

# Irrigation Efficiency at Robinvale

Wemen Vineyards at Robinvale, Victoria, are using sprinklers to irrigate wine grapes, with tile drains installed at 1.2 m depth to drain off excess irrigation water. They are recording the number of hours that water was pumped at each irrigation; the Neutron Probe is measuring the amount of water that actually reached the crop root zone at each irrigation; and a record is kept of the volume of water running out of the drains, on a scale from 1 to 10. The pipe has been marked off in 10 equal discharge volumes. The objective was to monitor the efficiency and effectiveness of each irrigation, and to graphically display the results.

The solution was to make four keydata entries, called **EFFEC**, **HOURS**, **+EFFEC/HOURS** and **DRAIN** on the Edit Site screen (Figure 1). **EFFEC** is the effective depth of water that reached the soil profile, as measured by the Neutron Probe; **HOURS** is the pumping time in hours; the ratio of **EFFEC** to **HOURS** will be a measure of the irrigation efficiency; and **DRAIN** is an arbitrary number from 1 to 10. The actual units of the ratio will depend on pump capacity and area irrigated, but it will immediately give an indication of efficiency.

91ENG5

-EDIT SITE-

Esc: site

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Site Number: 5      Site Name: Site 5      Crop/variety: GORDO  
 Area: 2.0 Ha      Tube Position (0%=Start 100%=End): 0  
 Water Time: 10:00      Volume Applied: 600 Kl      Water Depth: 30 mm  
 Planting Date: 1/7/1991

Root Zones	Depths	Horizon	Keydata
	20cm	1	<b>EFFEC</b>
Zone 1: 0-130cm	30cm	2	<b>HOURS</b>
Zone 2: 25-110cm	40cm	3	<b>+EFFEC/HOURS</b>
Zone 3: 0-70cm	50cm	4	<b>DRAIN</b>
	60cm	5	
	80cm	6	
	100cm	7	
	120cm	8	

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<F10>update site <PgUp>prv site <PgDn>nxt site

Figure 1 Edit Site Screen.

Each time an irrigation was posted to the readings screen (Figure 2), the pumping time (in hours) was also entered in the Irrigation column, in the Keydata **HOURS** row. The depth of water that actually reached the soil profile, after adjustment to get a reasonable ProbeDWU, was copied from the first row of the spreadsheet to the Keydata **EFFEC** row. After updating, the **+EFFEC/HOURS** was calculated by the Probe software.

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91ENG5 Sun 8 Sep 1991				-READINGS-								Esc: site	
Date	Time	6/9	7/9	7/9	8/9	8/9	9/9	10/9	10/9	13/9	16/9		
		8:00	6:59	7:00	22:59	23:00	8:00	17:59	18:00	8:00	14:00		
Depth	Full Refill	Probe	(Est)	Rain	(Est)	Irri	Probe	(Est)	Rain	Probe	Probe		
20cm	26.3	22.0	22.0	21.9	6	-	17	26.3	-	9	25.3	24.1	
30cm	28.3	25.2	25.3	25.3	(0)	-	(0)	28.0	-	(0)	28.3	27.9	
40cm	32.8	29.6	29.6	29.5	6	-	30	31.9	-	14	32.8	32.6	
50cm	33.2	30.3	30.3	30.2	-	-	-	31.7	-	-	33.2	33.4	
60cm	32.5	30.2	30.2	30.2	-	-	-	30.9	-	-	32.5	32.3	
80cm	31.0	29.7	29.7	29.6	-	-	-	29.9	-	-	31.0	30.9	
100cm	29.4	28.6	28.6	28.5	-	-	-	29.2	-	-	29.4	29.7	
120cm	28.1	27.7	27.7	27.7	-	-	-	27.8	-	-	28.1	28.7	
0-130cm	386	357	357	357	363	361	378	377	376	385	383	381	
25-110cm	264	247	247	247	-	-	-	256	-	-	264	264	
0-70cm	209	185	186	185	-	-	-	204	-	-	206	203	
Deficit	0	28	28	29	23	25	8	8	9	0	2	5	
ProbeDWU	-	-	0.8	1.0	1.0	1.0	1.0	1.0	0.7	0.7	0.7	0.7	
Est DWU	-	-	1.1	1.3	1.3	1.2	1.2	1.1	1.0	1.0	2.0	1.3	
<b>KeyData</b>													
EFFEC	-	-	-	-	-	-	17	-	-	-	-	-	
HOURS	-	-	-	-	-	-	6	-	-	-	-	-	
EFFEC/H	-	-	-	-	-	-	2.8	-	-	-	-	-	
DRAIN	-	-	-	-	-	-	1	-	-	-	-	-	

<F5>Recalc <F6>Select <F8>Menu <F10>Graph

Figure 2. Readings Screen.

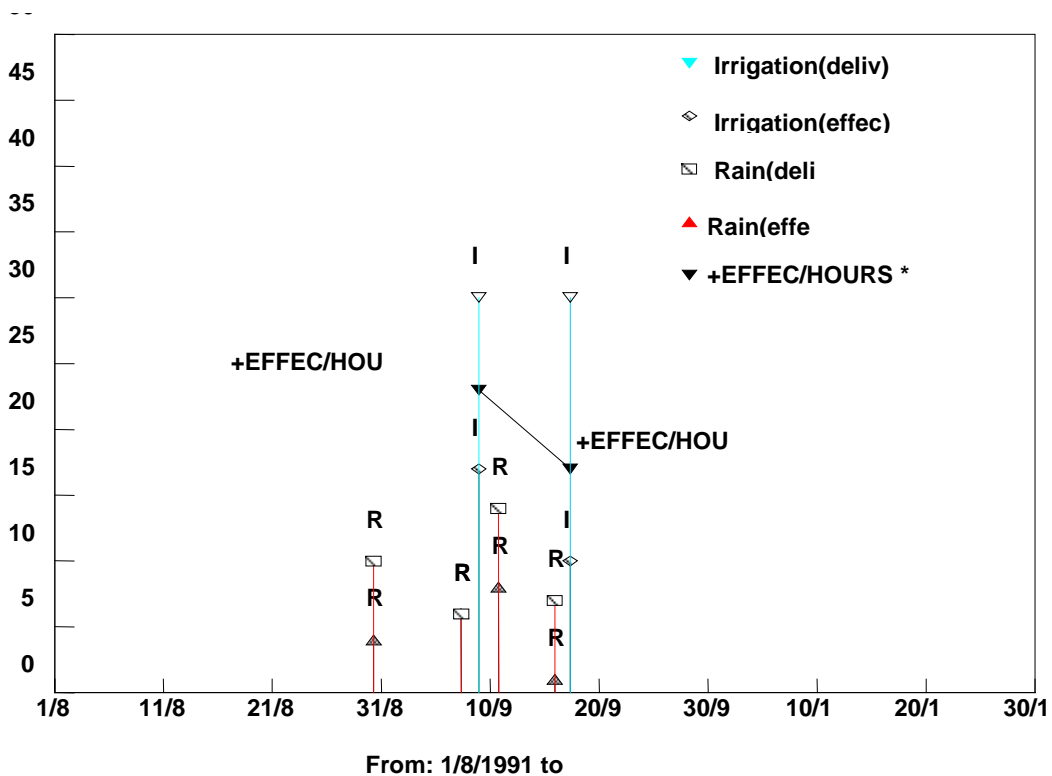


Figure 3. Time Graph of Irrigation Efficiencies.

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By *selecting* the **+EFFEC/HOURS** keydata row, and plotting a time graph of *selected* data, users could quickly see the efficiency of all irrigations in the season. However, in order to actually plot vertical bars for **HOURS** on the time graph a slight 'adjustment' was required. A 'dummy' estimate column was inserted immediately after each irrigation, and a value of "0" was inserted in the keydata rows in the (**Est**) columns before and after the irrigation. In this way, when the **HOURS** Keydata row was *selected*, vertical columns with a symbol at the top are drawn, on top of the normal Irrigation bars (Figure 3).

In this example, in 6 hours of pumping 30 mm was applied at a rate of 5 mm/hour, but only 17 mm was effective - a rate of 2.8 mm/hour. The difference is being lost in the pumping system, by evaporation, or by through drainage. An examination of the depth graphs will show the amount of drainage. In this case, pumping should have been for only 3.4 hours (17 mm at 5 mm/hour).

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