

Evapotranspiration and Measured Irrigation

Report for Smart Approved Watermark

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For all implementations of measured irrigation the water usage is directly proportional to the net evaporation rate from the evaporator. In this report the water usage is compared with the local evapotranspiration rate.

A series of research trials were organised at the Bureau of Meteorology Weather Station at Adelaide Airport.



Research trials at Adelaide Airport using the Unpowered Measured Irrigation Controller



Gravity feed water supply from header tank.



Precision adjustable dripper



Bureau of Meteorology, Adelaide Airport





A chicken wire cage protected the evaporator from birds and other animals

An Unpowered Measured Irrigation Controller UMIC delivered water to 5 irrigation drippers and the water from each dripper was collected in a corresponding catch can. The adjustable control dripper was a precision adjustable dripper with three Landline Purple drippers and three Landline 8 drippers. For all trials, two Landline Purple drippers were turned on and the remaining drippers in the precision adjustable dripper were turned off. For all trials, the 5 irrigation drippers were Landline Purple drippers.

The Bureau of Meteorology Weather Station at Adelaide Airport publishes daily evapotranspiration and rainfall data for the 24 hour period midnight to midnight. Daily reference evapotranspiration (ET_0) is derived from automatic weather station records and satellite measurements. The research trials were conducted for 40 consecutive days from 5 February 2019 to 16 March 2019. Before midnight each night, the catch cans were emptied and the float on the UMIC was pressed down to start the irrigation event. The irrigation event stopped automatically when the water reached the high level. The quantity of water in each catch cans was measured and corrected for any evaporation that had occurred during the irrigation event. The irrigation event was started at a time that would ensure that the irrigation event stopped at about midnight.

Results

Figure 1 is a graph of ET minus rainfall, and mean irrigation volume at Adelaide Airport from 5 February 2019 to 16 March 2019.

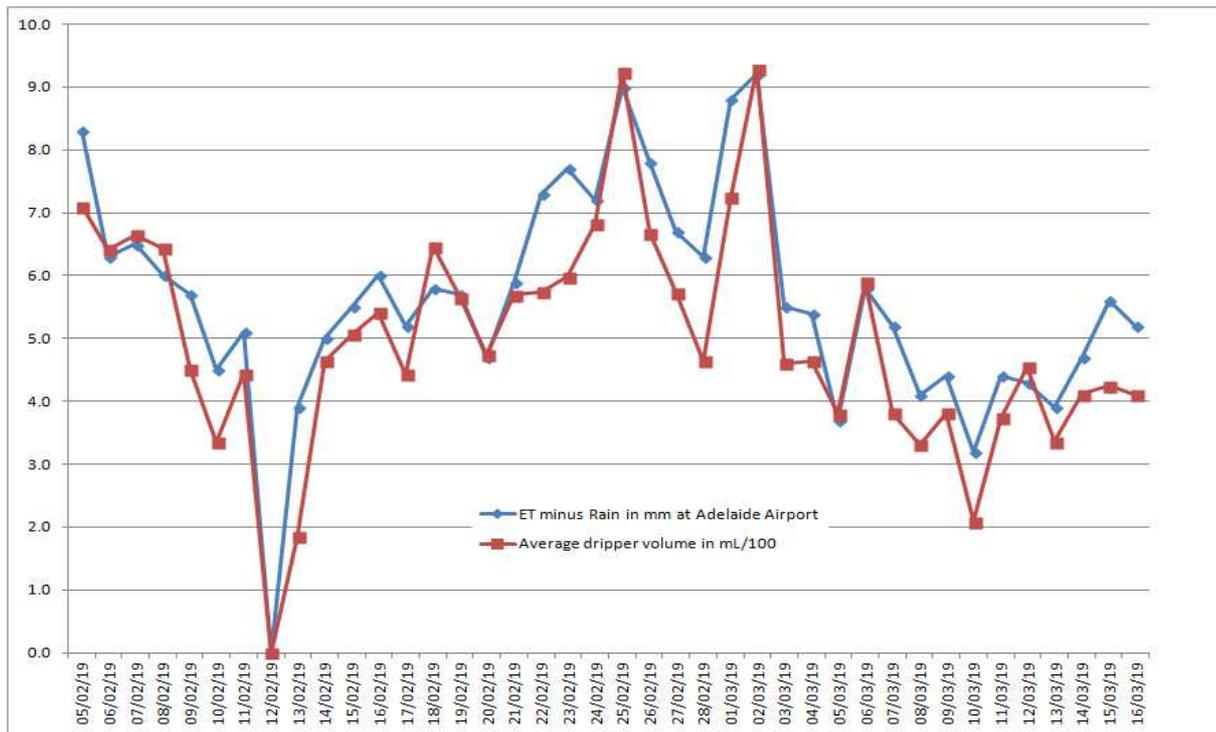


Figure 1 Daily ET minus rainfall, and mean irrigation volume at Adelaide Airport from 5 February 2019 to 16 March 2019.

The results in Table 1 show the correlation between the daily evapotranspiration minus rainfall data (for 40 days) and the daily mean irrigation volumes for the 5 catch cans (for 40 days). The results also show the correlation between the daily evapotranspiration minus rainfall data and the daily irrigation volumes for each of the catch cans.

TABLE 1 Correlation between daily irrigation volume and daily ET₀ minus rainfall

Correlation coefficient for mean dripper volume and ET ₀ minus rainfall	0.929
Correlation coefficient for dripper 1 volume and ET ₀ minus rainfall	0.931
Correlation coefficient for dripper 2 volume and ET ₀ minus rainfall	0.928
Correlation coefficient for dripper 3 volume and ET ₀ minus rainfall	0.929
Correlation coefficient for dripper 4 volume and ET ₀ minus rainfall	0.928
Correlation coefficient for dripper 5 volume and ET ₀ minus rainfall	0.925

The results demonstrate a strong correlation between measured irrigation discharge volumes and the prevailing evapotranspiration minus rainfall. With measured irrigation, the discharge volumes are directly proportional to the net evaporation rate from the evaporator. Thus we can conclude that there is a strong correlation between net evaporation from the evaporator and the prevailing evapotranspiration minus rainfall.