1-31-2012

Corn and Dry Soils at Planting, Looking Ahead to 2012—Part I: Yield prediction with dry conditions at planting

Roger W. Elmore
Iowa State University, relmore@iastate.edu

Corn and Dry Soils at Planting, Looking Ahead to 2012—Part I: Yield prediction with dry conditions at planting

Abstract
Dry conditions persist in many parts of Iowa. As of Jan. 30, modeled volumetric root-zone soil water in the northwestern half of the state was one-third or less (see Mesonet map). Elwynn Taylor, Iowa State University Extension and Outreach climatologist, indicates there is some probability that these dry conditions will persist.

Keywords
Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

Integrated Crop Management NEWS

Corn and Dry Soils at Planting, Looking Ahead to 2012 – Part I

Part I: Yield prediction with dry conditions at planting

By Roger Elmore, Department of Agronomy

Dry conditions persist in many parts of Iowa. As of Jan. 30, modeled volumetric root-zone soil water in the northwestern half of the state was one-third or less (see Mesonet map). Elwynn Taylor, Iowa State University Extension and Outreach climatologist, indicates there is some probability that these dry conditions will persist.

What if it is dry at planting in 2012?

Methods

We don't have specific research experiments planted every year in Iowa to provide actual yield data for dry planting conditions – we don't often have dry soils at planting. However, modeling tools that simulate dry conditions at planting help us understand the effect of dry conditions on potential yield. The corn simulation model Hybrid-Maize can address several questions regarding corn management practices. The model uses historic weather data from automated weather stations. I used data from five of ISU's Research and Demonstration Farms, one in each of the four corners of Iowa and the other near Ames in central Iowa.

The model allows users to change soil moisture conditions at planting to simulate different possibilities. With this capability, we can address the question, "What if the soils are only half field capacity (FC) at planting?"

In this exercise I compared two moisture levels: A. 75 percent field capacity (FC) in the topsoil (0-12 inches) and 100 percent FC in the subsoil (12-40 inches), and B. 50 percent FC in both topsoil and subsoil. I realize that many soils now are drier than 50 percent FC so the second possibility may be overly optimistic for those areas. Other common inputs for each site modeled are provided in Table 1. Factors that varied across locations such as soil textures are shown in Table 2.

Simulation Results

Without changing hybrids or plant populations, with drier soils at planting, probabilities of reduced yield vary depending on the location in the state (Table 3). If we have a year with weather conditions like those of 2011 at the five locations with the stipulation of planting into dry soils, yield potentials at the Northwest (NW) Sutherland, Northeast (NE) Nashua, and Central Ames research farms would be similar to what they would be if the soils were moist at planting. The weather experienced at each of these sites was sufficient to overcome any disadvantage of the dry soil planting conditions. However, at the Southwest (SW) Lewis farm yields would be 64 percent of those of a wet soil at planting; at the Southeast (SE) Crawfordsville farm, 70 percent.

Another way to think about yield potentials is to look at probabilities of experiencing a year that would provide yield reductions with dry soils at planting. A median year at NW, SW and SE would result in sizeable yield reductions if soils were dry at planting. A 25 percentile year would reduce yields at NE if soils were dry at planting, and only the worst year since 1986 would reduce yields at the Central location.

We all know that many things can happen between now and planting. If soil moisture conditions do not improve by planting, yields will be reduced at many Iowa locations. Meanwhile, let's hope for complete recharge of our soil before planting and a good year!

Endnote: This article and the two associated with it summarize portions of the 2012 Crop Advantage Series (CAS) talk entitled "Long silks, short pollen,... long year" presented in January 2012. Slides from that presentation with more detail are available here: CAS Presentation Slides.

Table 1. Hybrid-Maize model input factors that were the same across locations and years

Factor	Factor Input Value/ Date
Emergence date	15 May
Plant population	32,000 plants per acre
Soil moisture	
Situation A	
Top soil	75% Field capacity (FC)
Sub soil	100% Field capacity (FC)
Situation B	
Top soil	50% Field capacity (FC)
Sub soil	50% Field capacity (FC)
Rooting depth	40 inches

Table 2. Hybrid-Maize model input factors that varied by location

	ISU Research & Demonstration Farm (Location)				
Factor	**NW**	**NE**	**Central**	**SW**	**SE**
Year†	1988	1988	1986	1997	1988
Top Soil	SiClLo‡	Lo	ClLo	SiClLo	SiClLo
Sub Soil	SiClLo	Lo	ClLo	SiClLo	SiClLo
Hybrid GDU§	2500	2500	2600	2600	2600

† Year when weather data collection began

‡ Si = Silt, Cl = Clay, Lo = Loam.

§ GDU = Growing Degree Units; 2500 = about 105 RM; 2600 = about 110 RM.

Table 3. Effect of dry soils relative to wet soils at planting on simulated corn yield potential.†

	ISU Research & Demonstration Farm				
Year or Percentile	**NW**	**NE**	**Central**	**SW**	**SE**
	Yield with Dry Soil (Percent)‡				
2011	100	99	100	64	70
Best yield	100	100	100	100	102
75 percentile	100	99	103	100	97
Median year	88	97	98	85	75
25 percentile	70	80	100	65	48
Worst yield	44	58	65	52	26

† In these simulations: Dry soil conditions = both topsoil and subsoil 50% Field Capacity (FC) at planting; Wet soil conditions, topsoil = 75% FC and subsoil = 100 FC at planting.

‡ Dry Soil divided by Wet Soil simulated yield within the same 'Year or Percentile 'multiplied by 100 to calculate Percent of Wet Soil Yield.

Roger Elmore is a professor of agronomy with research and extension responsibilities in corn production. He can be contacted by email at relmore@iastate.edu or (515) 294-6655.

This article was published originally on 1/31/2012 The information contained within the article may or may not be up to date depending on when you are accessing the information.