SOIL MOISTURE INDICATOR

A device to assess soil moisture status and schedule irrigations

Hari, K., Puthira Prathap, D., and Sivaraman, K.,

ICAR-Sugarcane Breeding Institute,
Coimbatore 641007, Tamil Nadu, India.
Email: k.hari@icar.gov.in
Introduction

- Worldwide depletion of water resources in agriculture has been a serious cause of concern.
- Water - the vital input for crop production.
- Both its deficit and excess water in the soil affect crop yield.
- The crop does not suffer from water stress when the soil moisture is between field capacity and permanent wilting point.
- Shortage of water and costs of irrigation necessitate on developing methods of irrigation that maximize the water use efficiency. *More crop per drop*
Improper irrigation practices could result in insufficient or excess soil moisture. This could affect crop productivity and results in wastage of irrigation water.

Tuned irrigation have a positive impact on crop yield and water use efficiency.
Under Indian situations, the irrigation scheduling based on soil moisture is not in practice due to the non-availability of simple soil moisture indicating devices to farmers and lack of awareness on irrigation scheduling based on the soil moisture.
• ICAR-Sugarcane Breeding Institute has conducted field demonstrations in different locations of Tamil Nadu to sensitize farmers on various water conservation techniques.

• To assess the irrigation water, ‘Tensiometer’ was introduced to farmers to plan irrigations based on soil moisture status.

Tensiometer based irrigations resulted in reduction of number of irrigations and consequently saving in irrigation water.
Problems associated with tensiometer

- Permanent installation of multiple units (10 units/ha)
- Blocking / of ceramic cup
- Regular filling of water in the reservoir tube
- Vacuum leakage problems
- Chances for breaking the ceramic cup
- Expensive (@Rs. 6500/- per unit)
- Other maintenance problems.
This has necessitated the requirement for a simple soil moisture indicating device better than tensiometer that can help the cane grower to assess the status of soil moisture and aids in planning irrigation.
Measuring soil moisture is a tricky and difficult procedure.

The standard method is gravimetric oven drying method, which is practically not possible under field situations.

Other available devices viz., neutron moisture probe, ultrasonic Doppler systems etc. are highly sophisticated and are very expensive. These devices are beyond the reach of the farmer.
ICAR-SBI has developed a simple electronic device to indicate soil moisture named as “SOIL MOISTURE INDICATOR” (SMI)

- A team of scientists tested the device in farmers fields.
- This device was fine tuned based on the requirement and feedback received from farmers.
- The device was evaluated by farmers under their field conditions for the suitability.
**SOIL MOISTURE INDICATOR**

- Principle - soil electrical conductivity is directly proportional to soil moisture content. Similar to gypsum block technique.

- This soil moisture indicator has been designed to objectively indicate soil moisture between above permanent wilting point and field capacity.

- The electronic circuit is designed in such a way to display approximate moisture level by glowing any one coloured led out of the ten.
Metal sensor rods, when inserted in soil and on pressing the switch, single light glows indicating the moisture status.

- High soil moisture - Blue.
- Sufficient soil moisture – Green - no need for immediate irrigation.
- Slightly above permanent wilting point - orange - immediate requirement for irrigation.
Metal sensor rods, when inserted in soil and on pressing the switch, single light glows indicating the moisture status.

MOISTURE STATUS

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### Evaluation of SMI in farmers’ fields

<table>
<thead>
<tr>
<th>Item</th>
<th>Conventional Irrigation</th>
<th>Irrigation based on SMI</th>
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<tbody>
<tr>
<td>Cane yield (t/acre/crop)</td>
<td>55.8</td>
<td>60.4</td>
</tr>
<tr>
<td>No. of irrigations / crop</td>
<td>42</td>
<td>36</td>
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</tbody>
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Average of 14 farmers’ fields
Problems associated with SMI

- SMI will not measure exact soil moisture, can only be used for objective indication of soil moisture and not for quantitative measurement.

- It is possible to get varied results / errors depending on different situations / conditions viz., heavy clayey or sandy soil, salinity, high soil and irrigation water EC etc.

- These problems can be addressed by fine tuning the device before use.
Conclusions

✓ Water will become a scarce commodity in the years to come and there is a need to improve the water use efficiency in sugarcane agriculture.

✓ Trials using SMI in the farmers’ fields, in participatory mode, proved that sugarcane yields were not affected when irrigated based on SMI indication.

✓ SMI will be very helpful to the farmers for its simple objective indication, ease of handling, sturdy, low cost and suitability for field use.

✓ Can be used for sensitizing the farmers about efficient use of irrigation water and scheduling irrigations based on soil moisture status.
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