

# Where is your soil water? Crop yield has the answer

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Crop yield is highly dependent on soil plant-available water, the portion of soil water that can be taken up by plant roots. Quantitative determination of the maximum amount of plant-available water in soil using traditional methods on soil samples remains challenging, especially at the scale of an entire field.

However, a map of plant-available water capacity for a field would be instrumental in yield potential assessment and site-specific soil and water management, making the search for improved methods of soil plant-available water quantification an important step towards improved crop productivity and management.

One of the alternative methods designed to rapidly and economically estimate plant-available water capacity for a field is the Simple Inverse Yield Model (SIYM). The SIYM first simulates crop yield using a water-budgeting algorithm and growing season weather conditions such as radiation, temperature, and rainfall. As such, yield values can be simulated for a range of levels of soil plant-available water. In the following model step, plant-available water values can subsequently be obtained by matching measured crop yield with the closest simulated yield on a yield map.

A group of researchers at the University of Missouri and the USDA-ARS (Cropping Systems and Water Quality Research Unit) investigated the applicability and performance of the SIYM for poorly-drained claypan soils in Central Missouri, and compared them to well-drained

soils where the model was first developed and tested. For the study, a total of nine corn yield maps were generated using data collected from two fields in Central Missouri during 1993 to 2005. Soil samples were taken to determine plant-available water capacity using traditional laboratory methods. This research was published in the May-June issue of *Agronomy Journal*.

Results showed that measured plant-available water capacity correlated with corn yield better in dry years than in normal or wet years.

Agreement between measured plant-available water and SIYM estimates was weaker in the claypan soils than well-drained soils, especially at locations where the claypan layer was shallow or exposed at the surface. At these locations, plants cannot utilize all the plant-available water in the soil, due to slow water transport in clay-rich soils. As a result, yields simulated by SIYM tended to be higher than measured yields, and thus SIYM-estimated plant available water capacity tended to be lower than measured plant-available water capacity.

The lead author, Pingping Jiang, stated "Compared to the measured plant-available water using traditional methods, the SIYM estimates may be more useful in assessing soil productivity and making site-specific management decisions. SIYM is based on actual yield measurements, and less strongly on conventional soil measurement techniques, which do not take crop-soil-water interactions into account."

Source: Soil Science Society of America

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