

ECONOMICS OF WEED CONTROL AND NITROGEN RATE DECISIONS FOR CORN



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Background

N rate guidelines for corn

- Under continued scrutiny
 - ▣ Max. economic returns
 - ▣ Min. water quality impacts

- N rate research database
 - ▣ Sites where N and crop management BMPs are followed

- However, in-season crop stress can potentially affect corn N needs for optimum production

Weeds and yield loss

- Postemergence weed control has become more common
 - ▣ Glyphosate resistant corn hybrids

- Delaying weed control has the potential to alter corn response to applied N
 - ▣ Early-season weed competition for sunlight
 - ▣ Soil moisture
 - ▣ Soil N and other nutrients

- Delaying weed control beyond a 4- to 6-inch weed height results in corn grain yield losses of 7 to 20%

Objectives

- To determine the effect of weed control timing on
 - Corn N uptake
 - Weed N uptake
 - Economic optimum N rate (EONR) for corn
 - Economic return to N and weed control

Materials and Methods

Treatments

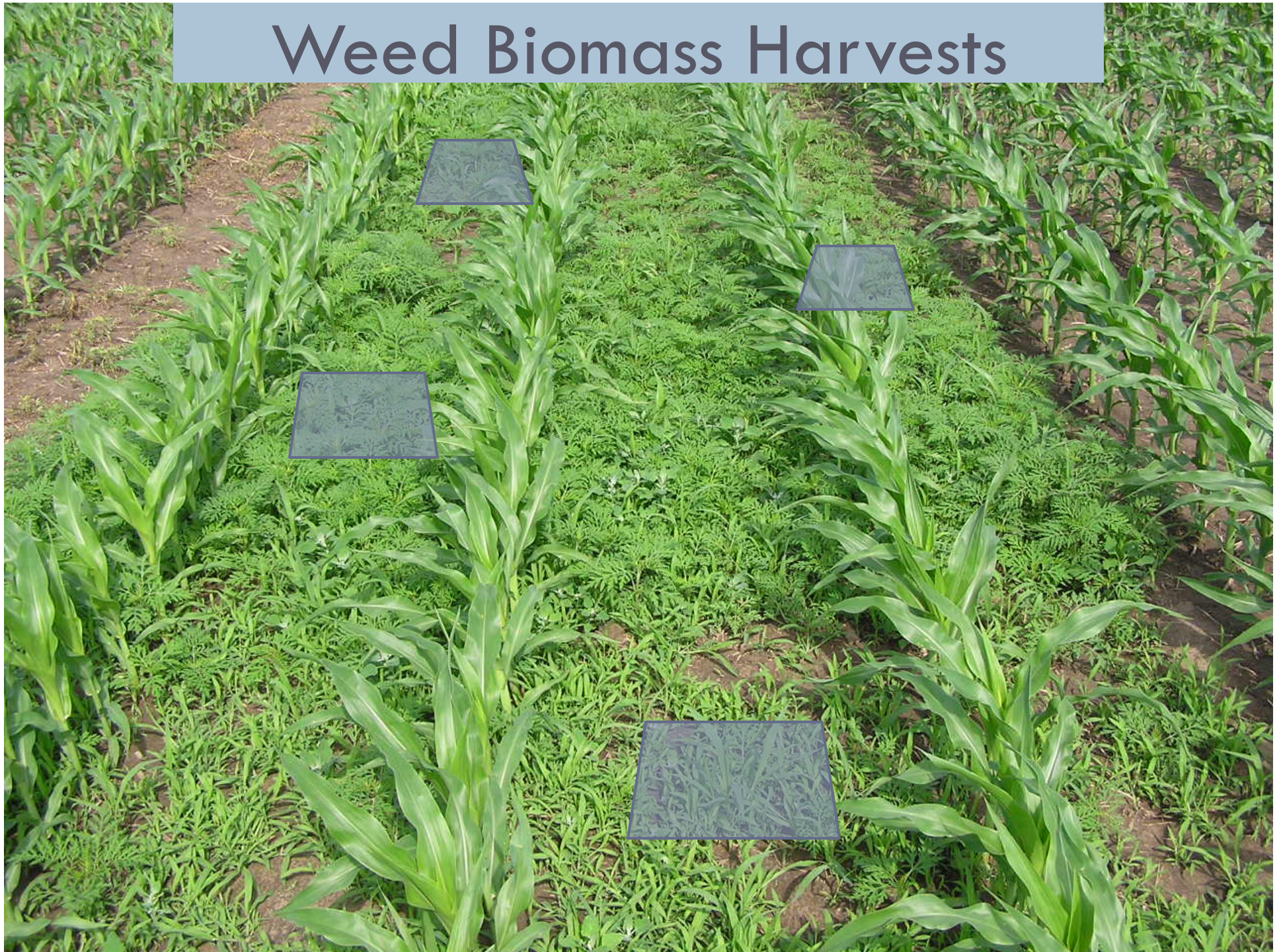
- Split plot RCBD, 4 reps
 - Main plot – N rates
 - 6 rates (0-200 lb N/a)
 - UAN broadcast incorporated prior to planting
 - Sub plot – Weed control
 - Pre-emerge (weed free control, 2.4 qt/a Camix)
 - 4 inch weed height (22 oz/a WeatherMax)
 - 12 inch weed height (22 oz/a WeatherMax)
 - No weed control

Location & measurement details

- Arlington, WI
 - 2006 and 2007
 - Corn following soybean
 - Plano silt loam (fine-silty, mixed, superactive, mesic Typic Argiudoll)
 - Natural weed seed bank

- Measurements
 - Weed biomass and total N concentration at time of weed control
 - For preemerge there was no sample
 - For no weed control
 - 2006 sampled at VT
 - 2007 sample just prior to harvest
 - Corn biomass and total N at VT
 - Grain yield

Weed Biomass Harvests



Results and Discussion

How weedy was it?

July 19, 2006

0 lb N/a

Preemerge

4 inch height

12 inch height

No control



160 lb N/a

Preemerge

4 inch height

12 inch height

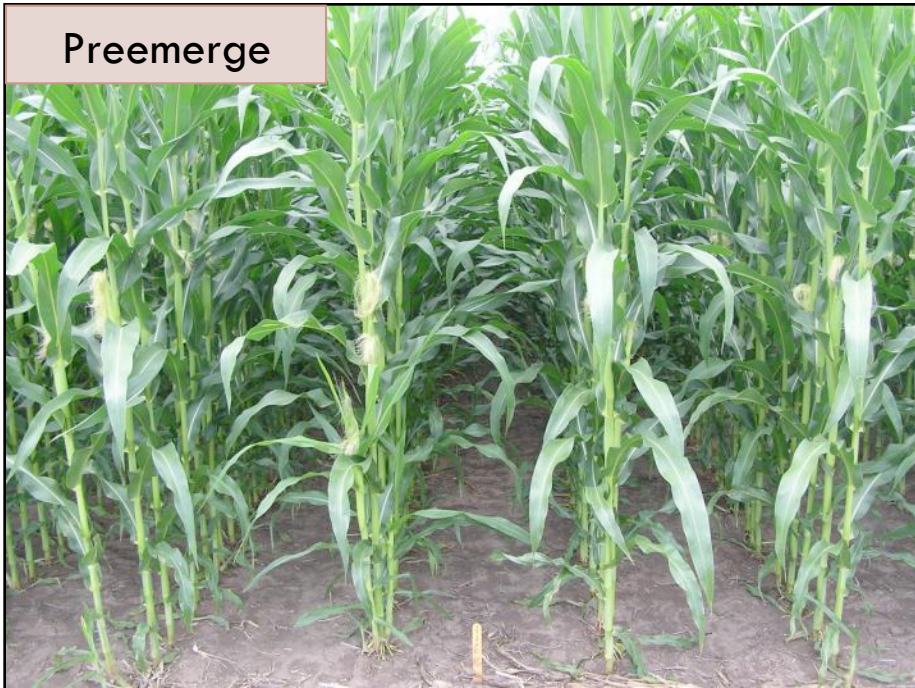
No control





June 13, 2007 – 12 inch spray date





Mid July 2007



Effect of N rate & timing of weed control on corn whole plant N uptake at VT

N rate lb/a	2006 Weed Control					2007 Weed Control				
	Pre	4 inch	12 inch	None	Mean	Pre	4 inch	12 inch	None	Mean
	Corn N uptake at VT, lb/a									
0	57	51	39	21	42 c †	97	83	47	20	62 d
40	78	66	54	30	57 b	113	96	63	30	76 c
80	81	82	63	37	66 b	135	104	96	38	93 b
120	101	98	78	45	80 a	132	121	103	55	103 b
160	92	101	93	46	83 a	132	142	114	84	118 a
200	101	96	93	67	89 a	155	140	103	65	116 a
Mean	85 a	82 a	70 b	41 c		128 a	114 b	88 c	48 d	

† Means separation based on Fisher's protected LSD at $\alpha=0.05$.

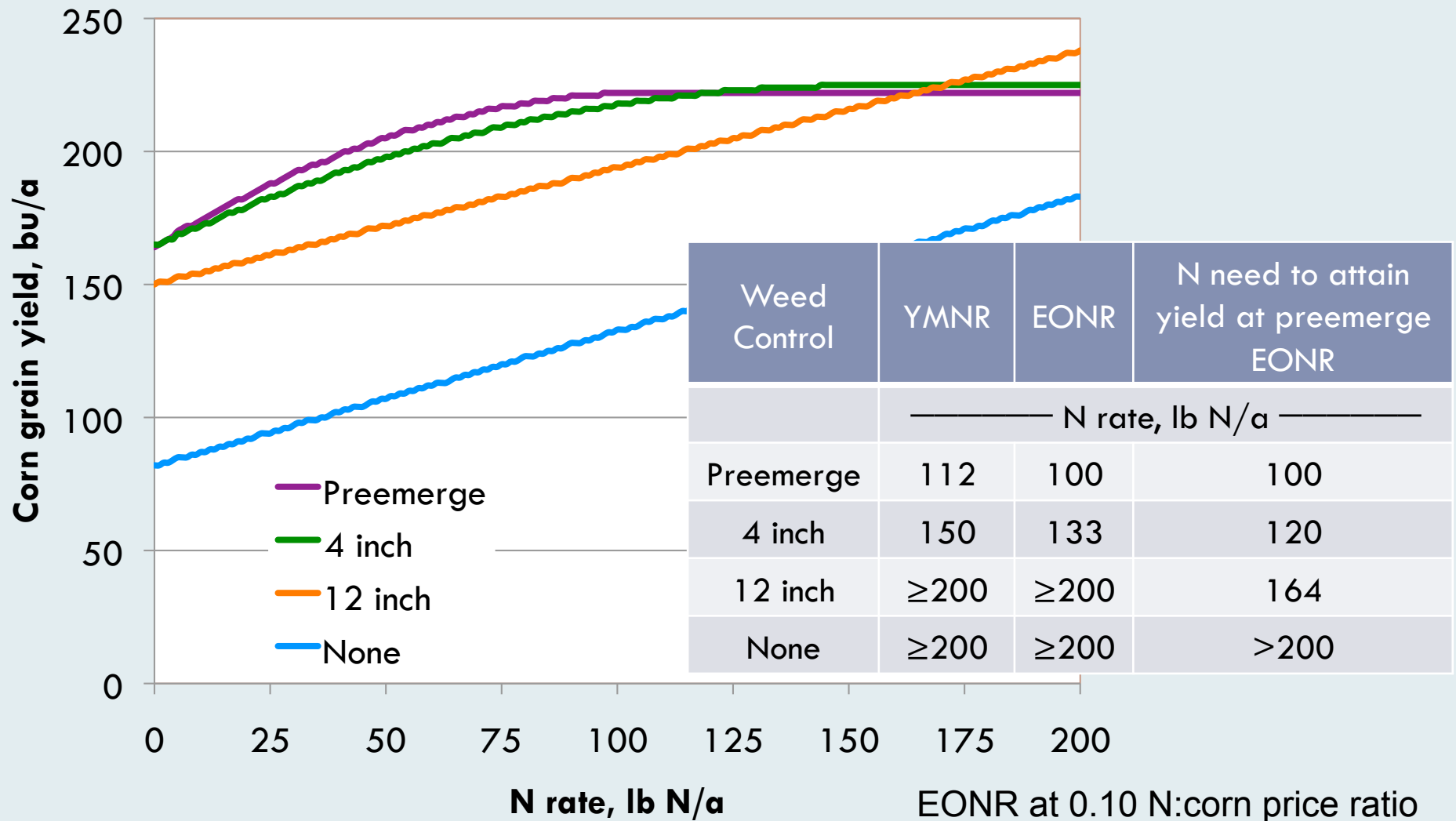
Effect of N rate & timing of weed control on weed N uptake, 2006

N rate	2006 Weed Control			
	4 inch	12 inch	None	Mean
lb/a	Weed N uptake, lb N/a			
0	7	13	39	20 b †
40	14	22	61	32 ab
80	11	28	62	33 ab
120	11	34	98	47 a
160	14	35	81	43 a
200	13	19	101	45 a
Mean	12 c	25 b	74 a	

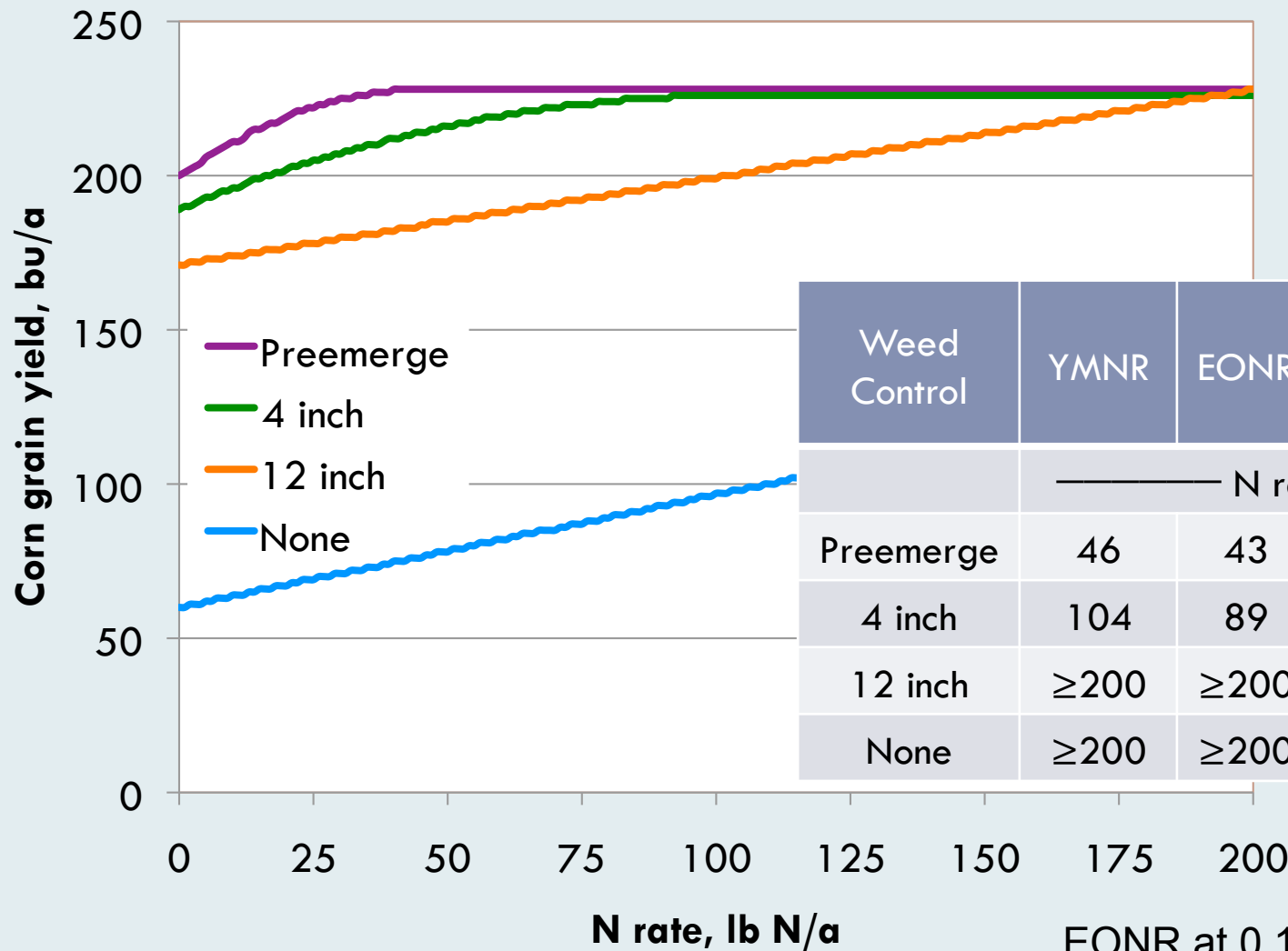
† Means separation based on Fisher's protected LSD at $\alpha = 0.05$.

2007 similar results

Effect of N rate & timing of weed control on corn grain yield, 2006



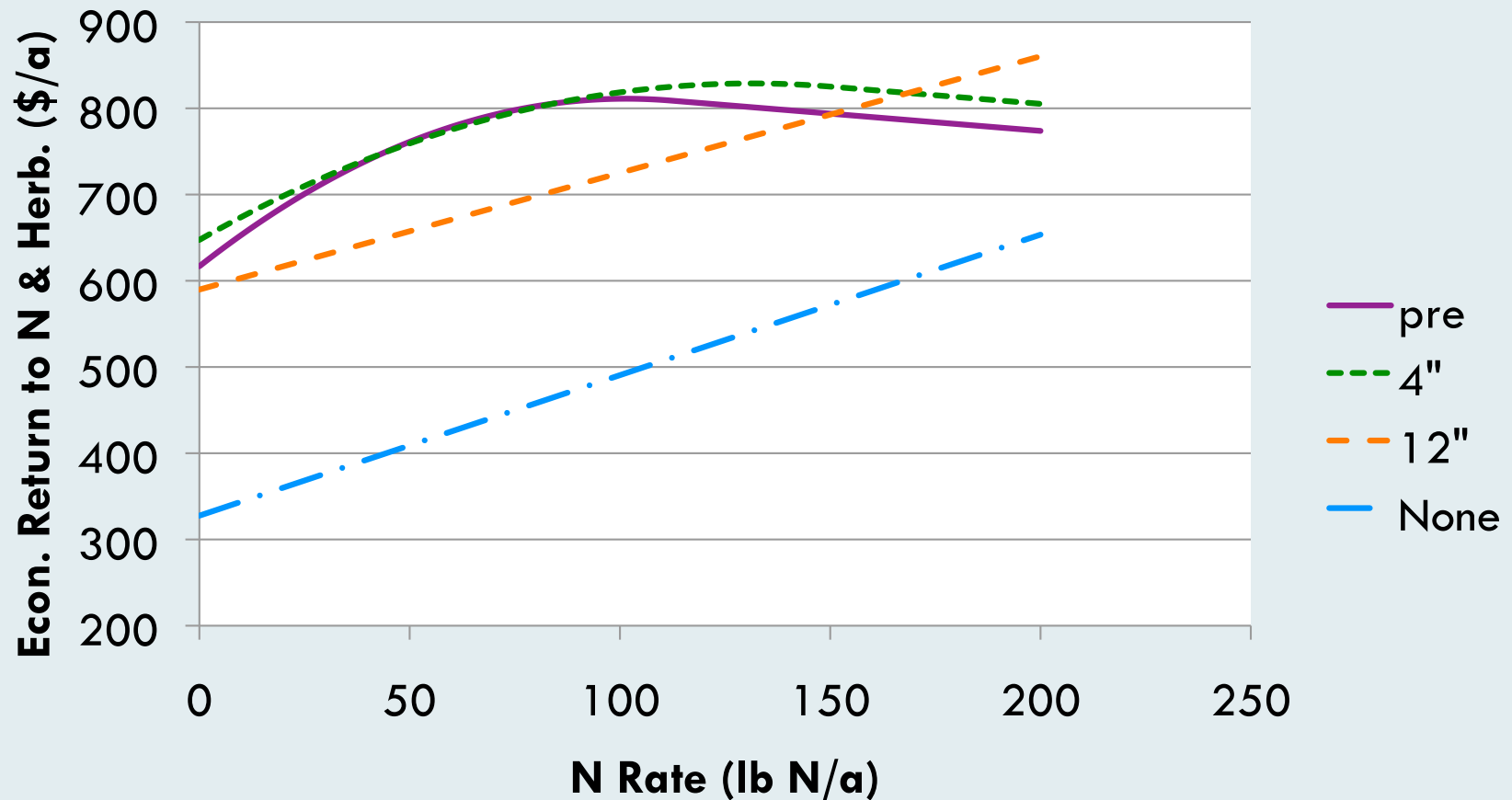
Effect of N rate & timing of weed control on corn grain yield, 2007



Weed Control	YMNR	EONR	N need to attain yield at preemergence EONR
	N rate, lb N/a		
Preemergence	46	43	43
4 inch	104	89	104
12 inch	≥200	≥200	200
None	≥200	≥200	>200

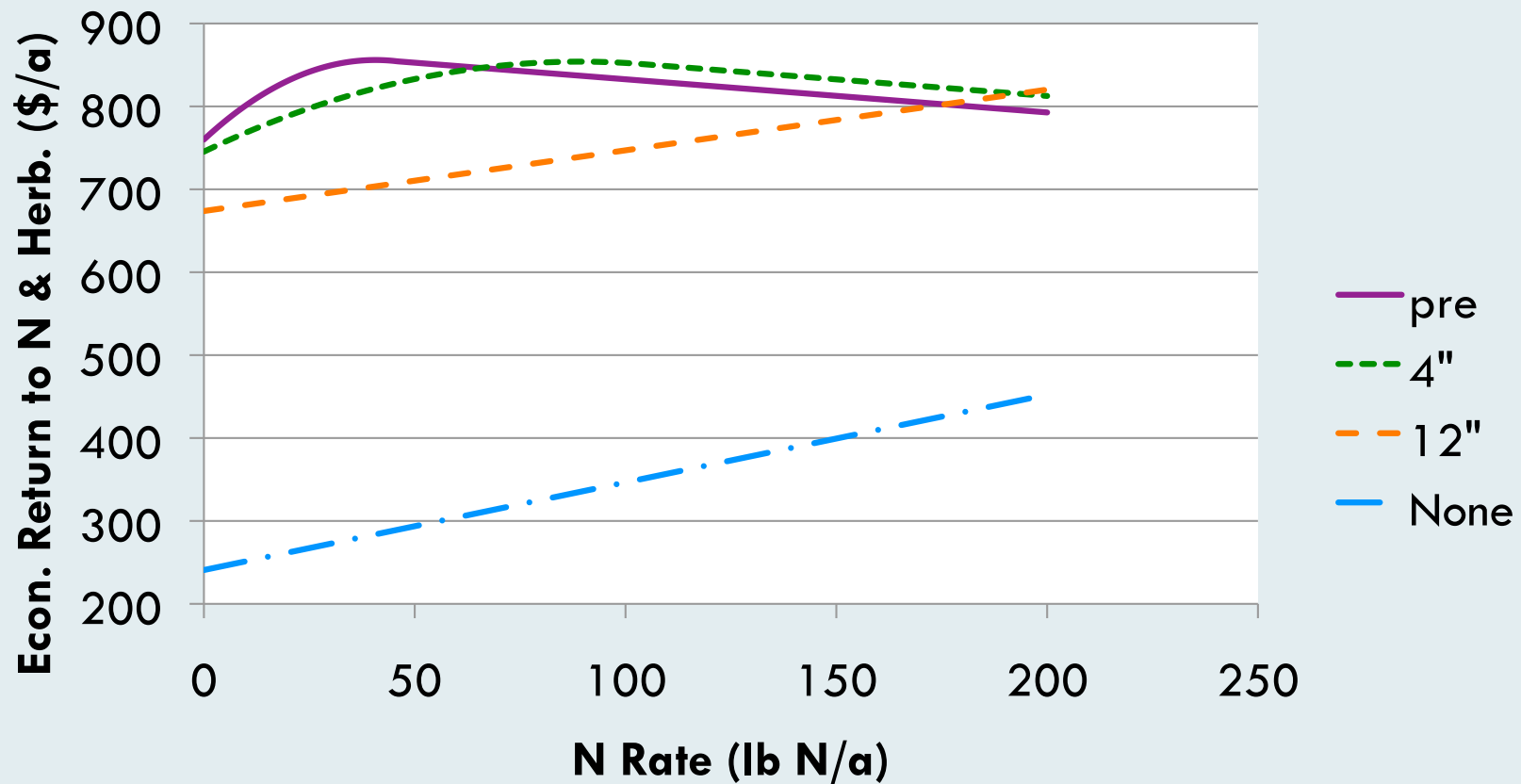
EONR at 0.10 N:corn price ratio

Economic return to N and herbicide, 2006



EONR at 0.10 N:corn price ratio; \$4/bu and \$0.40/lb N
Pre is \$40/a, Post is \$11/a

Economic return to N and herbicide, 2007



EONR at 0.10 N:corn price ratio; \$4/bu and \$0.40/lb N
Pre is \$40/a, Post is \$11/a

Conclusions

- EONR increased as weed control was delayed
- Additional N needed to attain same yield as preemergence EONR
 - ▣ 4 inch – 20 to 61 lb N/a
 - ▣ 12 inch – 64 to 157 lb N/a
 - ▣ None – No amount of N could compensate
- Additional N needed was greater than weed biomass N
- With no weed control, weed + corn N uptake was greater than corn N uptake with preemergence

Conclusions

- At current N prices
 - ▣ Failure to control weeds in a timely fashion is very costly
 - ▣ Preemergent and 4" post weed control can provide similar economic returns in some situations
 - If N prices increase and all other prices remain the same, then preemergent weed control is favored over 4-in. postemergent control