

Profiling Probes for Irrigation Study

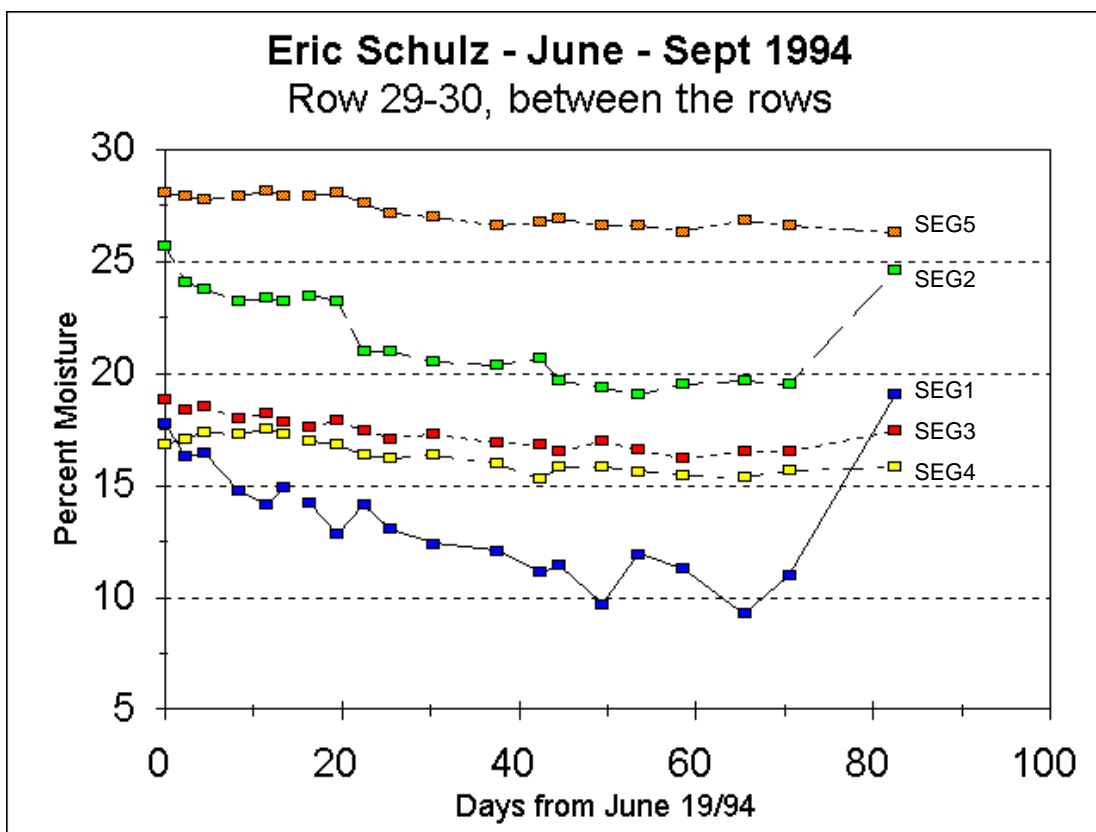
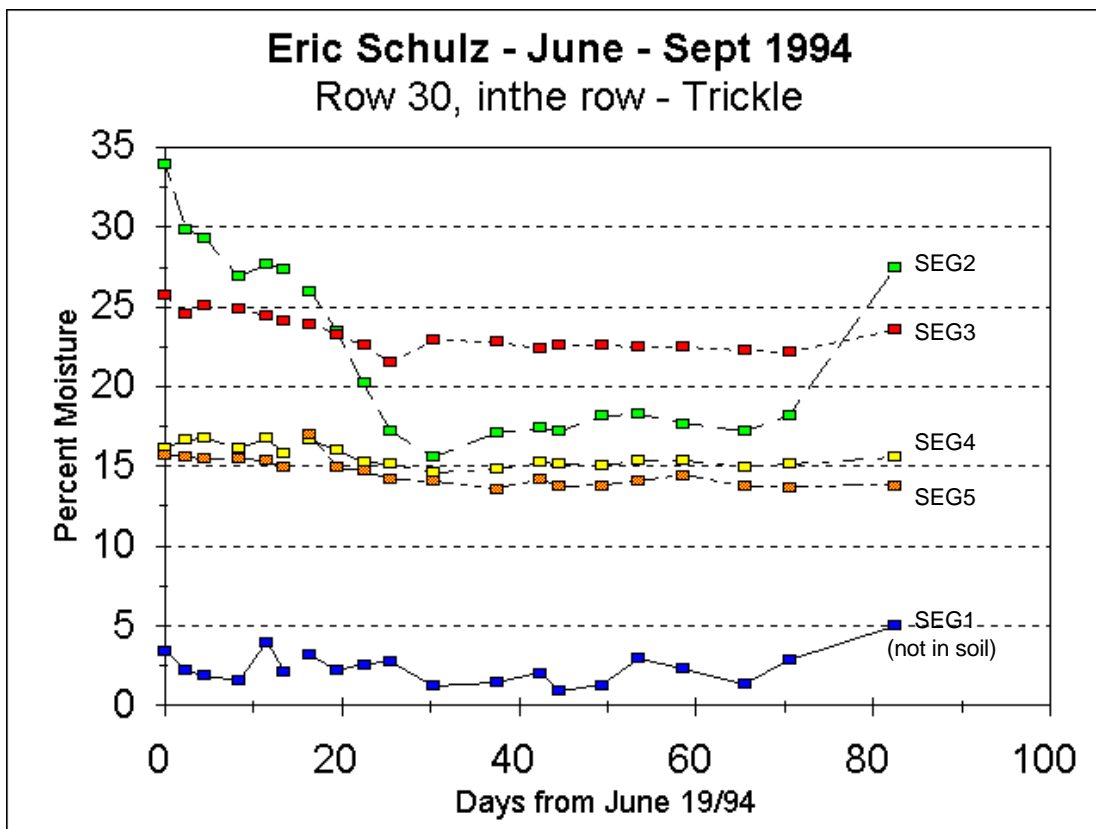
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Raspberry Farm Irrigation Study

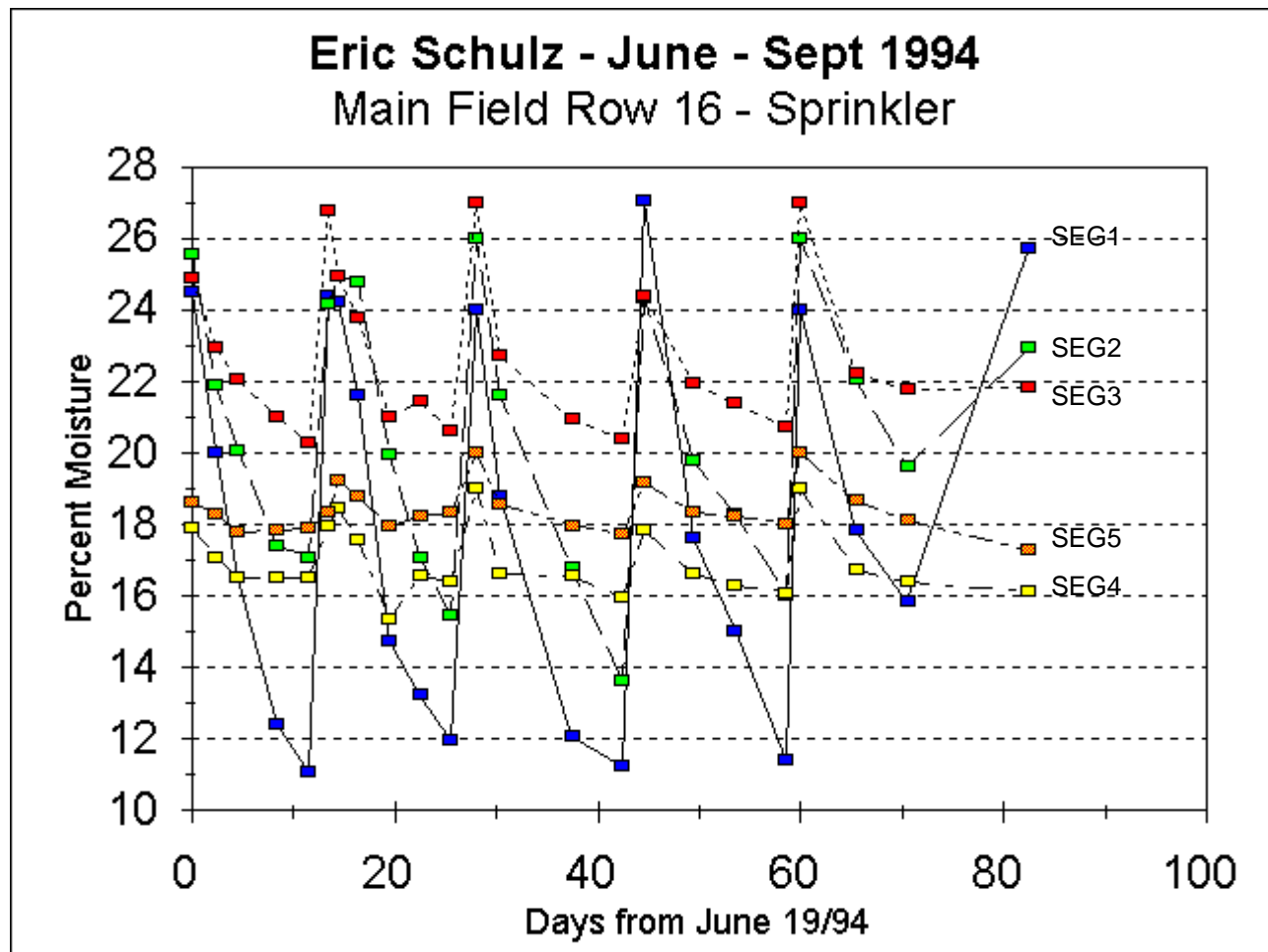
The installation consisted of three probe sites in a raspberry field for the purpose of evaluating irrigation effectiveness and comparing sprinkler with trickle type watering. Three early-prototype probes (6", 6", 12", 12", 12" segments) were installed in early June, 1994 and left in place for the duration of the measurements. The data was obtained manually by going out to each of the probes whenever time permitted; initially about every other day, later, less frequently. At each probe, two sets of readings were obtained and the values were recorded in a field log along with notes about weather and irrigation.

The data and comments were transcribed from field notes to a spreadsheet. The spreadsheet is included, following the graphs. The points plotted on the graphs are each the average of the two individual readings for each segment. Each graph shows all five of the segments of one probe.

The "Row 29-30...", "Row 30"..." graphs compare the moisture levels directly under the trickle (*Row 30*) and between trickle outlet sites (*Rows 29-30*). This comparison is awkward because the probe in the row could not be driven in completely so that the top segment was out of the soil. Consequently, SEG2, *Row 30* compares with SEG1 *Rows 29-30*--the top 6"--and so forth. Two features of this data are noteworthy: SEG3 and SEG4 of *Rows 29-30* and SEG4 and SEG5 of *Row 30* (at comparable depths) hover around 15 - 17% without change for the whole season. Irrigation does not get down to this depth. Second, from about Day 25 to Day 70 following withholding irrigation for several days, the moisture level in the sub-surface layer dropped and stayed constant even though resuming normal irrigation schedule. Compare SEG2 and SEG3 of *Row 30* with SEG1 and SEG2 of *Rows 29-30*; but remember the comparison is not exact because SEG3 is 12" long. The very high readings for the deepest segment on the *Rows 29-30* site is thought to be caused by the segment being at an impermeable layer where water collects, but this conjecture was not investigated.



The *Row 16* graph is for a sprinkler irrigation area. The data was usually gathered just after irrigation, as well as points at intermediate times, but a couple of right-after times were missed. For those missed-data times, a data value of approximately that segment's after-irrigation level has been inserted, so that the moisture level decay curves would be comparable across irrigation-drying cycles. Again, the data shows that irrigation has no effect on deep layers--SEG4 and SEG5 on the *Row 16* graph.



Field irrigation study - Eric Schulz Bear Hill Raspberry Farm June - October 1994

group A - Main field Row 16 sprinkler

Date	Time	Days	Segment 1			Segment 2			Segment 3			Segment 4			segment 5			
			A11	A21	A1	A12	A22	A2	A13	A23	A3	A14	A24	A4	A15	A25	A5	
94-06-19	19:00	0.00	25.2	23.8	24.5	26.3	24.8	25.6	24.9	24.9	24.9	18.0	17.8	17.9	18.7	18.6	18.7	soaked 24 hr before
94-06-22	7:00	2.50	20.5	19.6	20.1	22.2	21.6	21.9	22.9	23.0	23.0	17.5	16.7	17.1	18.6	18.0	18.3	sunny for last 2 days
94-06-24	7:00	4.50	17.1	16.0	16.6	20.7	19.5	20.1	22.4	21.7	22.1	17.1	16.0	16.6	17.8	17.8	17.8	sunny on day 22, cloudy on day 23
94-06-28	7:00	8.50	12.7	12.1	12.4	18.0	16.8	17.4	21.3	20.7	21.0	17.1	15.9	16.5	18.2	17.5	17.9	sunny every day
94-07-01	8:00	11.50	11.5	10.7	11.1	17.7	16.5	17.1	20.6	20.0	20.3	16.9	16.2	16.6	18.6	17.2	17.9	raining 4 hrs
94-07-03		13.50	24.7	24.1	24.4	24.8	23.6	24.2	27.3	26.3	26.8	18.2	17.8	18.0	18.7	18.0	18.4	partial irrig(???)
94-07-04	7:00	14.50	24.4	24.1	24.3	24.8	25.1	25.0	25.2	24.7	25.0	18.9	18.0	18.5	19.8	18.7	19.3	completed irrigation
94-07-06	7:00	16.50	22.7	20.5	21.6	24.2	25.4	24.8	23.4	24.2	23.8	18.0	17.1	17.6	19.0	18.6	18.8	sunny
94-07-09	8:00	19.50	14.6	14.9	14.8	20.1	19.8	20.0	20.9	21.1	21.0	15.5	15.2	15.4	18.0	17.9	18.0	not irrigated for 6 days
94-07-12	7:30	22.50	13.8	12.7	13.3	18.0	16.2	17.1	21.6	21.3	21.5	16.7	16.5	16.6	18.6	17.9	18.3	sunny,very warm last 3 days
94-07-15		25.50	12.9	11.0	12.0	16.2	14.7	15.5	20.9	20.4	20.7	16.9	15.9	16.4	18.3	18.4	18.4	sunny & warm. Just before sprinkling
		28.00			24.0			26.0			27.0			19.0			20.0	no measurement: after-irrigation value inserted
94-07-20	17:30	30.50	19.1	18.5	18.8	21.6	21.6	21.6	22.9	22.6	22.8	17.0	16.3	16.7	18.7	18.4	18.6	very hot days. spr 1 on 9 completed June 17
94-07-27		37.50	12.4	11.8	12.1	16.8	16.8	16.8	20.9	21.0	21.0	16.9	16.3	16.6	18.0	18.0	18.0	very hot and dry
94-08-01	8:50	42.50	12.1	10.4	11.3	14.4	12.9	13.7	20.7	20.1	20.4	16.7	15.2	16.0	18.2	17.3	17.8	warm and dry
94-08-03	7:00	44.50	28.6	25.5	27.1	24.8	23.9	24.4	24.5	24.3	24.4	18.4	17.3	17.9	19.4	19.0	19.2	overcast. after irrigation
94-08-08	7:00	49.50	18.2	17.1	17.7	19.8	19.8	19.8	22.3	21.6	22.0	17.1	16.2	16.7	18.8	17.9	18.4	warm cooler slight sprinkling drizzle
94-08-12	7:00	53.50	15.2	14.9	15.1	18.6	18.0	18.3	21.9	20.9	21.4	16.7	15.9	16.3	18.6	17.9	18.3	warm & dry
94-08-17	7:00	58.50	11.8	11.0	11.4	16.8	15.3	16.1	21.1	20.4	20.8	16.0	16.2	16.1	18.3	17.8	18.1	overcast for 2 days. irrig after reading
		60.00			24.0			26.0			27.0			19.0			20.0	no measurement: after-irrigation value inserted
94-08-24	17:00	65.50	18.0	17.7	17.9	23.1	21.0	22.1	22.1	22.4	22.3	17.0	16.5	16.8	18.7	18.7	18.7	sunny except for 1 day
94-08-29	8:00	70.50	16.3	15.4	15.9	20.7	18.6	19.7	21.9	21.7	21.8	17.0	15.8	16.4	18.4	17.9	18.2	warm. 1 day slight shower
94-09-10		82.50	26.3	25.2	25.8	23.4	22.5	23.0	22.0	21.7	21.9	16.3	16.0	16.2	17.5	17.1	17.3	cloudy and rainy

group B Row 30 in the row - Trickle

Date	Time	Days	Segment 1			Segment 2			Segment 3			Segment 4			segment 5			
			B11	B21	B1	B12	B22	B2	B13	B23	B3	B14	B24	B4	B15	B25	B5	
94-06-19	19:00	0.00	3.7	3.2	3.5	34.1	33.8	34.0	26.0	25.5	25.8	16.2	16.0	16.1	15.7	15.8	15.8	soaked 24 hr before
94-06-22	7:00	2.50	2.6	1.8	2.2	30.2	29.6	29.9	24.6	24.5	24.6	16.7	16.7	16.7	15.6	15.6	15.6	sunny for last 2 days
94-06-24	7:00	4.50	2.6	1.2	1.9	29.9	28.7	29.3	25.2	24.9	25.1	17.0	16.6	16.8	15.6	15.3	15.5	sunny on day 22, cloudy on day 23
94-06-28	7:00	8.50	2.0	1.2	1.6	27.2	26.6	26.9	25.2	24.6	24.9	16.7	15.5	16.1	15.6	15.3	15.5	sunny every day
94-07-01	8:00	11.50	4.6	3.4	4.0	28.1	27.2	27.7	24.7	24.2	24.5	17.0	16.5	16.8	15.4	15.3	15.4	raining 4 hrs
94-07-03		13.50	2.3	2.0	2.2	27.5	27.2	27.4	24.3	24.0	24.2	16.2	15.5	15.9	15.2	14.7	15.0	partial irrig(???)
94-07-04	7:00	14.50																completed irrigation
94-07-06	7:00	16.50	3.2	3.2	3.2	25.4	26.6	26.0	24.2	23.7	24.0	17.1	16.3	16.7	18.6	15.4	17.0	sunny
94-07-09	8:00	19.50	2.6	1.8	2.2	23.9	23.1	23.5	23.6	22.9	23.3	16.2	15.9	16.1	15.0	14.9	15.0	not irrigated for 6 days
94-07-12	7:30	22.50	2.6	2.6	2.6	21.0	19.5	20.3	22.7	22.6	22.7	15.8	14.7	15.3	14.9	14.5	14.7	sunny,very warm last 3 days
94-07-15		25.50	3.2	2.3	2.8	18.3	16.2	17.3	21.4	21.7	21.6	15.6	14.7	15.2	14.3	14.1	14.2	trickle off for 9 days prior. trickle start today after reading
94-07-20	17:30	30.50	1.8	0.6	1.2	15.6	15.6	15.6	23.0	22.9	23.0	14.5	14.7	14.6	14.3	13.8	14.1	very hot days. spr 1 on 9 completed June 17
94-07-27		37.50	1.2	1.8	1.5	18.0	16.2	17.1	23.0	22.7	22.9	15.1	14.5	14.8	13.6	13.6	13.6	very hot and dry
94-08-01	8:50	42.50	2.3	1.8	2.1	17.7	17.1	17.4	22.4	22.3	22.4	15.5	15.0	15.3	14.5	13.9	14.2	warm and dry
94-08-03	7:00	44.50	1.8	0.1	1.0	17.1	17.4	17.3	22.7	22.4	22.6	15.6	14.7	15.2	13.9	13.6	13.8	overcast. after irrigation
94-08-08	7:00	49.50	2.0	0.6	1.3	18.3	18.0	18.2	22.7	22.6	22.7	15.1	15.0	15.1	13.8	13.8	13.8	warm cooler slight sprinkling drizzle
94-08-12	7:00	53.50	3.4	2.6	3.0	18.0	18.6	18.3	22.7	22.3	22.5	16.0	14.7	15.4	14.3	13.9	14.1	warm & dry
94-08-17	7:00	58.50	2.9	1.8	2.4	18.3	17.1	17.7	22.9	22.1	22.5	15.8	15.0	15.4	14.6	14.3	14.5	overcast for 2 days. irrig after reading
94-08-24	17:00	65.50	1.8	0.9	1.4	17.7	16.8	17.3	22.1	22.4	22.3	15.5	14.5	15.0	13.6	13.9	13.8	sunny except for 1 day
94-08-29	8:00	70.50	2.3	3.4	2.9	18.3	18.0	18.2	22.3	22.0	22.2	15.4	15.0	15.2	13.8	13.6	13.7	warm. 1 day slight shower
94-09-10		82.50	5.4	4.6	5.0	27.8	27.2	27.5	23.9	23.3	23.6	16.2	15.0	15.6	13.8	13.8	13.8	cloudy and rainy

group C Row 29-30 between the rows

		Segment 1			Segment 2			Segment 3			Segment 4			segment 5				
Date	Time	Days	C11	C21	C1	C12	C22	C2	C13	C23	C3	C14	C24	C4	C15	C25	C5	
94-06-19	19:00	0.00	17.8	17.7	17.8	26.0	25.4	25.7	19.1	18.6	18.9	17.0	16.6	16.8	28.2	28.0	28.1	soaked 24 hr before
94-06-22	7:00	2.50	16.6	16.0	16.3	24.8	23.4	24.1	18.4	18.3	18.4	17.3	16.9	17.1	28.3	27.6	28.0	sunny for last 2 days
94-06-24	7:00	4.50	16.3	16.6	16.5	23.9	23.6	23.8	18.7	18.4	18.6	17.3	17.4	17.4	28.4	27.1	27.8	sunny on day 22, cloudy on day 23
94-06-28	7:00	8.50	15.2	14.3	14.8	23.1	23.4	23.3	17.7	18.3	18.0	17.3	17.3	17.3	28.0	27.8	27.9	sunny every day
94-07-01	8:00	11.50	14.1	11.1	14.1	23.4	11.1	23.4	18.4	18.1	18.3	17.4	17.7	17.6	27.9	28.4	28.2	raining 4 hrs
94-07-03		13.50	15.2	14.6	14.9	23.9	22.5	23.2	17.7	18.0	17.9	17.7	16.9	17.3	27.9	27.9	27.9	partial irrig(???)
94-07-04	7:00	14.50																completed irrigation
94-07-06	7:00	16.50	14.1	14.3	14.2	24.2	22.8	23.5	17.8	17.4	17.6	17.0	17.0	17.0	27.9	28.0	28.0	sunny
94-07-09	8:00	19.50	12.9	12.7	12.8	23.4	23.1	23.3	18.4	17.4	17.9	17.1	16.5	16.8	28.6	27.6	28.1	not irrigated for 6 days
94-07-12	7:30	22.50	14.1	14.1	14.1	20.7	21.3	21.0	17.5	17.4	17.5	16.7	16.0	16.4	27.6	27.6	27.6	sunny,very warm last 3 days
94-07-15		25.50	13.2	12.9	13.1	21.3	20.7	21.0	17.1	17.1	17.1	16.2	16.2	16.2	27.2	27.1	27.2	trickle off for 9 days prior. trickle start today after reading
94-07-20	17:30	30.50	12.7	12.1	12.4	21.0	20.1	20.6	17.5	17.1	17.3	16.7	16.0	16.4	27.2	26.8	27.0	very hot days. spr 1 on 9 completed June 17
94-07-27		37.50	12.1	12.1	12.1	20.1	20.7	20.4	17.0	16.8	16.9	15.8	16.2	16.0	26.5	26.7	26.6	very hot and dry
94-08-01	8:50	42.50	11.3	11.0	11.2	20.7	20.7	20.7	16.8	16.8	16.8	15.4	15.2	15.3	26.8	26.8	26.8	warm and dry
94-08-03	7:00	44.50	11.5	11.3	11.4	19.2	20.1	19.7	16.5	16.5	16.5	16.2	15.5	15.9	27.1	26.8	27.0	overcast. after irrigation
94-08-08	7:00	49.50	10.4	9.0	9.7	19.2	19.5	19.4	17.0	17.0	17.0	16.2	15.5	15.9	26.5	26.7	26.6	warm cooler slight sprinkling drizzle
94-08-12	7:00	53.50	12.4	11.5	12.0	19.2	18.9	19.1	16.7	16.5	16.6	15.9	15.4	15.7	26.8	26.5	26.7	warm & dry
94-08-17	7:00	58.50	11.3	11.3	11.3	18.9	20.1	19.5	16.4	16.0	16.2	15.9	15.0	15.5	26.2	26.5	26.4	overcast for 2 days. irrig after reading
94-08-24	17:00	65.50	9.3	9.3	9.3	20.1	19.2	19.7	16.4	16.7	16.6	15.5	15.2	15.4	26.9	26.8	26.9	sunny except for 1 day
94-08-29	8:00	70.50	10.7	11.3	11.0	19.8	19.2	19.5	16.7	16.4	16.6	15.8	15.6	15.7	26.8	26.5	26.7	warm. 1 day slight shower
94-09-10		82.50	19.4	18.8	19.1	25.1	24.2	24.7	17.5	17.4	17.5	15.9	15.8	15.9	26.1	26.5	26.3	cloudy and rainy