season, available soil moisture should be depleted by no more than 50 percent.<sup>1</sup> However, maintenance of excessively moist soil may cause anaerobic soil conditions which can kill the root growing point resulting in

misshapen carrots at harvest. As carrot roots develop most of their size in the last half of their growth period, irrigation is especially critical during this time. Water deficit during this period will have the greatest negative impact on yields. A balance must be struck however, between maintaining adequate moisture while minimizing wetness in the canopy, which promotes the common fungal diseases, alternaria, and cercospora. During the last half of the growing period, irrigate only early in the day to allow for rapid canopy drying whenever possible. Soils should also be allowed to dry to 50 percent of available soil moisture during harvest to prevent excessive cracking and damage to roots during harvest.

The peak water use for carrots is approximately 0.20 and 0.17 inches per day for April and May 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 carrots. 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 May plantings are listed in the worksheet. Use estimates from the closest planting date.

#### References

- 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: Carrot

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

Otherwise use Table 1 below.

## 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.	<input type="text"/>

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

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

## B. Determine Combined Efficiency

Uniformity Coefficient	g.	_____
Combined Efficiency	h.	<input type="text"/>

$h = (0.01583 * g) - 0.6327$

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

## C. Determine Depth of Irrigation

Monthly Evapotranspiration Rate [in/day]	Planting	April	May	June	July	August	September	October
	i. Apr.15	0.07	0.09	0.14	0.20	0.17	0.14	
May15		0.09	0.11	0.17	0.17	0.14	0.08	
Depth of Irrigation per Set [in]	j.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

$j = (i * f) / h.$

## D. Determine Set Time

Application Rate [in/hr]	k.	_____						
<i>Measure or see Tables 3 and 4 below to determine your application rate.</i>								
Irrigation Set Time [hrs]	l.	April	May	June	July	August	September	October
		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

$l = j / k$

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

Table 4

Sprinkler Spacing		Application Rate [in/hr]						
[ft]	-by- [ft]	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

How to use these tables:

Table 3

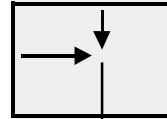
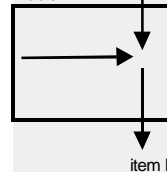


Table 4



(\*) 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.