
GETTING THE MOST FROM N AND P APPLICATIONS ON PROCESSING CROPS

Larry G. Bundy
Dept. of Soil Science
Univ. of Wisconsin

MRTN Corn N Rate Guidelines

- Introduced for the 2006 growing season
 - In response to higher N costs
 - Based on results of numerous N response experiments
 - Goal is to maximize economic return from N use
-

Impact of Price Ratio on MRTN for Irrigated Sands

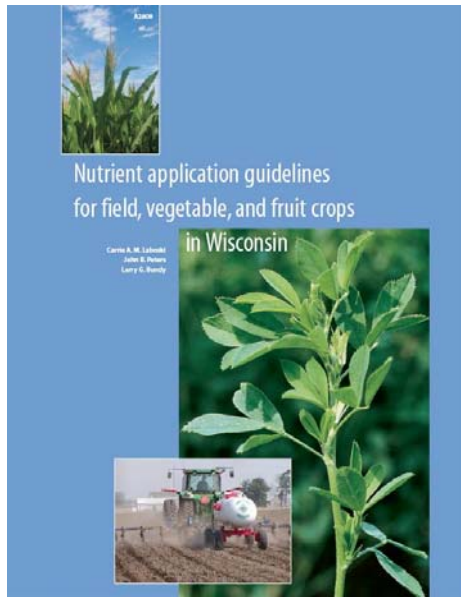
N:Corn Price Ratio	PC = All crops except forage legumes & green manures		
	low	MRTN	high
\$/lb:\$/bu	————— lb N/a —————		
0.05	200	215	230
0.10	190	205	220
0.15	180	195	210
0.20	175	190	200

Includes starter N

N & P Recommendations for Processing Crops

- N rates remain unchanged
 - Insufficient data for MRTN
 - Higher value per unit of yield
 - P rates based on soil test and crop to be grown
-

New Nutrient Guidelines Pub.



<http://www.soils.wisc.edu/extension/>

<http://learningstore.uwex.edu>

Nitrogen Rate Guidelines for Processing Crops

Organic matter (%)	Pea	Snap bean	Sweet corn
< 2	40	60	150
2-10	30	40	130
10-20	20	20	110
>20	0	0	70



Nitrogen Management for Sweet Corn

- Significant N requirement
 - 130-150 lb N/acre for most soils
 - Credit N from legumes and manure
 - Split or delayed N desirable on coarse textured soils
 - PSNT useful to identify N sufficient sites
-



Sweet Corn Yield Response to Nitrogen Rock County, WI

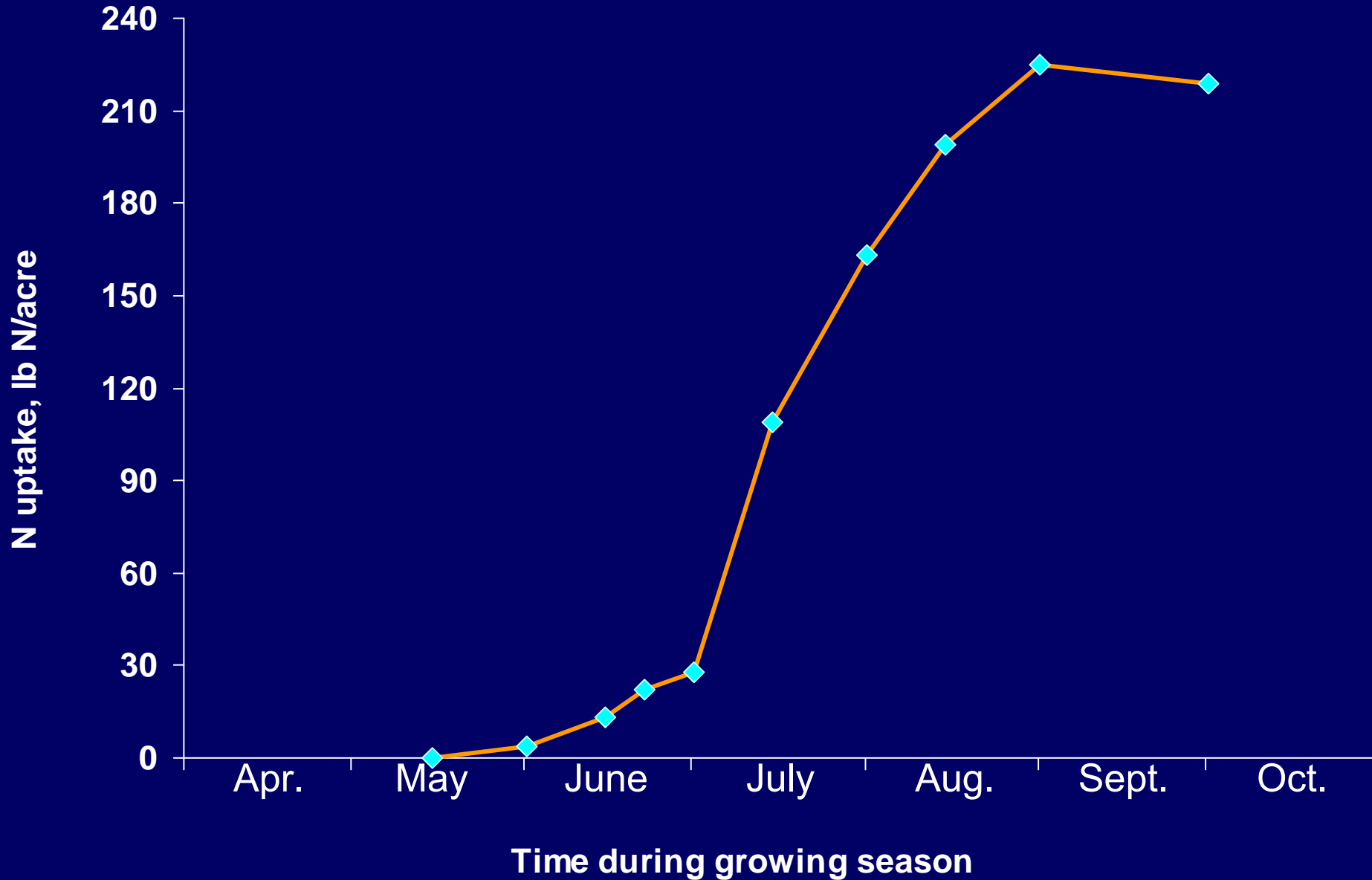
N rate lb/acre	Yield, tons/acre	
	Site 1	Site 2
0	5.64 b	4.17 c
40	6.77 a	6.08 b
80	7.22 a	7.03 a
120	7.55 a	6.78 ab



○ 1b N/a

(1/2) 170 1b N/a

Timing of Nitrogen Uptake by Corn



Nitrogen rate and timing effects on corn yield and N recovery, Hancock, WI, 2003-2004

N rate (lb/acre)	Yield (bu/acre)		N recovery (%)	
	Preplant	Sidedress*	Preplant	Sidedress*
0	96	96	--	--
50	122	142	47	84
100	145	175	45	79
150	164	194	42	73
200	180	202	40	66
250	193	202	37	57
Average	161	183	42	72

* Split sidedress N applied at 4 and 7 wk after planting.



Sweet corn yield response to N, Hancock, WI

N rate*	Yield		
	Year 1	Year 2	Year 3
lb/acre	-----	tons/acre	-----
0	4.43	3.44	1.90
170	9.74	11.0	8.40

* N applied as ammonium nitrate in two equal split sidedress applications.

Nitrogen uptake and source by sweet corn, Hancock , WI

Plant part	Total N uptake	Fert. N uptake	Soil & water	Unknown
	----- lb N/acre** -----			
Ear	84	54 (32)	24	6
Residue	82	51 (30)	26	5
Total	166	105 (62)	50	11

* 170 lb N/acre of labeled ammonium nitrate applied in two equal split sidedress applications. ** Ave. of two years.

Nitrogen Management for Snap Beans

- Optimum N rate:
 - About 60 lb N/acre on sandy soils
 - About 40 lb N/acre on medium soils
 - Year-to-year variation in optimum N rate
 - Leaching losses on coarse-textured soils
 - Additional N (30-40 lb N/acre) needed if leaching is extensive
 - Varieties: N needs (optimum N rates) are similar
-

Nitrogen Management for Snap Beans

- Excess N showed yield reduction
 - N rate did not affect sieve size (measure of maturity)
-

Nitrogen Management for Snap Beans

- Nitrogen timing:
 - Apply part of N early in growing season (1st trifoliate)
 - Split N applications are sometimes superior (especially when leaching is extensive)
 - Applying all N late in growing season (bud stage) is usually inferior
-

Phosphate and Potash Application Rates

- Crop
 - Soil test level
 - Yield goal
 - Soil group
-

Soil test interpretation for peas, sweet corn, and snap beans

Soil test

P

K

Soil

Optimum

Ex. high

Optimum

Ex. high

----- ppm -----

Medium textured

16-23

>30

91-120

> 220

Sands

26-37

>55

81-120

> 220

Relationship between P soil test and phosphorus fertilizer recommendation

Soil Test	Recommendation
Low, very low	Crop removal +
Optimum	Crop removal
High	$\frac{1}{2}$ Crop removal
Excessively High	None

Suggested phosphate & potash application rates at optimum soil test levels

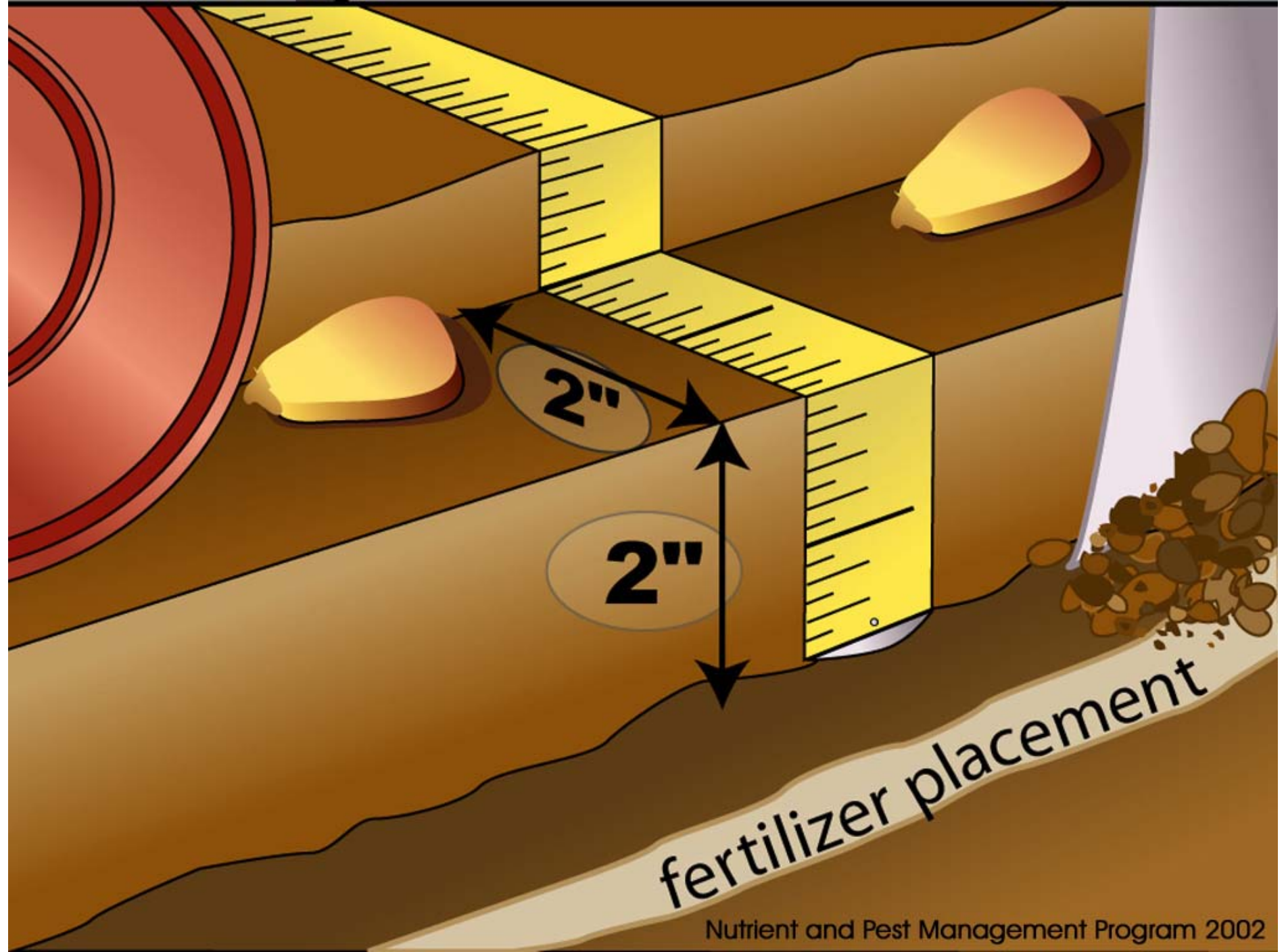
Crop	Yield goal tons/acre	Application rate*	
		P_2O_5 ----- lb/acre -----	K_2O -----
Peas	2-3	25	45
Sweet corn	8-10	30	55
Snap beans	5.6-6.5	30	120

* Approximately equal to crop removal

Phosphate and potash removal by vegetable crops (per ton of yield)

Crop	Crop removal	
	P_2O_5	K_2O
	----- lb/ton* -----	
Sweet corn	3.3	6
Snapbeans	5.0	20
Peas	9.2	18

* Fresh weight



fertilizer placement

Maximum Recommended Starter Fertilizer Rates for Corn

Placement method	Soil type	
	Sands	Silts and Clays
With seed (pop-up)	50 ¹	50 ¹
Side (2" x 2")	300	500

1/ Limit the N + K₂O to 10 lbs/acre

Effect of starter fertilizer rate and placement on sweet corn stand and yield

Rate/ analysis	Place- ment	Plant spacing (in)	Yield (tons/acre)
None	--	11.3	8.14
44/9-18-9	seed	12.0	8.17
44/7-23-5	seed	13.1	8.32
200/7-23-5	3 x 3 (in)	10.3	7.95

Soil test P=28 ppm; K = 190 ppm

Snap Bean Response to Starter Fertilizer on Manured Soils ^{1/}

Year	Yield (tons/acre)	
	Starter ^{2/}	No starter
1	5.33	5.96
2	6.16	6.69

^{1/} Stellato, et al., 1999.

^{2/} Starter = 200 to 250 lb/a of 9-23-30; manure = 25 tons/acre dairy manure

Nutrient Management for Peas

- Lime to pH 6.0
 - Relatively low nutrient requirement
 - Preplant broadcast of complete fertilizer is common (200 lb/acre of 9-23-30 or similar)
 - Fertilizers applied with drill at planting are suitable, but not often used
 - Optimum soil test levels:
 - P = 16-37 ppm
 - K = 81-120 ppm
-

Nutrient Management for Snap Beans

- Lime to pH 6.0 or higher (Target = 6.8)
 - Relatively low nutrient requirement
 - Nitrogen management critical
 - Optimum soil test levels:
 - P = 16-37 ppm
 - K = 81-120 ppm
-

Nutrient Management for Sweet Corn

- Lime to pH 6.0
 - Significant N requirement, relatively low P and K removal (harvested portion only)
 - Optimum soil test levels:
 - P = 16-37 ppm
 - K = 81-120 ppm
-