Appendix A

Chris Brosch

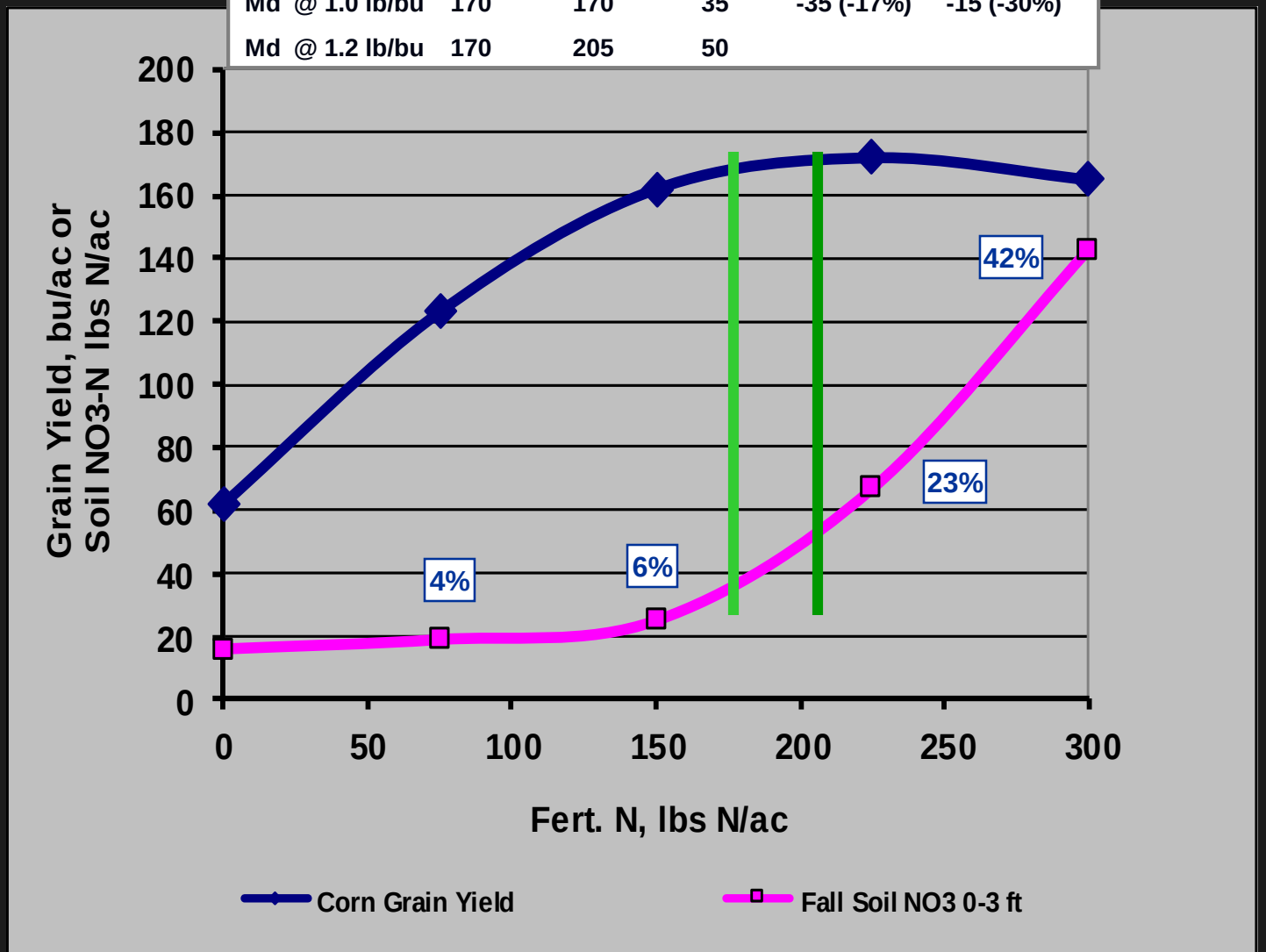
NM Expert Panel 9.23.13

What's the Link between Basic NMP & the Environment?

(Adapted from Coale et al., 2000)

Cont. Corn, no CC, 3-yr study, Mattapex silt loam, Lower Eastern Shore

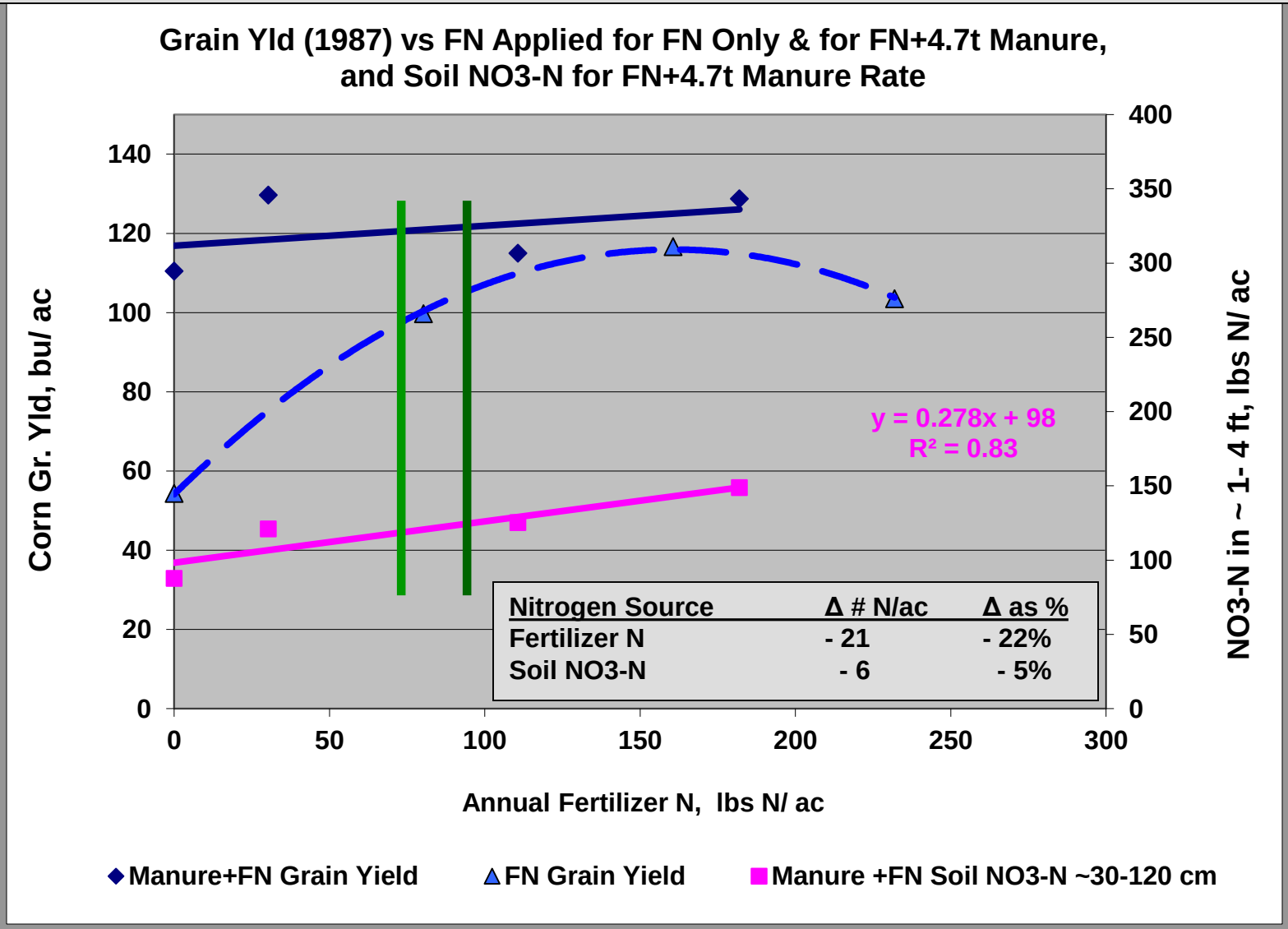
	Exp. Yld	lbs FN	Fall NO3-N	Δ FN	Δ Fall NO3-N
Md @ 1.0 lb/bu	170	170	35	-35 (-17%)	-15 (-30%)
Md @ 1.2 lb/bu	170	205	50		



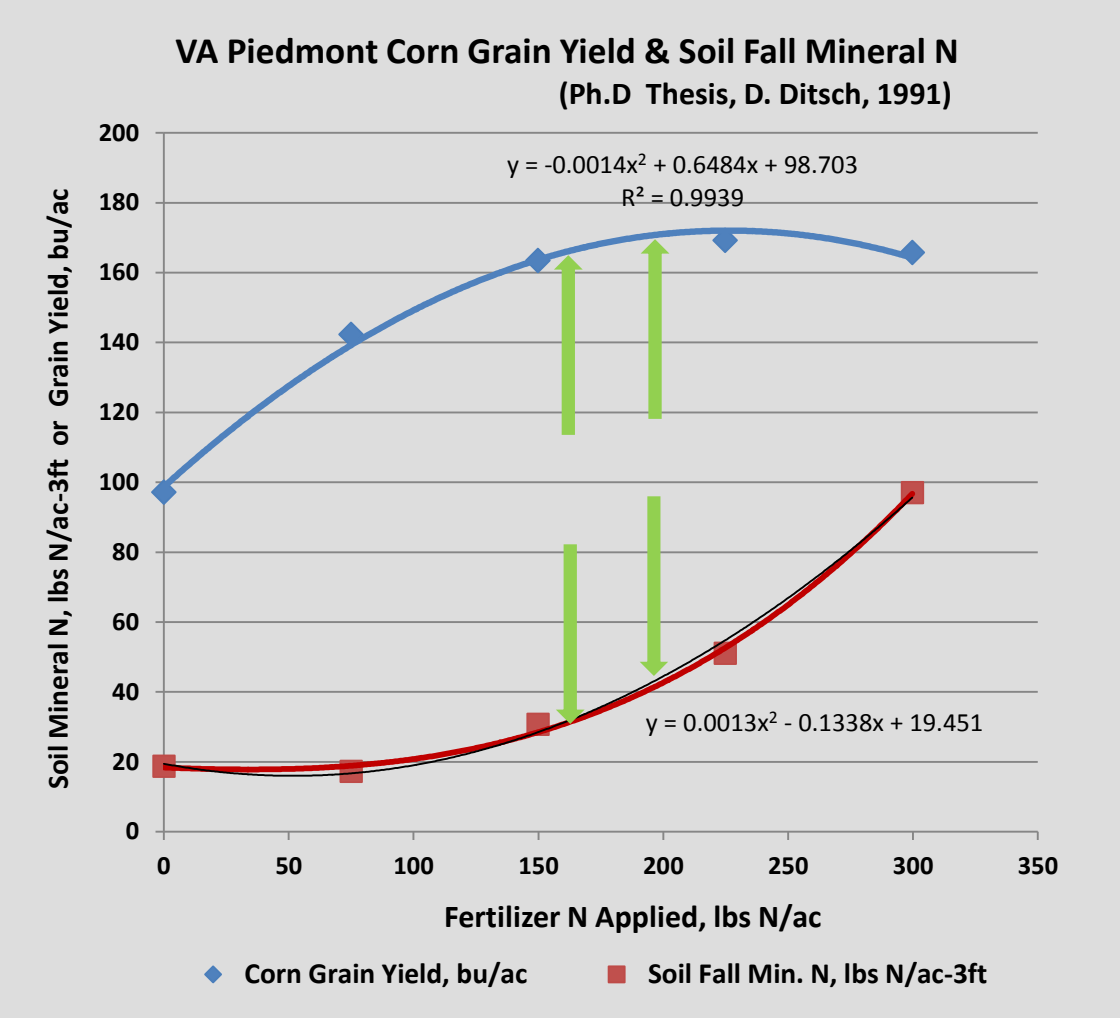
MD Piedmont, 3rd Yr of FN vs 4.7t Solid Dairy Manure, Cont. Corn, Avg over NT & PT

Angle, Gross, et al. 1993. JEQ 22:141-147

Description of Manure N Management System	Expt. Yld.	N for Yld	Man Credit	FN Remainder
1985: 25% Min. rate & no residual N credits	125 bu/a	125 # N/a	30 # N/a	95 # N/ac
1995: 35% Min. rate & 2yrs residual N credits	125 bu/a	125 # N/a	51 # N/a	74 # N/ac



	N rec		
Yield goal, bu/ac	1 lb N/bu	1.15 lb N/bu	1.2 lb N/bu
165	165	189.75	198
	Est soil residual N, lb/ac - 3ft		
	32.8	**40.9**	**43.9**
RSN decrease lb/ac, 1.2 to 1.0	11.2		
RSN decrease %, 1.2 to 1.0	25%		



References and Summaries of Representative Corn Nitrogen Studies from New York State

Greg Albrecht – August 2013

The following references and summaries are a representative sample of the corn nitrogen studies performed in New York State where yield, end of season N, and beginning of season N were measured across various rates of N (manure alone, manure + fertilizer, or fertilizer alone). The relationship between N rate/supply, yield, end of season residual nitrate, and beginning of season nitrate is fairly classic and consistent across all studies: scenarios that lead to higher residual soil nitrate levels at corn harvest result in higher N losses via leaching (better drained soils) or denitrification (more poorly drained soils) by the next spring. When producers engage in nutrient management, other sources of N (soil N, prior manure N, sod N, soybean N, etc.) are taken into account as are often more realistic yield potentials, thereby matching supplemental manure and fertilizer rates more closely to actual remaining crop need and reducing residual fall nitrate levels.

- Sogbedji, J.M., H.M. van Es, C.L.Yang, L.D. Geohring, and F.R. Magdoff. 2000. Nitrate leaching and N budget as affected by maize N fertilizer rate and soil type. Journal of Environmental Quality 29:1813-1820.
- van Es, H.M., K.J. Czymmek, and Q.M. Ketterings. 2002. Management Effects on Nitrogen Leaching and Guidelines for a Nitrogen Leaching Index in New York. Journal of Soil and Water Conservation 57(6):499-504.
- Cornell University Nutrient Management Spear Program: http://nmsp.cals.cornell.edu/projects/NitrogenforCorn.html
- Note the data described for reference #3, below, is a sub-data set from the N management trials described on the link, above.
- Cornell University Nutrient Management Spear Program: http://css.cals.cornell.edu/cals/css/extension/cropping-up/archive/loader.cfm?csModule=security/getfile&PageID=1095460

References and Summaries of Representative Corn Nitrogen Studies from New York State

Reference	Research Trial Description	Years	N Rates (lbs/ac)	Yield [3]	Fall NO3-N (ppm)	Delta Fall NO3-N (%) Relative to Nutrient Mgt. Rate[1]
1, 2	Corn N rate, yield, and N loss trial (plot sized lysimeters) on both a clay loam and a loamy sand.	1993, 1994 (2nd, 3rd yr corn after sod)	20	a	3 (clay), 5 (sand)	0,0
			90[1]	b	3 (clay), 6 (sand)	----------
			120[2]	b	8 (clay), 12 (sand)	63,50
3	Corn N rate/loss study nested in a broader N, P, and K management field trial on a silt loam (included a wide range of weather years).	2001-2005 (dry '01, '02, & '05; wet to very wet '03 & '04)	20 (starter only)	a	5,5,5,5,5	-80,-86,-58,-29,-77
			Starter + 100[1]	b	25,35,12,7,22	----------
			Starter + 150[2]	b	30,48,10,10,40	17,27,-20,30,45
			Starter + 200	b	50,58,22,25,45	50,40,45,72,51
4	Dairy manure application rate (spring injection with no starter fertilizer) and corn yield trial with intensive N, P, and K sampling on a channery silt loam.	2010-2012	9,000 gal/ac[1]	a	16	----------
			12,000 gal/ac[2]	a	22	27
			15,000 gal/ac	a	25	36

References and Summaries of Representative Corn Nitrogen Studies from New York State

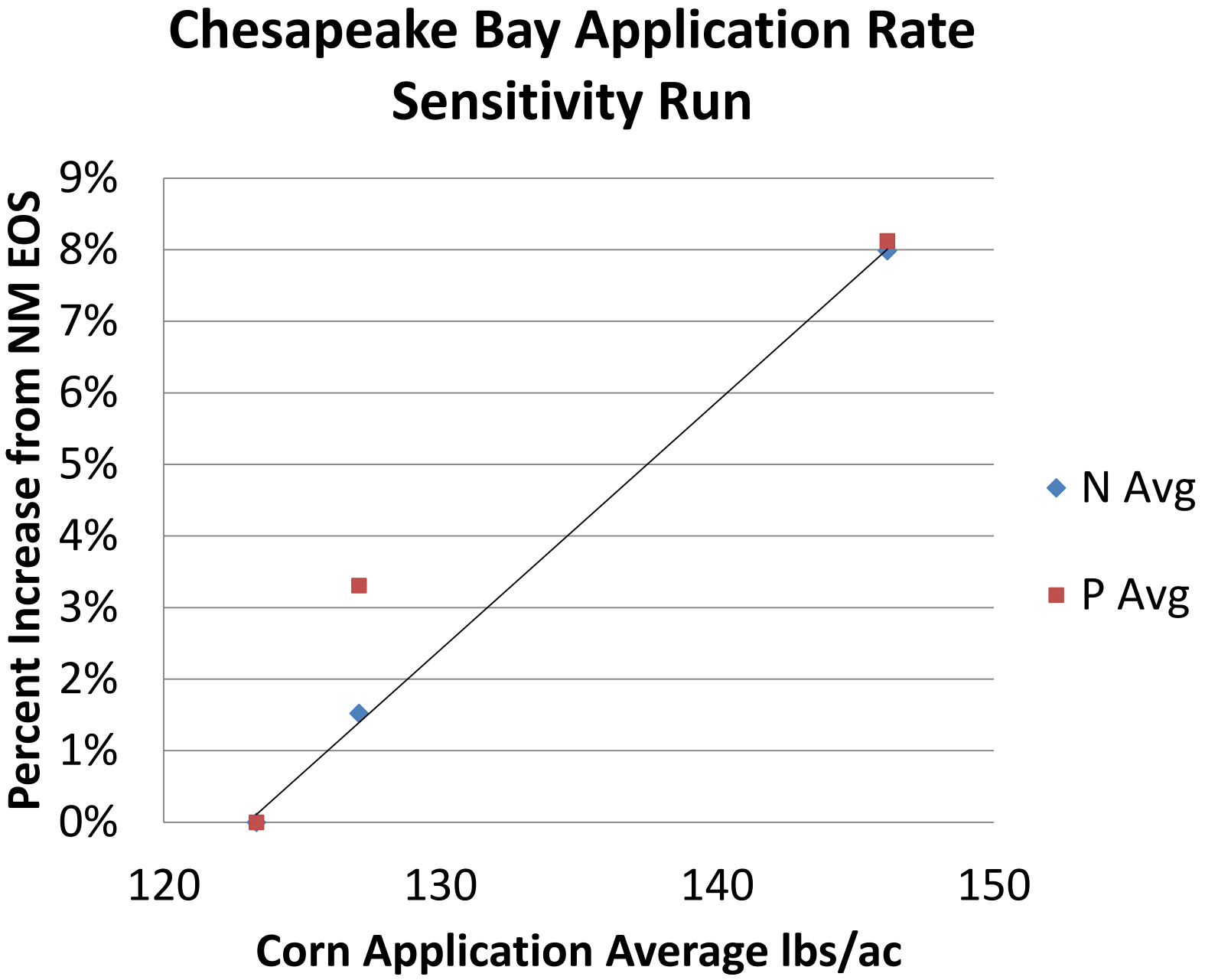
[1]Nutrient management rate based on Cornell University Crop Nutrient Guidelines

[2]Reasonable characterization of the pre- or non-nutrient management condition.

[3]Average values with different letters are statistically different (alpha = 0.05)

Analysis Adjusts Corn Application Rates

- 2007 model year was used to approx moderate level of other BMPs on landscape
- Corn is in a row crop landuse with scores of other Ag Census crops
  - 2.7m of 3.4m row crop (soy, wheat, etc) acres
- 2.7m of 6.7m ag acres in this analysis
  - Row crops, alfalfa, all hays
  - Excludes pasture, animal areas, nursery


Chesapeake Bay Application Rate Sensitivity Run
Percent Increase from NM EOS
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
120
130
140
150
Corn Application Average lbs/ac
N Avg
P Avg

Among just row crops:

- N and P EOS loss increase 9.25 and 10%, respectively from NM to 120% N app rate on corn.

Approved Tier 1

Pros

Efficiency approach

Is well supported by research

Is simple and easily implemented

Cons

Could require change in reporting to separate acres of NM for pasture

Maintains model based approach to efficiency on many acres (less than Opt A)

- Use research derived NEGATIVE efficiencies to increase N and P load from non-NM *row crop* Ag acres 9.25 & 10%, respectively, Bay-wide.
  - Landuses: row crops
- Use model derived neg eff (5 & 8%)for other landuses.
  - Pasture, nursery, alfalfa, hays.