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NRRI-ARM SENSOR

A tool for real time soil moisture monitoring

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Over the past few decades, water scarcity has emerged as one of the biggest challenges for sustaining rice production. Hence, development of novel water saving technologies is an important step to help rice farmers cope with water scarcity. In order to maximize the water use efficiency in rice production, it is essential to apply right amount of irrigation water at right time. The timing of irrigation is a critical factor for improving the water use efficiency under limited water supply conditions. Due to lack of fixed criteria for re-watering the alternate wet and drying often results in over-irrigation or under irrigation. It is difficult to decide when the best time to re-water the rice crop is?

In an effort to enhance water use efficiency in rice under water deficit condition, ICAR – NRRI, Cuttack has developed a farmer friendly electronic moisture–indicating device named NRRI-ARM Sensor (NRRI-Aerobic Rice Moisture Sensor).This device aids the rice farmers in deciding the right time of re-irrigation in rice crops and thus results in substantial saving of water and increasing water use efficiency.

Construction of NRRI-ARM sensor

NRRI- ARM Sensor comprises two sensor rods and a casing. The two metal sensor rods are placed at a distance of about 3.5 cm. The casing houses an electronic circuit board with an integrated circuit, electronic components, three LEDs, a provision for batteries and an on/ off switch. This device works on the principle that electrical conductivity of the soil depends on the soil moisture content of the soil between the rods. The electronic circuit is designed in such a way to display moisture levels by glow of one LED lamp out of 3 LED lamps at a time.

How to use NRRI-ARM sensor?

It is well established that maintaining standing water in rice field is not necessary to achieve high water productivity in rice production. However, keeping sufficient moisture in the field is essential to avoid any moisture deficit stress. For assessing optimum moisture in the rice field, NRRI-ARM sensor is installed in the rice field. The rods of the device should be properly inserted into the soil upto the required depth (approximately 25-30 cm). The inbuilt electronic circuit in the device interprets resistance or conductance between the sensor rods and illuminates one of the LED bulbs out of the three, depending on the soil moisture content. The electronic circuit is designed in such a way that different colored LED bulb corresponds to different levels of soil moisture content. Blue light indicates abundant moisture, hence irrigation not required; yellow light indicates low moisture content, hence irrigation is recommended and red light indicates very low moisture content, hence immediate irrigation is required.

Table 1. Interpreting Soil Moisture status from NRRI-ARM sensor

Color of bulb	Soil moisture status	Interpretation
Blue	Sufficient moisture	Irrigation not needed
Yellow	Low moisture	Irrigation advisable
Red	Very Low moisture	Immediate need of irrigation

Advantages

- No need to install this device permanently in the field.
- It is portable and easy to handle.
- Easy to install in the field.
- Provides instant indication of the real time soil moisture status.
- Indicates soil moisture level in the form of different colors, which can be easily interpreted by farmers.
- Irrigation scheduling based on this device can save irrigation water upto 41%, without any significant yield loss as compared to the conventional practice of rice cultivation.

Limitations

This device doesn't provide exact soil moisture content. The LED color indications of this device can only be used for objective indication of soil moisture. This device works well for varied type of soil, however, in case of heavy clay soil/sandy soils/ saline soils, this device often gives erroneous results

Precautions

- When the LED glow of the device is dim, replace/recharge the batteries.
- This device has two sharp metal rods. Keep the device away from the reach of children to avoid any personal injury.

Upscaling

This user-friendly device can be upscaled by imparting training and demonstration by taking leverage of several government schemes. Policy support and systematic extension will help popularization of this device among different stakeholders.

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REAL TIME SOIL MOISTURE MONITORING

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