
Drip irrigation scheduling

Drip irrigation scheduling :

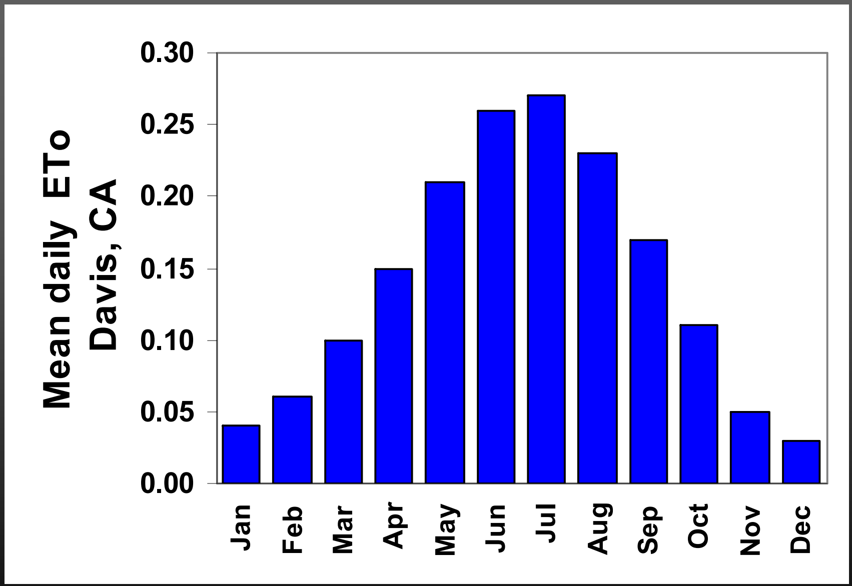
- **Water budget system**
  replace estimated water loss from crop and soil

- **Soil moisture measurement**
  irrigate at a set level of soil moisture depletion

Crop water requirement driven by :

- environmental conditions
- plant size (degree of sunlight interception)

Reference evapotranspiration (ET_o)



ET_o vs. crop evapotranspiration (ET_c) :

Method 1 :

ET_c = (ET_o x (% of ground surface covered by foliage *or wet soil*)) x 1.1

Maximum crop $ET_c \approx$ 110% of ET_o

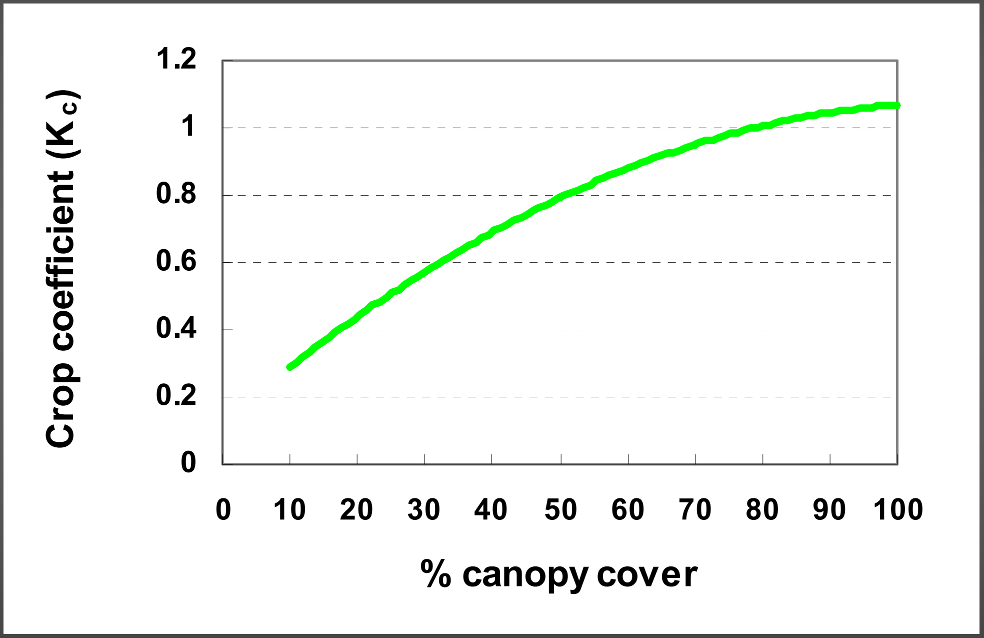
ET_o vs. crop evapotranspiration (ET_c) :

Measure maximum canopy spread !

ET_o vs. crop evapotranspiration (ET_c) :

Method 2 :

Use spreadsheet equation :



Estimate 'true' % cover !

$$ET_c = ET_o \times K_c$$

ET_c x drip system non-uniformity factor = irrigation requirement

- typical non-uniformity factor = 1.1 to 1.2

Sample calculation:

tomato canopy width = 30” on a 60” bed

daily ET_o is 0.25”

drip system non-uniformity factor = 1.15

(0.25” x (30” / 60”)) x 1.1 = 0.14” daily ET_c

0.14” x 1.15 = 0.16” daily irrigation requirement

Irrigation is often scheduled by # of hours applied, but volume applied should be confirmed by a water meter

Determining irrigation frequency :

How much crop evapotranspiration (ET_c) can you tolerate before irrigation ?

Effective rooting depth (feet)

x soil water holding capacity (available inches / foot)

x fraction of soil volume wetted

x % depletion desirable

= maximum inches of ET_c between irrigations

Drip irrigation frequency :

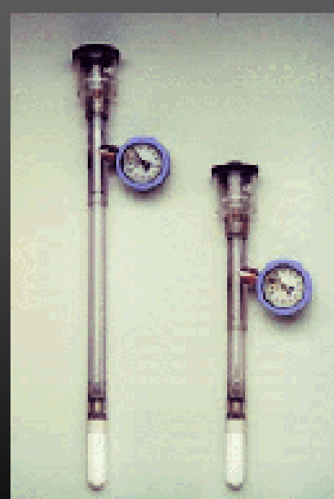
Generic guidelines:

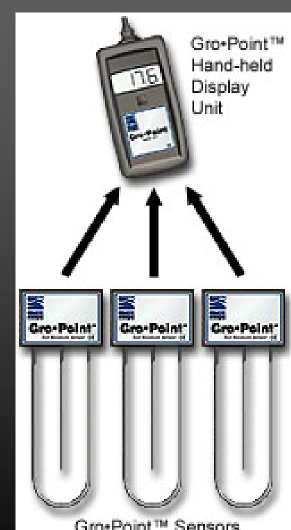
- Deplete no more than 20-30% of available moisture in the active root zone

Soil texture	Allowable depletion (inches)
Sandy loam	0.2 – 0.3
Loam	0.3 – 0.6
Clay loam	0.4 – 0.6

- ✓ irrigation frequency can vary from once a week early in the season to daily in sandy soils at full canopy
- ✓ ‘typical’ frequency is about every other day at full canopy

Soil Moisture Sensors:





Soil moisture monitoring :

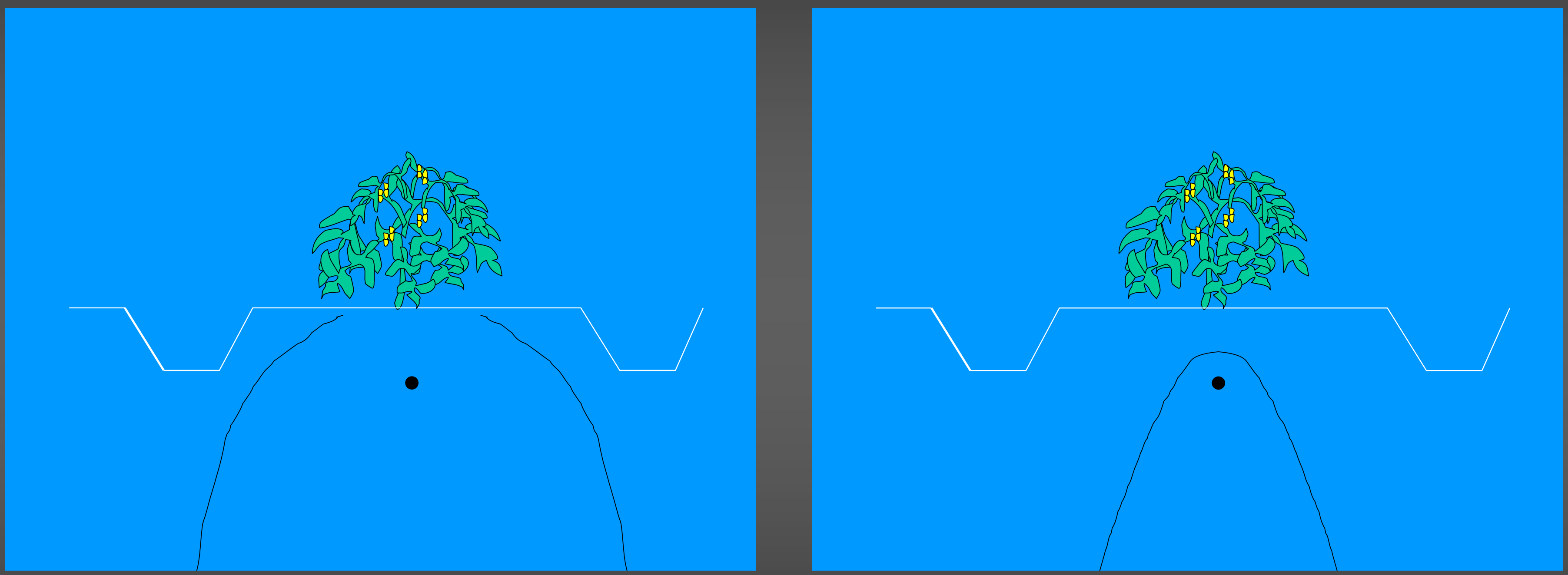
- Capacitance probes good for monitoring wetting patterns
- Tensiometers and Watermark blocks useful for monitoring soil tension

Interpreting soil tension measurements :

	Sandy loam	Clay loam
Field capacity	10 - 15	15 - 20
20% depletion	20 - 25	25 - 30
40% depletion	35 - 40	40 - 45

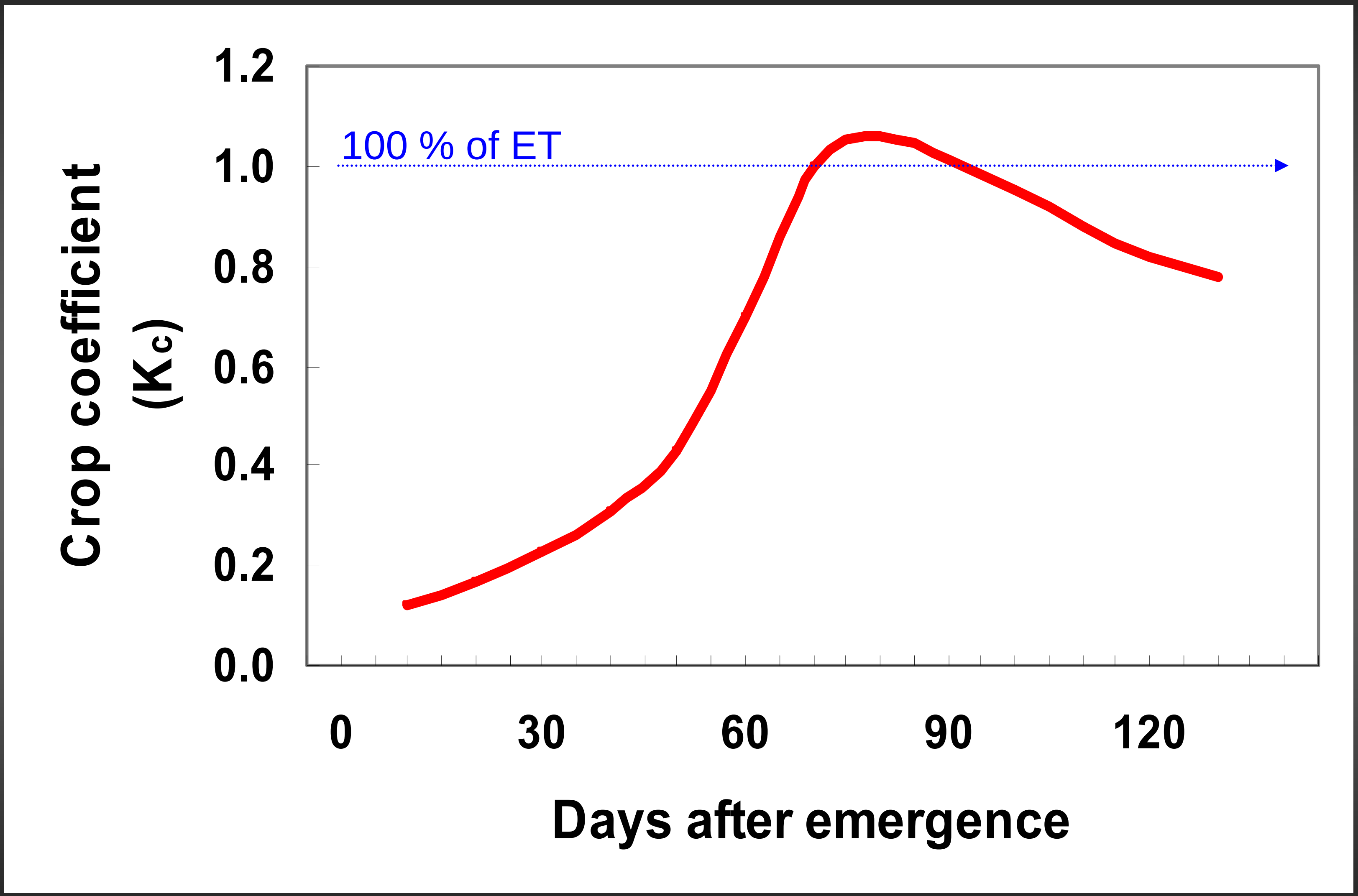
Where do I place soil moisture sensors ?

- capillary wetting patterns vary widely among fields



In general, locating sensors about 4-6” to the side of the tape is reasonable
- 12-15” depth indicates status in the most concentrated root zone
- 24-30” shows excess or deficient irrigation

Managing end-of-season irrigation :

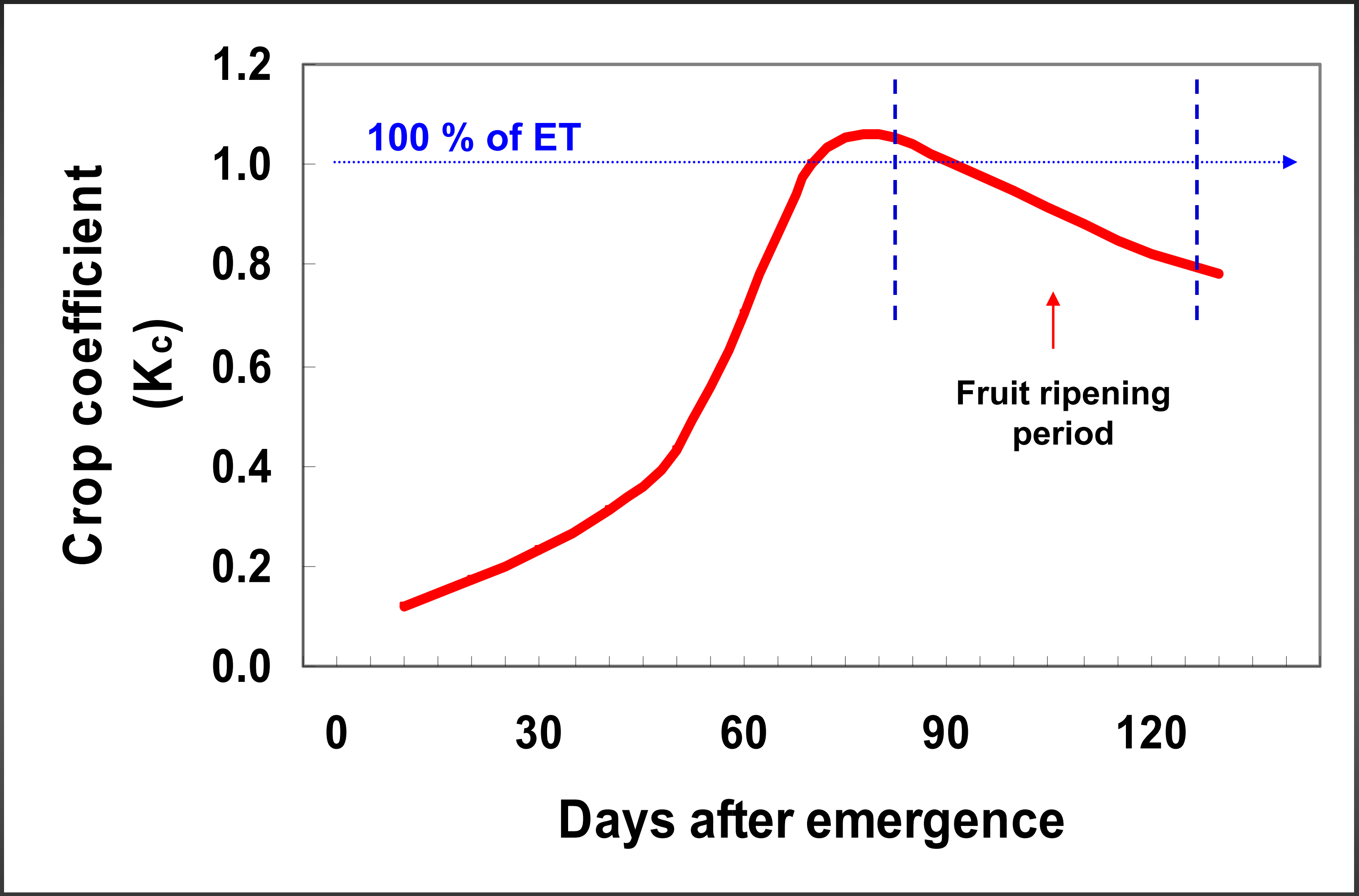


Adapted from Phene et al., 1986

How do fruit respond to irrigation ?

- Water content of green fruit changes with plant water status, so irrigation management affects soluble solids concentration of green fruit
- Water content of red fruit is not affected by subsequent changes in plant water status, so irrigation management has no effect on brix of ripe fruit

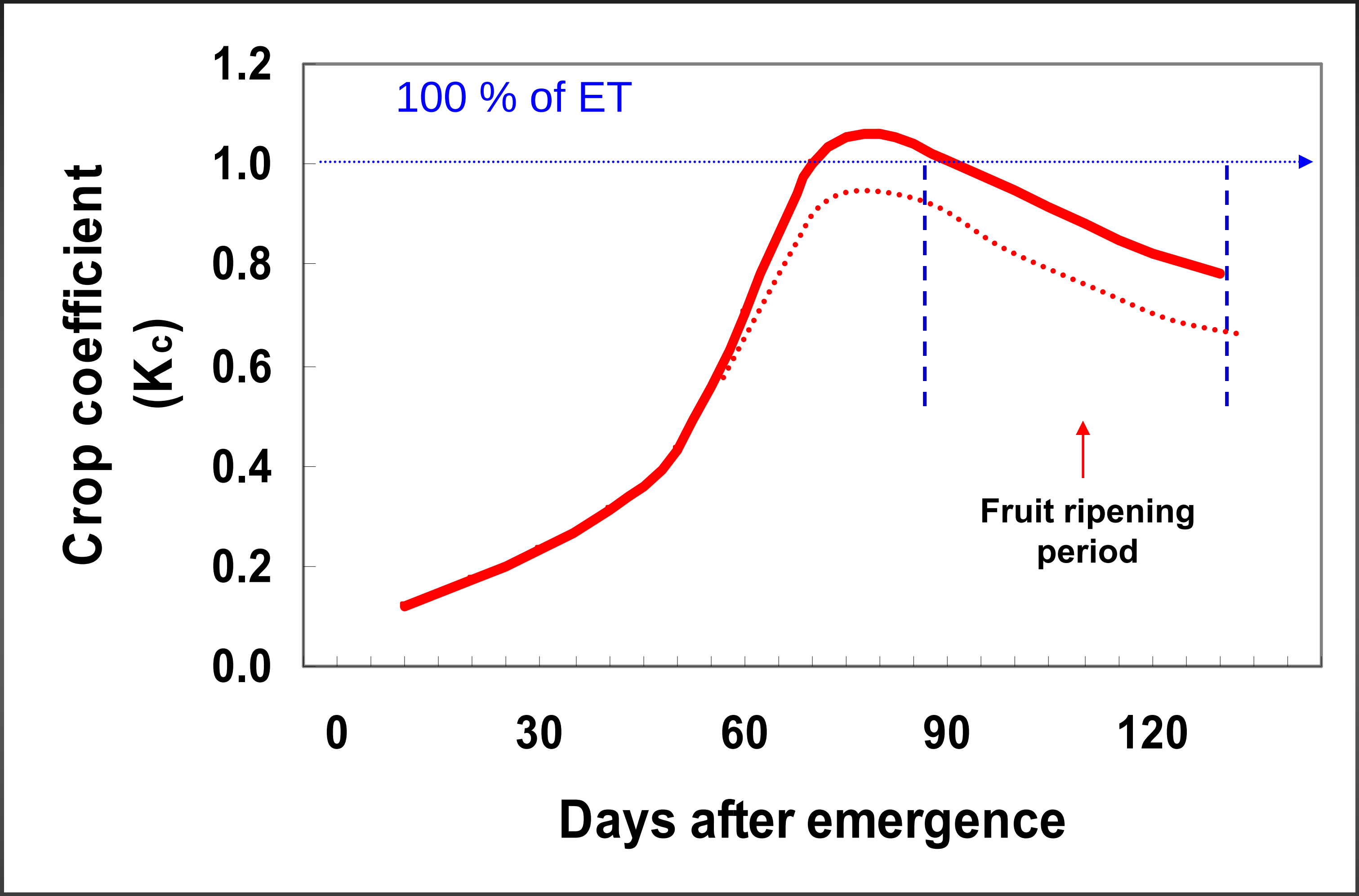
To increase solids, reduce irrigation during fruit ripening :



General guideline:

apply 30 – 70% of CIMIS ETo starting at early fruit ripening

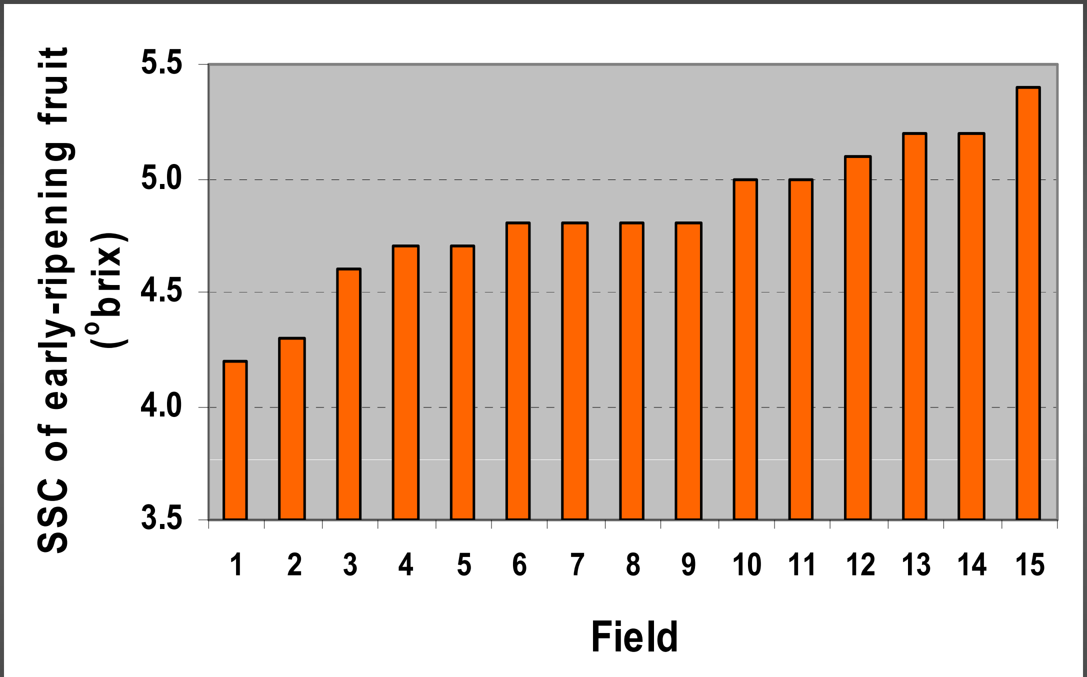
Within that range, how do you choose ?



- Greater cutback for fields with lower plant vigor, or where aggressive canopy management is practiced
- Greater cutback in fields with high available soil moisture

Within that range, how do you choose ?

- test early-ripening fruit to see how much brix increase is needed



Test a composite sample of at least 20 fruit:

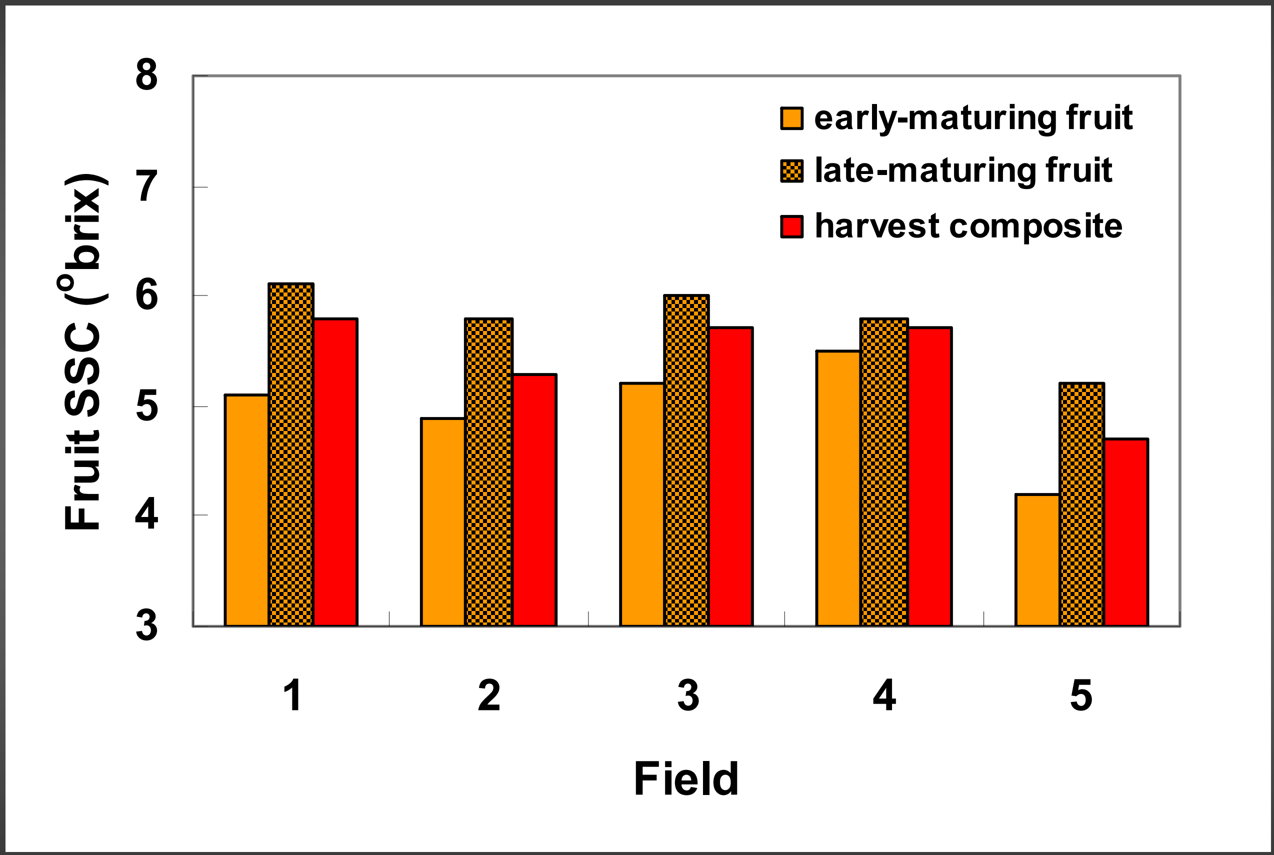
- ✓ From different plants throughout the field
- ✓ Showing some external color
- ✓ No damage or blossom end rot

How can you tell if your deficit strategy is working ?

- Monitor soil moisture tension to at least 2 ft depth
  - significant brix increase unlikely until soil is drier than 30-40 cb at 2 ft depth

- Repeat brix measurement of ‘pink’ stage fruit

How much can you increase brix by deficit irrigation ?



Will late-season deficit irrigation hurt yield ?

✓ If done correctly brix yield (tons of solids) doesn’t change

Example:

Yield with full irrigation = 50 tons @ 4.7 brix = 2.35 tons of solids

2.35 tons of solids @ 5.0 brix = 47 tons yield

Drip Irrigation and Fertigation Management of Processing Tomato

Tim Hartz, Dept. of Plant Sciences, University of California, Davis
Blaine Hanson, Dept. of Land, Air and Water Resources, University of California, Davis
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A. Drip Irrigation Management

Drip system design

The standard approach to drip irrigating tomatoes has been to use a buried system which remains in place for a period of years before field renovation. Drip tape is typically buried 10-12 inches deep, one line per 60-66 inch soil bed. In recent years some growers have used "in-furrow" drip systems in which drip tape is laid in every furrow, or every other furrow, after crop establishment. Many factors affect the choice between buried or surface drip systems: system cost, labor availability, crop rotation pattern, soil type, etc. The general experience has been that buried systems offer higher yield potential, but cost more to install and maintain. The main advantage of surface drip, beyond lower initial cost, is that it is mobile, able to be moved each year as the tomato crop is rotated.

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