Improving agricultural water management in irrigated small holder farms

Dr. Petra Schmitter
IWMI

Helping farmers in irrigation scheduling and increasing water productivity

Richard Appoh, IWMI
WETTING FRONT DETECTOR PRINCIPLE

- A mechanical device to monitor the wetting front as it passes through the soil
- Funnel shaped instrument with a small collection reservoir at the bottom to collect soil moisture
- Silica sand (0.2 to 0.4 mm diameter), with 20 to 50 % of the particles in the 200 to 200 micron range
- Foam inside of the plastic tubes
- Caps with indicator on top
- Irrigation practice
- Cultivated crop:
  - $1/2$ extensive rootzone: yellow indicator
  - $2/3$ of the extensive rootzone: red indicator
- Irrigation interval:
  - Short = shallow
  - Long = deep

(Stirzaker, WRC project report 288, 2004)
OVERHEAD IRRIGATION OF ONION
Field capacity at the top layer is reached

Field capacity is reached within the entire root zone: **over irrigation**

20 cm

40 cm
### RESPONSE OF THE DETECTOR

<table>
<thead>
<tr>
<th>Shallow WFD</th>
<th>Deep WFD</th>
<th>What it means</th>
<th>What you should do</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Shallow WFD image" /></td>
<td><img src="image2.png" alt="Deep WFD image" /></td>
<td>Not enough water for established crops.</td>
<td>Apply more water at one time or shorten the interval between two irrigations. May be the desired result for young crops or when trying to minimize leaching of nutrients.</td>
</tr>
<tr>
<td><img src="image1.png" alt="Shallow WFD image" /></td>
<td><img src="image2.png" alt="Deep WFD image" /></td>
<td>Wetting front has penetrated into the lower part of the root zone.</td>
<td>Much of the time this is the desired result. However during hot weather or when the crop is at a sensitive growth stage irrigation should be increased. The deep detector should respond from time to time, showing that the entire root zone is wet.</td>
</tr>
<tr>
<td><img src="image1.png" alt="Shallow WFD image" /></td>
<td><img src="image2.png" alt="Deep WFD image" /></td>
<td>The wetting front has moved to the bottom or below the root zone.</td>
<td>Both detectors should respond when irrigating to satisfy high demand for water. However if this happens on a regular basis over-watering is likely. Reduce irrigation amounts or increase the time interval between irrigations.</td>
</tr>
<tr>
<td><img src="image1.png" alt="Shallow WFD image" /></td>
<td><img src="image2.png" alt="Deep WFD image" /></td>
<td>Soil or irrigation is not uniform or the soil surface is uneven.</td>
<td>Ensure the soil is level over the detectors and water is not running towards or away from the installation site. Check uniformity of irrigation or location of drippers.</td>
</tr>
</tbody>
</table>

(Stirzaker, WRC project report 288, 2004)
FURROW IRRIGATION OF WHEAT
Improving agricultural water management in irrigated small holder farms

Dr. Petra Schmitter
IWMI

Thank you! Questions?

Dr. Petra Schmitter
IWMI