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Updated Nitrogen Application Rate Guidelines for Corn

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In 2005, the N application rate guidelines for corn were updated to follow a regional approach called maximum return to N or MRTN. This method allows farmers to select a N rate that is appropriate for their economic situation, soil, and cropping system.

The MRTN and range of profitable N rates is calculated using data from N response experiments in Wisconsin. Since the MRTN debuted in 2005, corn N response data have been added to the database annually. These new sites comprise small plot trials at UW Ag Research Stations along with many more replicated field strip trials conducted by County Extension Agents in cooperation with farmers, consultants, and ag businesses. A total of 62 new sites were added to the database since 2005 (Table 1, next page).

The current database comprises 157 sites; the location of these trials are shown in Figure 1 (next page). Because so much new data was acquired, it was time to determine how much the addition of this data would affect the MRTN and if the MRTN guidelines needed updating.

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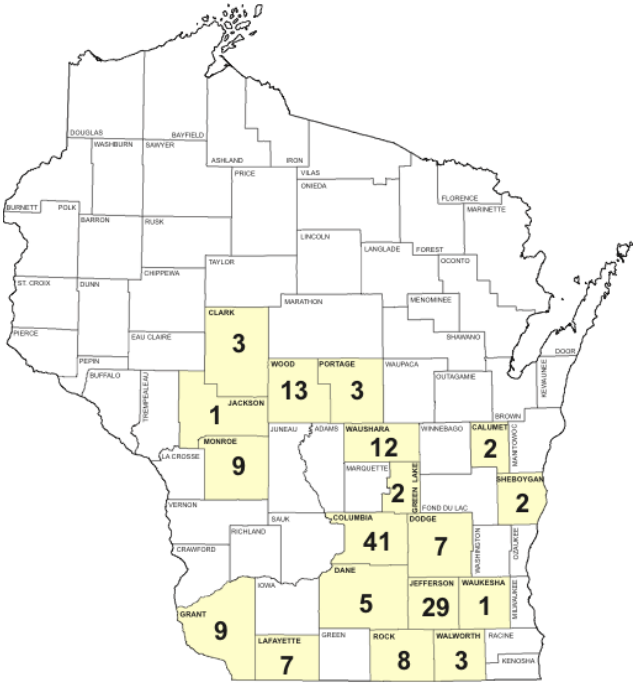
The first 2010 UW-Extension/ Madison Plant Disease Diagnostic Clinic (PDDC) Update

Table 1. Number of corn N response sites added to the database since 2005.

Soil Yield Potential	Previous Crop	Sites added since 2005
High/Very High	Corn	14
	Soybean	24
Medium/Low	Corn	8
	Soybean	9
Irrigated sands/loamy sands	All	1
Non-irrigated sands/loamy sands	All	6
TOTAL		62

Figure 1. Location of MRTN trials comprising the Wisconsin corn N response database (April 2010).



So what was found when the new larger database was analyzed?

First, no relationship between grain yield and the amount of N needed to obtain that yield was found (Figure 2, next page). Second, the contribution of mineralized soil N towards maximum yield is substantial (Table 2, next page).

For example, yield when no N was applied was 65 and 61% of maximum yield for corn following corn on high/vey high and medium/low yield potential soils, respectively. When corn followed soybean, 74 and 85% of maximum yield was achieved with no N for high/very high and medium/low yield potential soils, respectively. Irrigated sand/loamy sand soils with low organic matter contents are highly responsive to N fertilization whereby soil N mineralization only contributed 35% of the total yield. When these soils are not irrigated, they are limited more by water than lack of N as evidenced by the fact that the soil supplied enough N for 52% of maximum yield. It should be noted that maximum yields in Table 2 are the average for each soil yield potential and previous crop category in the database. There are numerous very high yielding (>200 bu/a) sites in the high/very high yield potential and irrigated sands/loamy sands categories. Both of these observations confirm previous findings.

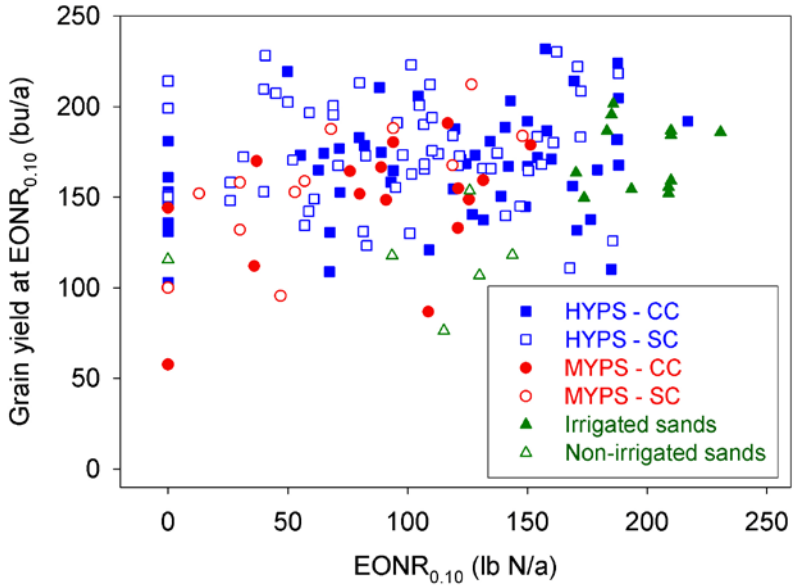


Figure 2. Relationship between the economic optimum N rate at the 0.10 N:corn price ratio ($EONR_{0.01}$) and grain yield at the $EONR_{0.01}$ for sites comprising the Wisconsin corn N response database.

Table 2. Contribution of mineralized soil N towards maximum yield.

Soil Yield Potential	Previous Crop	Yield at 0 lb N/a	Maximum Yield	Relative Yield
		——— bu/a ———		%
High/Very High	Corn	110	169	65
	Soybean	130	176	74
Medium/Low	Corn	91	148	61
	Soybean	134	158	85
Irrigated sands/loamy sands	All	61	174	35
Non-irrigated sands/loamy sands	All	61	118	52

The MRTN was calculated using four N:corn price ratios (0.05, 0.10, 0.15, and 0.20) with the corn price being set at $4/bu. The third finding of the data analysis is that the MRTN obtained using the new, larger database is 5 to 25 lb N/a greater than when the old database was used. This difference was deemed large enough to justify updating the guidelines. The new MRTN guidelines are presented in Table 3. The biggest changes occur in the non-irrigated sands/loamy sands, all previous crops and medium/low yield potential soils, corn following soybean categories. These larger increases result from the new data, added since 2005, comprising a large portion of the total data in those categories. The N rates that represent the range in profitability (within $1/a) surrounding the MRTN rate also changed. Where the MRTN rate increased substantially, the range in profitable N rates shifted upwards accordingly. For soil yield potential and previous crop categories where the MRTN did not change by more than 5 lb N/a, the range in profitable N rates became somewhat smaller.

Table 3. 2010 Updated Maximum Return to N (MRTN) N rate guidelines for corn.

Soil Yield Potential[1]	Previous Crop	N:Corn Price Ratio			
		0.05	0.10	0.15	0.20
		lb N/a (total to apply)[2]			
High/Very High	Corn, Forage & Vegetable legumes, Green manure[5]	**170**[3] 155 – 185[4]	**150** 135 –160	**130** 120 – 145	**115** 105 – 125
	Soybean, Small grains[6]	**140** 125 – 160	**120** 105 – 135	**105** 95 – 115	**95** 80 – 105
Medium/Low	Corn, Forage & Vegetable legumes, Green manure[5]	**125** 110 – 140	**110** 100 – 115	**100** 95 – 110	**95** 85 – 100
	Soybean, Small grains[6]	**110** 90 – 125	**85** 70 – 95	**70** 60 – 80	**60** 50 – 70
Irrigated sands/loamy sands	All	**215** 205 – 225	**205** 195 – 215	**195** 180 – 205	**180** 170 – 195
Non-irrigated sands/loamy sands	All	**140** 130 – 150	**130** 120 – 140	**120** 110 – 130	**110** 100 – 120

[1] To determine soil yield potential, consult UWEX publication A2809 or contact your county agent or agronomist.

[2] Includes N in starter.

[3] Maximum return to N (MRTN) rate

[4] Profitability range within $1/a of MRTN rate.

[5] Subtract N credit for forage legumes, legume vegetables, animal manures, green manures.

[6] Subtract credits for animal manures and second year forage legumes.

The updated MRTN guidelines are effective as of May 1, 2010. The next release of SNAP Plus will contain the updated guidelines. Soil test reports will have the new guidelines printed on them by July 1 at the latest.

For more information on how to use the MRTN guidelines see Chapter 6 Nitrogen in UWEX Publication A2809 *Nutrient Application Guidelines for Field, Vegetable, and Fruit Crop in Wisconsin* (http://www.soils.wisc.edu/extension/pubs/A2809.pdf).

For more information on the philosophy behind the regional MRTN approach see Iowa State University Extension Publication PM2015 *Concepts and Rationale for Regional Nitrogen Rate Guidelines for Corn* (http://www.extension.iastate.edu/Publications/PM2015.pdf).

UW-Extension/Madison Plant Disease Diagnostic Clinic (PDDC) Update

Brian Hudelson, Ann Joy, and Amanda Zimmerman, Plant Disease Diagnostics Clinic

The PDDC receives samples of many plant samples from around the state. The following diseases/disorders have been identified at the PDDC from January 1 to April 27, 2010.

PLANT/SAMPLE TYPE	DISEASE/DISORDER	PATHOGEN	COUNTY
FIELD CROPS			
Soybean	White Mold	*Sclerotinia sclerotiorum*	Sauk
FORAGE CROP			
Alfalfa	Aphanomyces Root Rot	*Aphanomyces euteiches*	Columbia, Dane
	Crown Rot	*Fusarium* spp., *Pythium* spp.	Dane
	Phytophthora Root Rot	*Phytophthora medicaginis*	Columbia, Dane
FRUITS			
Apple	Bitter Rot	*Colletotrichum gloeosporoides*	Walworth
VEGETABLES			
Carrot	Root Rot	*Fusarium* sp., *Rhizoctonia* sp.	Dane
Spinach	Heterosporium Leaf Spot	*Heterosporium* sp.	Winnebago
Pepper (Green Bell)	Tobacco Mosaic	Tobacco mosaic virus	Waukesha
Potato	Bacterial Soft Rot	*Pectobacterium carotovorum*	Oneida, Waupaca
	Black Dot	*Colletotrichum coocodes*	Oneida
	Early Blight	*Alternaria solani*	Dane
	Fusarium Dry Rot	*Fusarium* sp.	Waupaca
	Late Blight	*Phytophthora infestans*	Langlade
	Potato Virus S	Potato virus S virus	Waushara
	Potato Virus Y	Potato virus Y virus	Waushara
Tomato	Bacterial Canker	*Clavibacter michiganensis* pv. *michiganensis*	Douglas
	Cucumber Mosaic	Cucumber mosaic virus	Douglas, Waukesha
	Tobacco Mosaic	Tobacco mosaic virus	Douglas, St. Croix, Waukesha

For additional information on plant diseases and their control, visit the PDDC website at pddc.wisc.edu