CORN TALK NEWS
PENNSYLVANIA CORN GROWERS ASSOC., INC.

Got Water? Crop Thirst Depends On Soil Type

COLUMBUS, Ohio — The biggest element in the world of agricultural production that makes or breaks a crop is water.

"The biggest risk to production is not practices like fertilization, but the amount of water present in the soil," said Brian Slater, an Ohio State University natural resources researcher. "The limitation of water impacts a crop's growth potential and does have an influence on other production practices."

Slater and his colleagues are using geospatial technology to map soil water levels in fields and demonstrate how growers can use information on water-deficit areas or saturated fields to better manage their crop. Geospatial technologies include remote sensing, geographic information systems (GIS), global positioning systems (GPS), data recording and analyzing and aerial and satellite photography.

"Knowing a crop requires different management practices even in different parts of the same field as a result of varying water levels can help produce those maximum yields," said Slater.

The first step to realizing a soil's water capacity is to understand the type of soil one is dealing with. More than 480 different soil series have been identified in Ohio, each with a different set of characteristics reflecting how the soil formed.

The amount of water that a soil can hold is dependent upon a variety of factors including: how much rainfall the soil receives during the growing season; the water needs of the crop (corn is more water-dependent than other crops like wheat); what type of production a farmer practices (no-till or conservation tillage provides better soil filtration); and if the soil is situated to receive run-off.

Ultimately, however, it's the size of the particles that make up the soil that determines whether the soil holds onto water or quickly loses it. Clay soils, for example, are made up of fine particles that hold onto water very easily, but make it difficult for plants to access.

"In clay soils, the soil particles have an enormous surface area. The soil absorbs large amounts of water but holds on to it very tightly, resulting in a less available water capacity for plants," said Slater. "As a result, it takes large amounts of water for the soil to reach a water content that is available for plants."

This explains why fields throughout north and northwest Ohio, comprised predominately of clay soils, have been suffering from insufficient rainfall this growing season.

At the other end of the spectrum are sandy soils. Made up of very large particles, they don't hold on to water well and, as a result, drain much quicker.

Slater said the ideal soil is silt loam, a mixture of fine and large particles that offers a range of water holding capacity. "Ohio is fortunate in that silt loam is a common soil texture in the state, and many Ohio soils have a high water holding capacity," said Slater.

Once a grower knows what type of soil(s) his field has, he can then determine the water holding capacity and use that number as a guide for calculating the water needs of his crop. County soil surveys are available from the U.S. Department of Agriculture Soil Conservation Service.

Ohio State researchers have also developed a comprehensive soil property database that growers can access by logging on to http://www.ag.ohio-state.edu/agwatmgt/tables.htm. The database provides detailed soil information, including the available water capacity of every soil series identified in Ohio.

"The database gives growers some indication of what water is available to the plant during a normal growing season," said Slater.

Average water use of a corn crop during pollination and grain fill is about ⅓ inch per day. So, for example, with a water storage capacity of 1.8 inches per foot, a fully-charged silty clay loam soil might carry corn with a three-foot rooting depth up to 18 days during silking and early grain fill stages.

Said Ohio State agronomist Peter Thomison, although corn roots can grow as deep as eight feet, when actively growing, corn obtains 90 percent of its water requirements from the top three feet of the soil profile.

Growers should keep in mind that soil types have varying water capacity depths and different layers of soil types that affect root growth, especially during a period of dry weather.