Maize-N: An Integrated Approach for N Rate Recommendation for Corn

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Abstract

Maize-N model is a computer program that estimates field-specific, economically optimal N rate (EONR) for corn crop based on mechanistic and quantitative understandings of corn cropping system. It achieves the goal in a systematic manner: (1) simulate maize yield potential and year to year variation using long-term weather data and user-set management for hybrid maturity, planting date and plant population, (2) assess attainable yield either based on field-specific, past yield record or using generic estimation, (3) estimate N uptake requirement for the attainable yield, (4) simulate mineral N release from soil organic matter, crop residues (including roots) and manures, (5) estimate recovery efficiency of applied N fertilizers, and (6) assess EONR of fertilizer maize based on pricing info of corn grain and fertilizer. The model has been tested and validated in US Corn Belt (Setiyono, et al, 2011), and is being tested globally.

The model is available at: http://hybridmaize.unl.edu/maizen.shtml

Comprehensive outputs



Straightforward input settings

N Maiz	e-N: Nitrogen Rate Recommendation for Maize	the same comparison provide the second transmission					
Setting	Result Utilities Help						
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	-Weather data						
Ð	From local weather station						
l ti		Weather file Clay Center, NE. wth	Estimate N rate				
t s		26 years of data included	Metric units				
ndu	The maize crop	N fertilizer management	Properties of top-soil				
	Maturity @ GDD10C 1500	Basal application	Soil organic carbon content, %				
	C CRM, days	Fertilizer Anhydrous ammonia 🔹	Torturo Learn				
	Date of planting 1st week - May -	N content, % 82					
_		Price per Mg 300	Bulk density, g/cm3 1.3				
sult	Plant population, x1000/ha / /4	% in total N rate 30	Acidity Neutral -				
Be							
	Price of maize per Mg 250	Time of application 2nd half - April -	Manuring 🔽				
	Mean yield of previous years 🔽 🔰 10	In-season application	Type of manure Beef manure 💌				
		Fertilizer Anhydrous ammonia 💌	Organic N content, % in DM 2.4				
	-Last crop	N content, % 82	Inorganic N content, % in DM 0.25				
		Price per Mg 500	Moisture content, % 81				
		Number of doses 1	Fresh weight Ma/ba				
	Economic yield, Mg/ha 10						
	Time of maturity 1st half 💌 Oct 💌	User-set overall N recovery 0.4	Time of application 1st half 💌 April 💌				
	Amount of crop residue left in field All	N from irrigation water, kg/ha 10					
		,	Measured soil nitrate of root zone 🔽 —				
	N fertilizer applied Amount, kg/ha	Tillage	Amount, kg N/ba 50				
	Anhydrous ammonia 🗨 200	Type of tillage Plow/disk 💌					
	🗖 Anhydrous ammonia 🖃 100	Time of operation 1st half 💌 April 💌	Time of sampling 1st half 💌 April 💌				

N rate determination process







<u> </u>	5	min contracto or microped (for paeteria), default = 5		
6	3.3	min C dissimilation to assimilation ratio (DA ratio) of microbes (normal condition); default = 3.3		
7	14	max C dissimilation to assimilation ratio of (DA ratio) microbes (for bacteria); default = 14		
8	10	Reference T (oC) for R and S; default = 10		
9	2	Q10 coefficient: default = 2		
10	2	Difference of soil-T minus air-T (oC); default = 2		
11	35	Tmax cutoff (oC)/ default = 35		
12	1.39	R of loam soil relative to R of sandy soil in froation; default = 1.39 derived from Sorensen (1983)		
13	1.08	S of loam soil relative to R of sandy soil in fraction; default = 1.08 derived from Sorensen (1983)		
14	1.78	R of clay soil relative to R of sandy soil in fraction; default = 1.78 derived from Sorensen (1983)		
15	1.15	S of clay soil relative to R of sandy soil in fraction; default = 1.15 derived from Sorensen (1983)		
16	0.3	Ratio of amount of SOC below topsoil to the amount of SOC in the topsoil		
17	20	Depth of topsoil, cm		
18	15	Days before last crop maturity when mineral N from SOM mineralization will be available to the next crop		
19	15	Days after last crop maturity when roots start mineralization		
20				
04				

Ref: Setiyono, TD; Yang, HS; Walters, DT; Dobermann, A; Ferguson, RB; Roberts, DF; Lyon, DJ; Clay, DE; Cassman, KG, 2011. Maize-N: A Decision Tool for Nitrogen Management in Maize. Field Crops Research, 103, 1-8.

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