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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>a</code></td>
<td>Constant for neutron probe calibration equation that depends upon substances in the soil</td>
</tr>
<tr>
<td><code>ADL</code></td>
<td>Allowable depletion level</td>
</tr>
<tr>
<td><code>b</code></td>
<td>Slope of the neutron probe calibration equation</td>
</tr>
<tr>
<td><code>CF</code></td>
<td>Crop Factor</td>
</tr>
<tr>
<td><code>d_o</code></td>
<td>Depth of placement of the detector (m)</td>
</tr>
<tr>
<td><code>DOY</code></td>
<td>Day of the year</td>
</tr>
<tr>
<td><code>D_t</code></td>
<td>Drainage (mm)</td>
</tr>
<tr>
<td><code>E_{pan}</code></td>
<td>Evaporation from a class A pan (m)</td>
</tr>
<tr>
<td><code>E_s</code></td>
<td>Direct evaporation from the soil surface (m)</td>
</tr>
<tr>
<td><code>E_{sp}</code></td>
<td>Potential soil evaporation (kg m^{-2} s^{-1})</td>
</tr>
<tr>
<td><code>ET</code></td>
<td>Evapotranspiration (m)</td>
</tr>
<tr>
<td><code>ET_a</code></td>
<td>Actual evapotranspiration (m)</td>
</tr>
<tr>
<td><code>ET_m</code></td>
<td>Maximum crop evaporation (m)</td>
</tr>
<tr>
<td><code>ET_o</code></td>
<td>Reference evapotranspiration (m)</td>
</tr>
<tr>
<td><code>FC</code></td>
<td>Field capacity</td>
</tr>
<tr>
<td><code>FS1</code></td>
<td>FullStop 1</td>
</tr>
<tr>
<td><code>FS2</code></td>
<td>FullStop 2</td>
</tr>
</tbody>
</table>
$K_c$ - Crop coefficient

$K_{pan}$ - Pan coefficient

MACH - Machingilana

N - Count ratio for the neutron probe

NP - Neutron probe

O - Overhead from a wetting front detector

P - Precipitation (mm)

PAW - Plant available water

PET - Potential evapotranspiration (mm)

PT - Potential transpiration (mm)

PWP - Permanent wilting point

R - Run-off from the soil surface (mm)

SWB - Soil Water Balance model

T - Transpiration (mm)

$T_d$ - Daily transpiration (mm day$^{-1}$)

TDR - Time Domain Reflectometry

$\Sigma$ - The sum of

$I$ - Neutron probe count rate

$I_{std}$ - Neutron probe standard counts
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>( \theta )</td>
<td>Volumetric soil water content (m m(^{-3}))</td>
</tr>
<tr>
<td>( \theta_{\text{dul}} )</td>
<td>Volumetric water content at drained upper limit (m m(^{-3}))</td>
</tr>
<tr>
<td>( \theta_{\text{i}} )</td>
<td>Initial water content in the soil</td>
</tr>
<tr>
<td>( \theta_{\text{l}} )</td>
<td>Volumetric water content at lower limit (m m(^{-3}))</td>
</tr>
<tr>
<td>( \theta_{\text{r}} )</td>
<td>Volumetric water content at refill point (m m(^{-3}))</td>
</tr>
<tr>
<td>( \theta_{\text{w}} )</td>
<td>Volumetric water content at the wetting front (m m(^{-3}))</td>
</tr>
<tr>
<td>( \Delta S )</td>
<td>Change in soil water storage (mm)</td>
</tr>
<tr>
<td>( \circ )</td>
<td>Original trade name for product ( x )</td>
</tr>
<tr>
<td>( \ell )</td>
<td>litre</td>
</tr>
<tr>
<td>( \psi_{\ell} )</td>
<td>Leaf water potential (J kg(^{-1}))</td>
</tr>
</tbody>
</table>
APPENDIX A

(i) A Hydrus simulation of how soil suction plays a critical role in the operation of the wetting front detector. In an initially dry soil, gravity and suction are the driving force for water movement, and therefore the build-up suction in the WFD will cause water to flow into the detector. (ii) The position of the wetting front (and the soil tension above and below it) after detection by the WFD.

---

Soil Tension (cm)

-50 -40 -30 -20 -10 0 10 20
APPENDIX B

Soil water characteristic curve for the WFD experiment, Hatfield experimental farm, determined according to the ‘desorption’ method described by Hillel (1998); and Gardner (1986). The samples collected with a core sampler of a known volume were subject to different suction levels with a pressure plate until equilibrium was reached. The bulk density the soil sample was also determined.

\[ y = 2E-08x^{7.2555} \]

\[ R^2 = 0.9208 \]
APPENDIX C

Schematic layout of the WFD trial – Hatfield Experimental Farm showing only the treatment plots; border plots are excluded.

---|---|---|---|---|---|---|---|---|---
SWB | FS1 | CF | MACH | FS1 | NP | SWB | NP | MACH | FS2 
---|---|---|---|---|---|---|---|---|---
MACH | NP | FS2 | FS1 | CF | MACH | FS1 | FS2 | SWB | CF 
---|---|---|---|---|---|---|---|---|---
FS2 | CF | SWB | NP | SWB | FS2 | CF | MACH | FS1 | NP 
(1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) 

Legend

FS1 - FuliStop 1
FS2 - FuliStop 2
MACH - Machingilana
SWB - SWB model
NP - Neutron probe
CF - WFD generated crop factor
APPENDIX D

The irrigation controller configuration of WFD experiment at Hatfield experimental farm showing the flow rates as well the stations that controlled each solenoid valve.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>FS1 rep 1</th>
<th>FS1 rep 2</th>
<th>FS1 rep 3</th>
<th>FS1 rep 4</th>
<th>FS1 rep 5</th>
<th>FS2 rep 1</th>
<th>FS2 rep 2</th>
<th>FS2 rep 3</th>
<th>FS2 rep 4</th>
<th>FS2 rep 5</th>
<th>NP</th>
<th>SWB</th>
<th>CF</th>
<th>Machingilana</th>
<th>Main meter</th>
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<td>3</td>
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<td>5</td>
<td>6</td>
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<tr>
<td>Water meter number</td>
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<td>4</td>
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<tr>
<td>Control station</td>
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<tr>
<td>Flow rate</td>
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</tbody>
</table>

N:B * Indicates that the solenoid valves for this replicates where connected to a common control station although each one shuts-off irrigation separately.
REFERENCES


TOLLEFSON, L.C., 1996. Requirements For Improved Interactive Communication Between Researchers, Managers, Extensionists, And Farmers (Summary). In: Irrigation Scheduling: From Theory To Practice. ICID/FAO. Rome, Italy.


