WASHINGTON STATE UNIVERSITY EXTENSION

Quality of Alfalfa Hay As Influenced by Phosphorus and Potassium Fertilization

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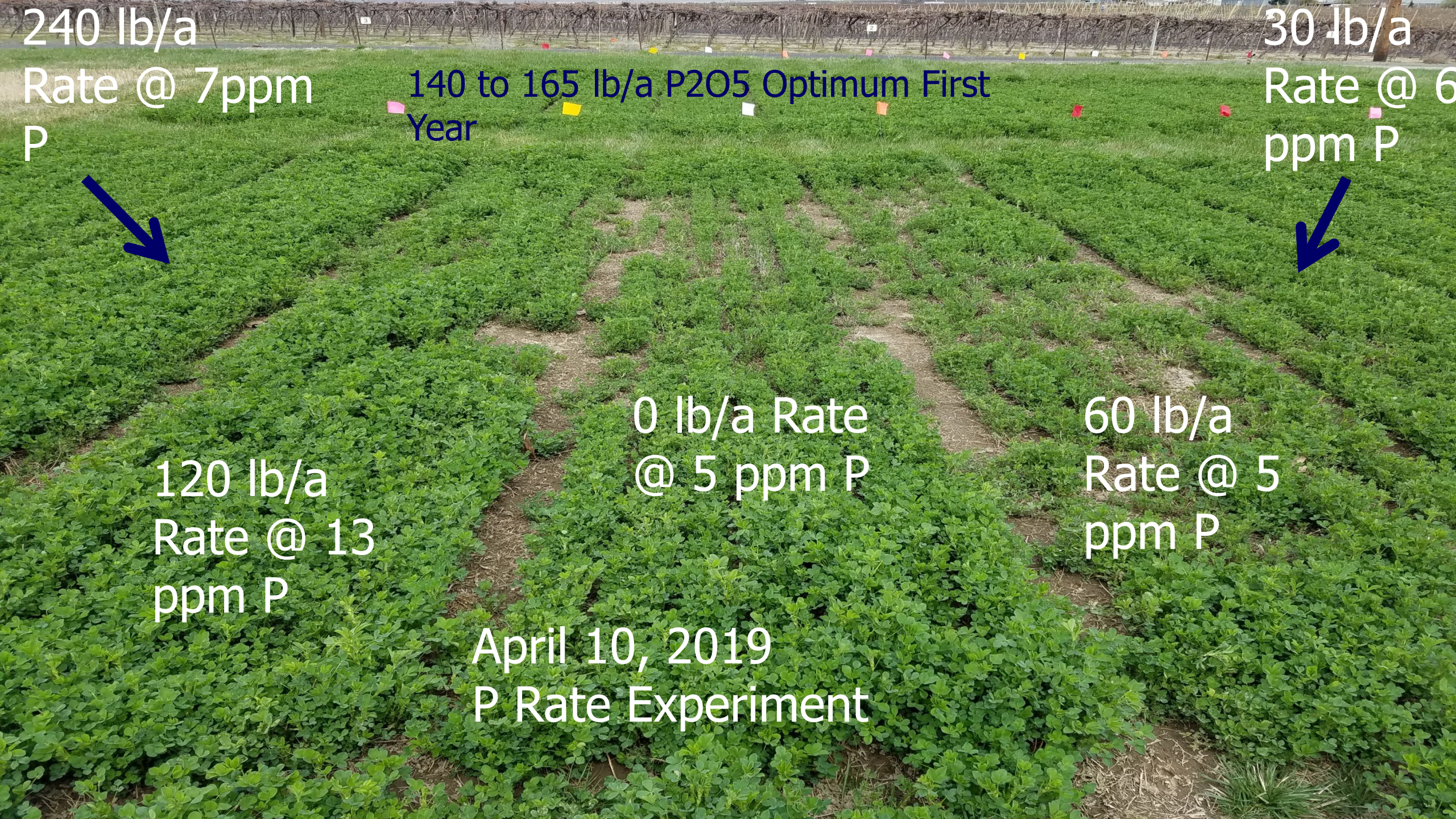
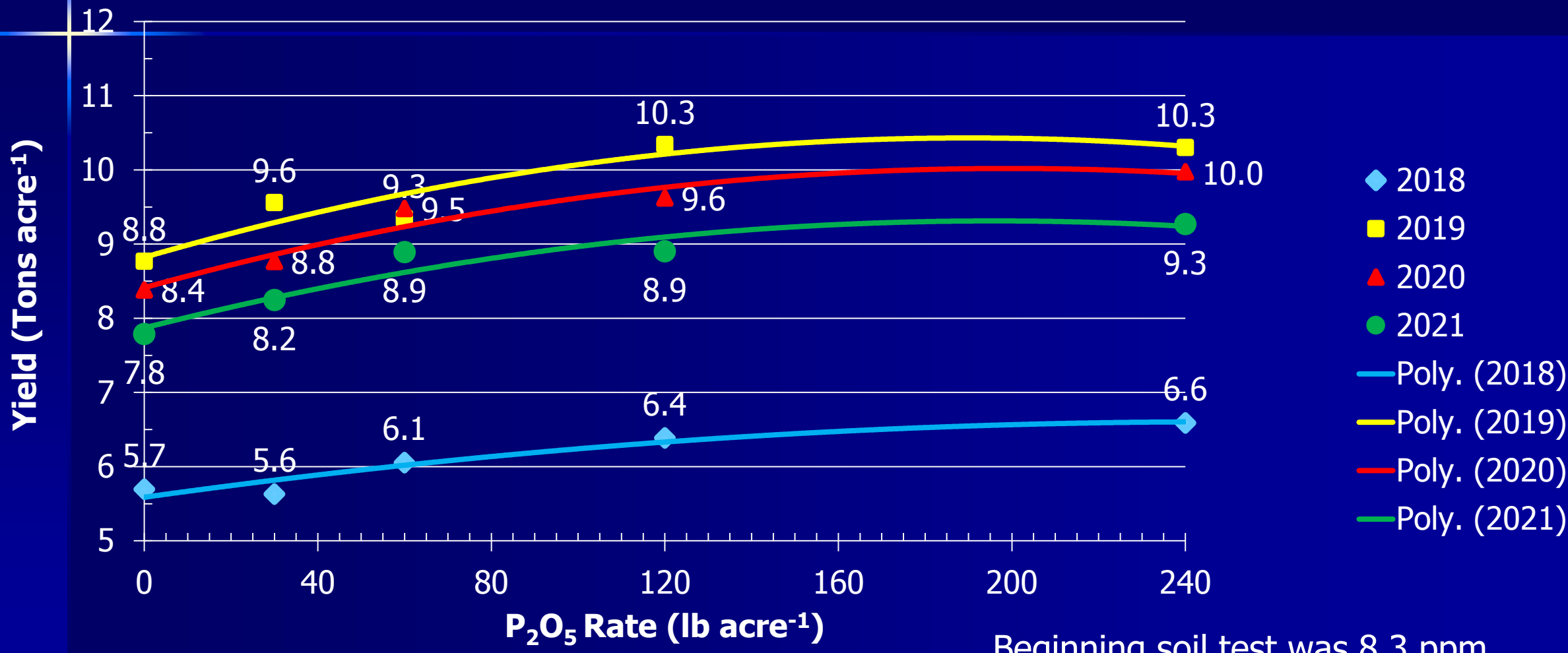

240 lb/a
Rate @ 7ppm
P
140 to 165 lb/a P2O5 Optimum First
Year
30 lb/a
Rate @ 6
ppm P
120 lb/a
Rate @ 13
ppm P
0 lb/a Rate
@ 5 ppm P
60 lb/a
Rate @ 5
ppm P
April 10, 2019
P Rate Experiment

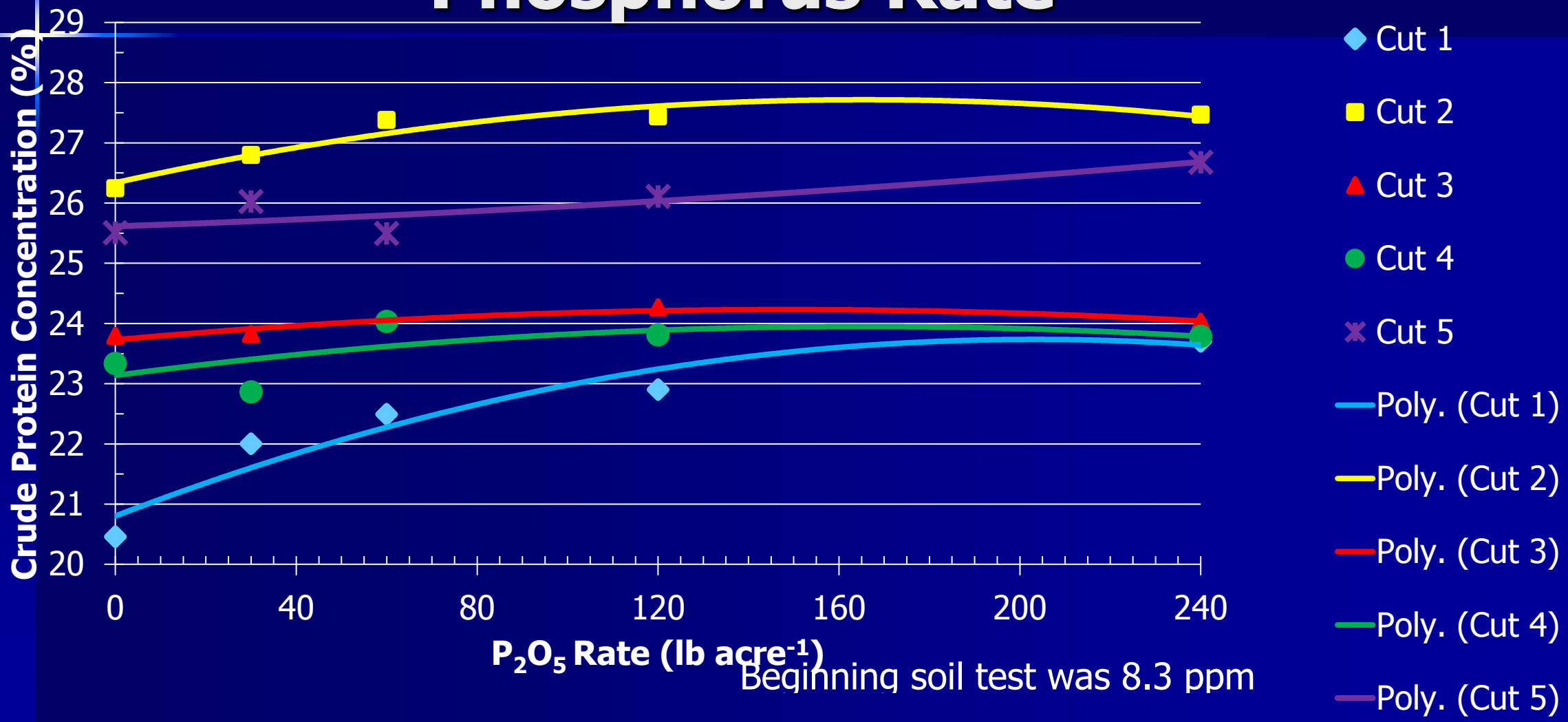
2018 – 2021 Yield of Alfalfa as Influenced by Phosphorus Rate



Beginning soil test was 8.3 ppm

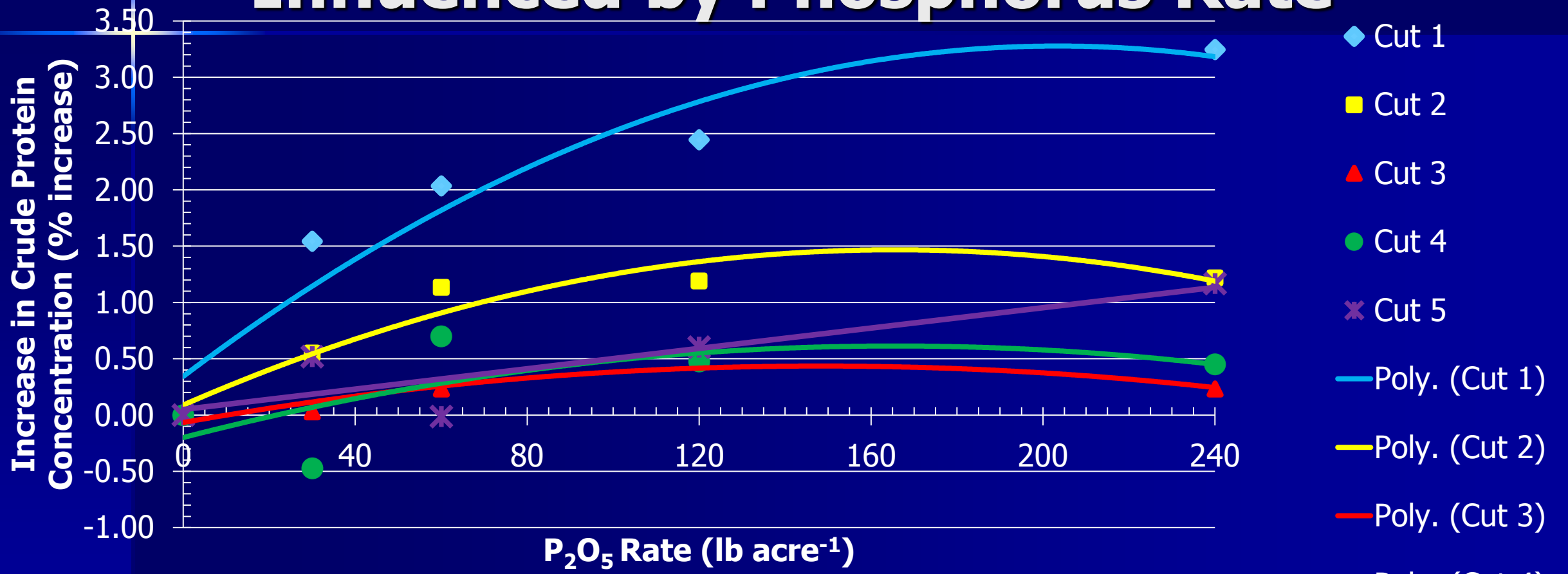
Nutrient results used year 2 and 3 of the stand as they were both 5 cuttings for both P and K studies

2019 – 2020 Crude Protein Concentration of Alfalfa by Cutting as Influenced by Phosphorus Rate



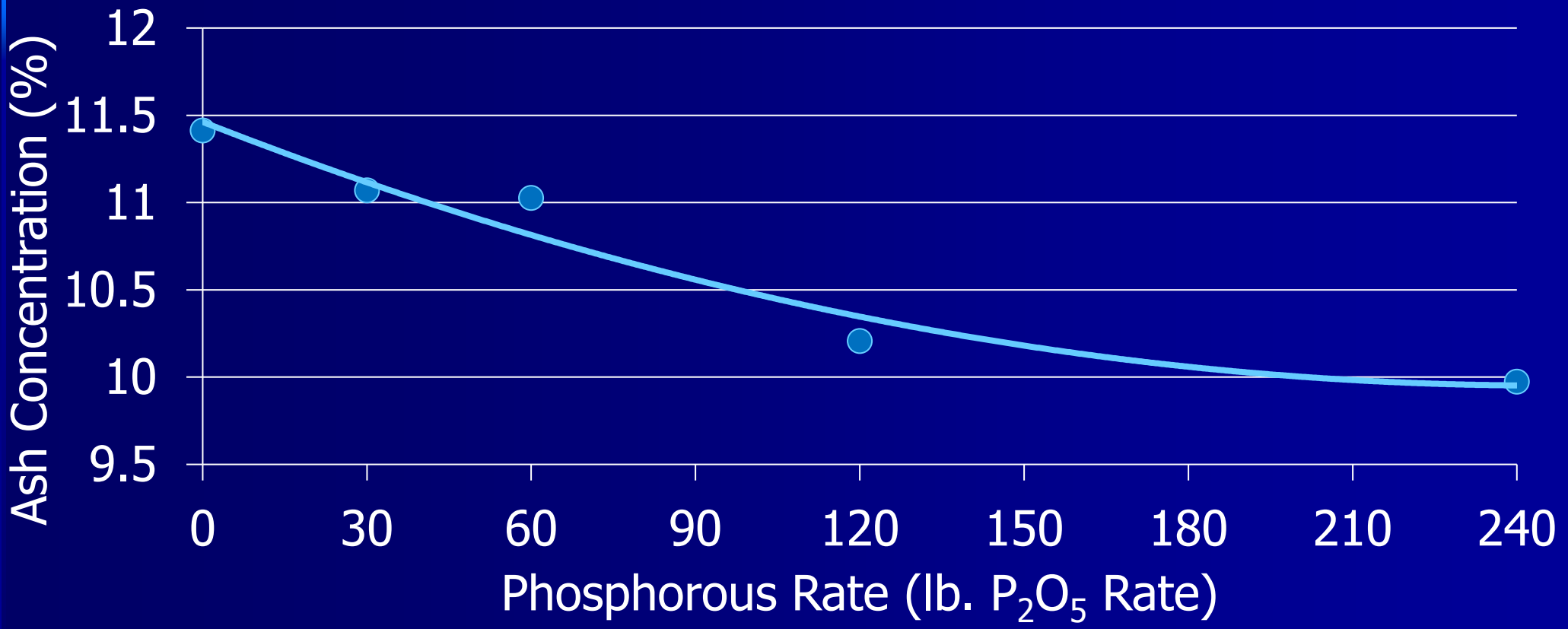
Beginning soil test was 8.3 ppm

2019 – 2020 Increase of Crude Protein Concentration of Alfalfa by Cutting as Influenced by Phosphorus Rate

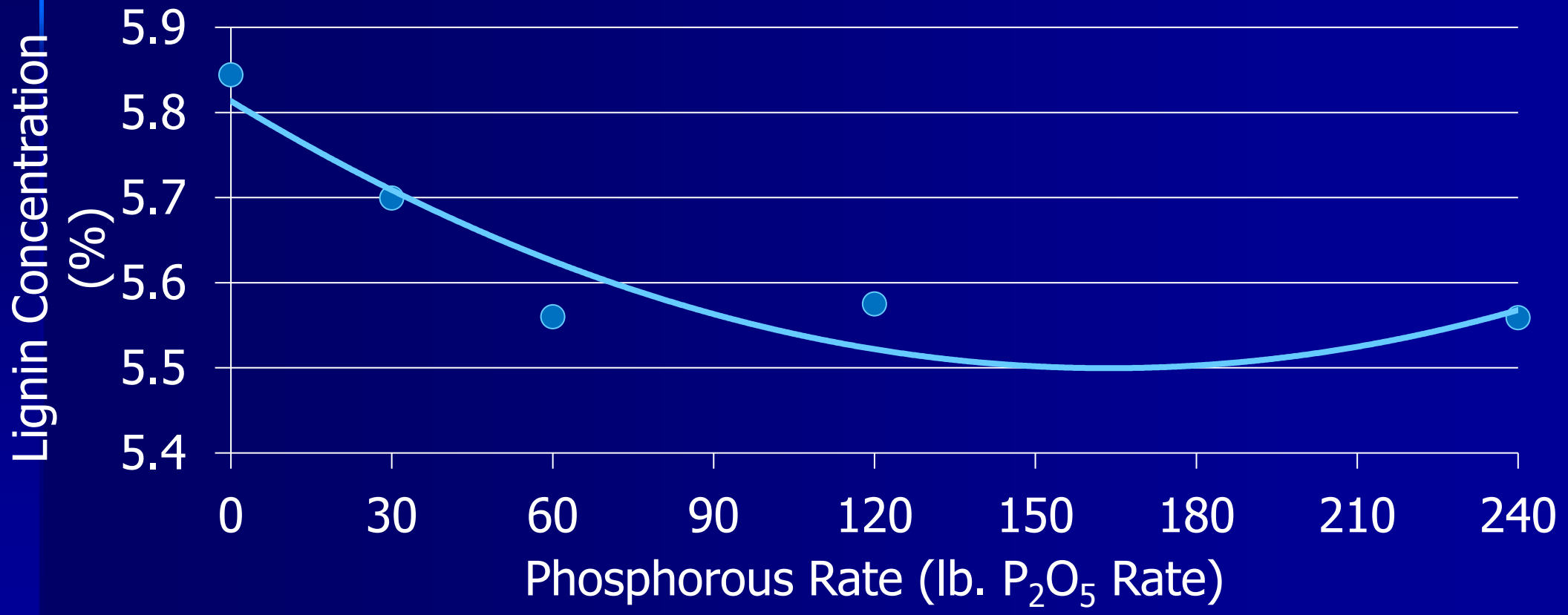


Beginning soil test was 8.3 ppm

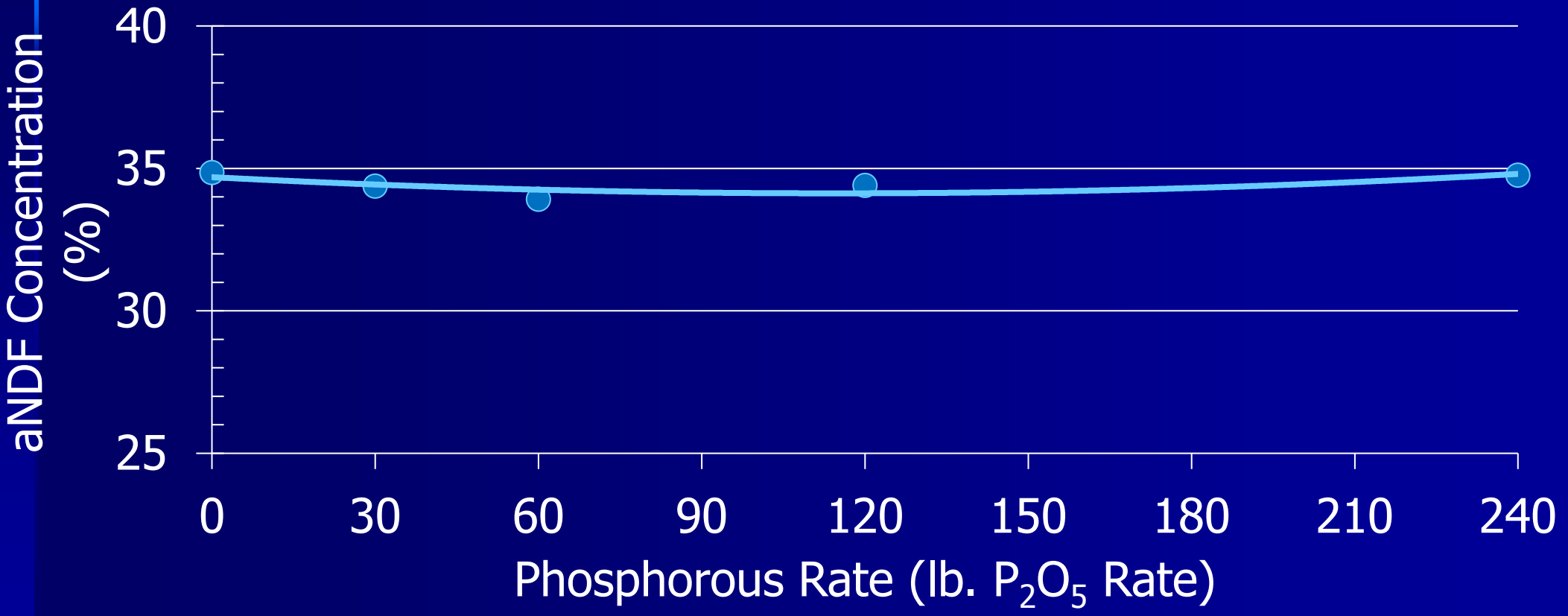
Ash Concentration as Influenced by Phosphorus Rate



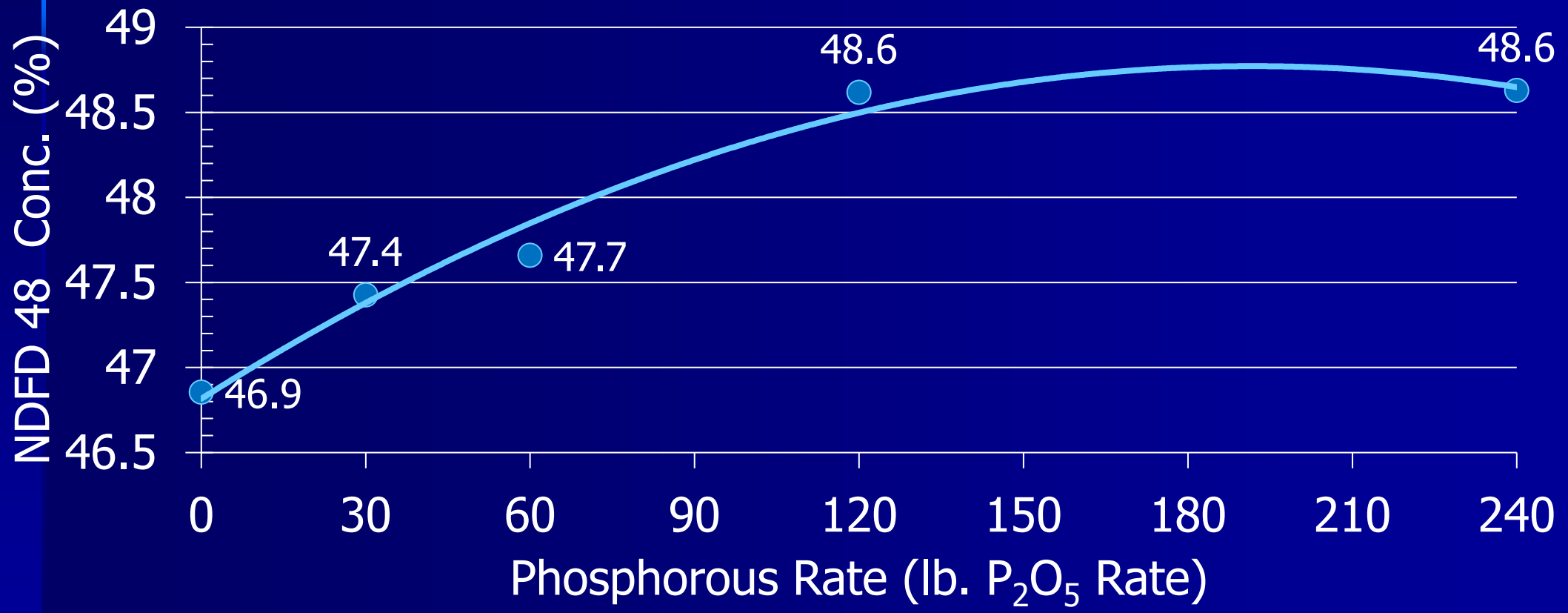
Lignin Concentration as Influenced by Phosphorus Rate



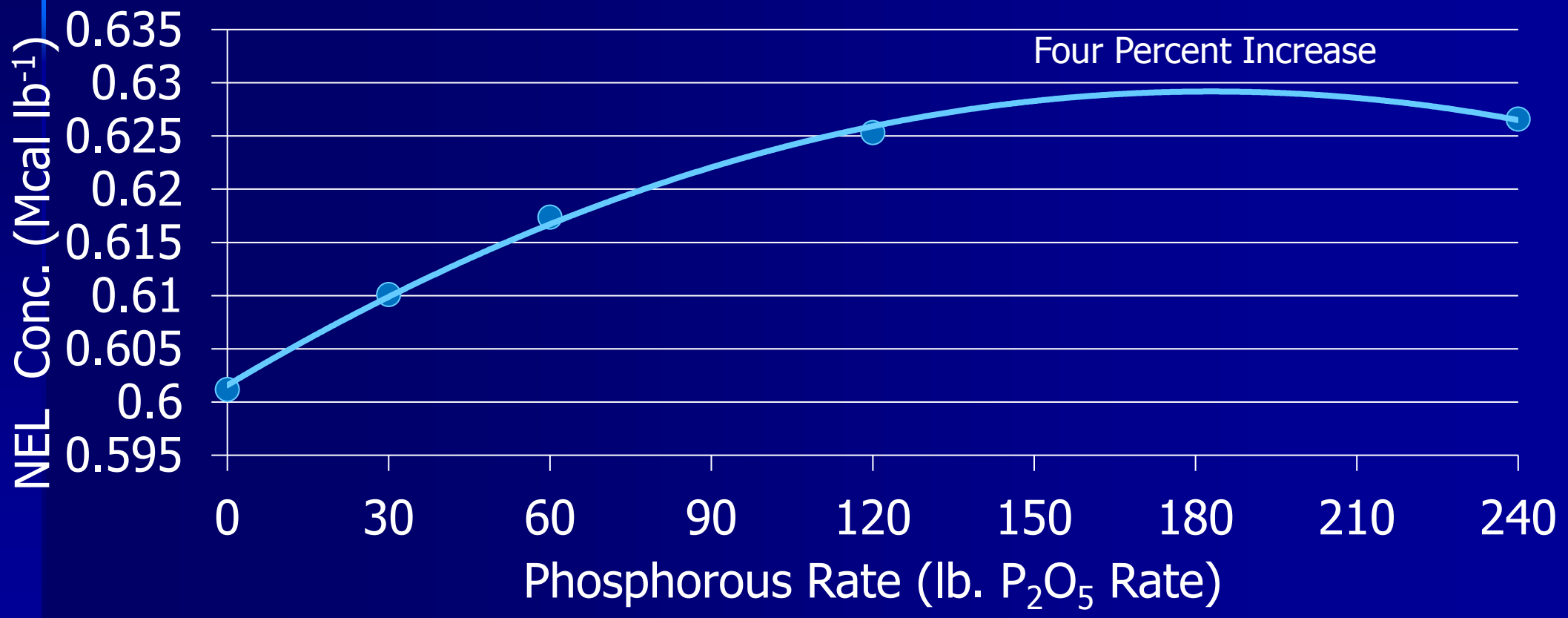
Neutral Detergent Fiber (aNDF) Concentration as Influenced by Phosphorus Rate



NDF Digestibility (NDFD 48) as Influenced by Phosphorus Rate



Net Energy for Lactation (NEL, NRC) as Influenced by Phosphorus Rate



Nutrient Value of Hay as Impacted by Phosphorus Rate Avg. over Cuttings

Phosphorus Rate (lb. P_2O_5 acre^{-1})	$ Value of Protein Ton^{-1}	$ Value of Energy Ton^{-1}	$ Value of Fiber Ton^{-1}	$ Value of Quality Adjustment Ton^{-1}	$ Value Hay Ton^{-1}
0	162	129	120	-1	411
30	166	131	119	3	418
60	168	132	117	4	422
120	170	134	119	11	433
240	171	134	120	11	436
Max. Change	9	5	0	12	25

Jan- May , 2023

$/lb MP	$/lb Mcal	$/lb eNDF
0.7042	0.1216	0.1962

Nutrient Value of Hay Ton^{-1} as Impacted by Phosphorus Rate First Cutting

Phosphorus Rate (lb. P_2O_5 acre^{-1})	$ Value of Protein Ton^{-1}	$ Value of Energy Ton^{-1}	$ Value of Fiber Ton^{-1}	$ Value of Quality Adjustment Ton^{-1}	$ Value Hay Ton^{-1}	RFV
0	139	127	126	-22	371	163
30	150	129	119	-10	388	175
60	153	128	119	-18	383	176
120	156	131	123	-6	404	168
240	162	131	126	-6	413	164
Max. Change	23	4	0	16	42	1

Jan- May , 2023

$/lb MP	$/lb Mcal	$/lb eNDF
0.7042	0.1216	0.1962

Nutrient Value of Hay Acre^{-1} Year^{-1} as Impacted by Phosphorus Rate

Phosphorus Rate (lb. P_2O_5 acre^{-1})	$ Value of Protein Acre^{-1}	$ Value of Energy Acre^{-1}	$ Value of Fiber Acre^{-1}	$ Value of Quality Adjustment Acre^{-1}	$ Value Hay Acre^{-1}
0	1,503	1,204	1,151	-42	3,816
30	1,656	1,321	1,218	4	4,198
60	1,733	1,369	1,236	-4	4,335
120	1,856	1,476	1,335	79	4,746
240	1,892	1,489	1,354	85	4,820
Max. Change	389	285	203	127	1,004

Jan- May , 2023

$/lb MP	$/lb Mcal	$/lb eNDF
0.7042	0.1216	0.1962

Conclusions

- Increasing phosphorus increased protein, NDFD 48, and Net Energy for Lactation (NEL) concentration.
- Increasing phosphorus decreased ash and lignin concentration.
- Increasing phosphorus increased nutrient value ton^{-1} of hay by $25 and $42 ton^{-1} averaged over cuttings and first cutting, respectively.
- Increasing phosphorus increased nutrient value $acre^{-1}$ by $202 per cutting or $ 1,010 per season

Conclusions

- Including yield increases the average nutrient value of hay averaged over cuttings was increased by per acre by 79, 104, 186, 202 $ acre^{-1} by applying 30, 60, 120, and 240 lb acre of P_2O_5 acre^{-1} of phosphorus.
- Including yield increases the average nutrient value of hay averaged over cuttings was increased by 16, 71, 81, 105, 142 $ acre^{-1} by applying 40, 80, 160, 240 and 320 lb acre of K_2O acre^{-1} of potassium.