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Soil Moisture

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Abstract
Soil moisture is critical for crop production in most years in north western Iowa. Soil moisture samples were taken at 20 sites in northwest and west central Iowa during the last few days of October 2012. Moisture samples were taken at 1-ft increments down to a 5-ft depth. Samples were weighed, oven dried, and reweighed at the ISU Northwest Research Farm. The moisture percentage was calculated from these data, and then used to calculate the inches of plant available moisture in the soil.

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Introduction

Soil moisture is critical for crop production in most years in north western Iowa.

Materials and Methods

Soil moisture samples were taken at 20 sites in northwest and west central Iowa during the last few days of October 2012. Moisture samples were taken at 1-ft increments down to a 5-ft depth. Samples were weighed, oven dried, and reweighed at the ISU Northwest Research Farm. The moisture percentage was calculated from these data, and then used to calculate the inches of plant available moisture in the soil.

Results and Discussion

The amount of subsoil moisture in northwest Iowa, not surprisingly, was well below average. The data from these sites are listed in Table 1. The level of subsoil moisture at the soil moisture sites in 15 northwest Iowa counties ranged from 1.2 in. to 7.0 in. of plant available moisture. The average among the 20 observations in the 15 counties was 4.5 in. The median value was 2.9 in. of plant available moisture. There was less than 5 in. of plant available moisture in the top 5 ft of soil in 17 of the 20 observations.

Soil moisture has been a concern since July 2011. Rainfall has been below normal to much below normal since mid-July 2011. Subsoil moisture levels were below normal at most of the locations when levels were checked during the fall of 2011 and in late April 2012. However, much of the area produced excellent corn and soybean crops on limited summer rainfall. Corn and soybean crops seemed to produce root systems that went deeper than the expected 5-ft depth. Deeper rooting may have been a result of good planting time conditions and a relatively dry spring that encouraged early season root development. This example is illustrated by the data from the subsoil moisture site near the town of Schaller. This location had 6.2 in. of subsoil moisture on April 23. Rainfall was between 8.1 and 10.5 in. of rainfall from April 23 to September 1. The subsoil moisture and rainfall total was about 15.0 in. for this location. That was well below the 20 to 22 in. of moisture that is considered necessary to grow a normal corn or soybean crop. However, corn and soybean yields in this area were near normal, with corn and soybean yields in the range of 170 bushels/acre and 50 bushels/acre, respectively. This moisture deficit also illustrates the fact that the corn and soybean crop accessed moisture below the normal 5-ft rooting depth.

The larger concern may be that this will be the third year with extended dry conditions. The conditions going into the 2013 crop year may represent the largest crop production risk in terms of the effects of long-term drought conditions. The subsoil moisture that is below normal 5-ft rooting depth is also likely depleted and therefore would not be available to carry the crop through an extended dry period in the summer. Another concern may be the location of the moisture in the soil profile. Many of the locations show that most of the moisture is in the top 2 or 3 ft of the profile. The soil profile that is 4 and 5 ft in depth shows almost no moisture.

The soil profile at the Schaller location, for example, contains no moisture from 2 to 5 ft deep in the profile.

Rainfall during November, March, and April also will contribute to subsoil moisture. Typical rainfall for those months is 4.8 to 5.7 in. About 80 percent of that rainfall contributes to subsoil moisture reserves.

Table 1. Soil moisture available to plants.

Site	County fall average (in.)	County	2012 crop	Plant available moisture (in.)
Doon	4.3	Lyon	corn	3.0
Sibley	5.1	Osceola	corn	2.2
Spirit Lake	5.7	Dickinson	corn	3.9
Estherville	5.9	Emmet	soybean	1.4
Ireton	4.2	Sioux	soybean	4.5
Sanborn	5.9	O'Brien	corn	4.5
Sutherland	5.9	O'Brien	corn	5.1
Rossie	5.7	Clay	corn	5.8
Akron	4.3	Plymouth	corn	1.8
Le Mars	4.3	Plymouth	corn	2.2
Hinton	4.3	Plymouth	soybean	2.0
Cherokee	5.6	Cherokee	corn	7.0
Marcus	5.6	Cherokee	corn	4.7
Newell	6.0	Buena Vista	corn	4.3
Rolfe	6.0	Pocahontas	soybean	3.2
Lawton	4.6	Woodbury	corn	1.6
Anthon	4.6	Woodbury	corn	2.6
Battle Creek	6.0	Ida	soybean	2.8
Schaller	5.9	Sac	corn	2.9
Castana	4.9	Monona	corn	1.2