Exercise 2: Determining a Phosphorus Nutrient Recommendation and Fertilizer Rate

Exercise: Determine a 2 year phosphorus fertilizer application rate based on the Tri-State Fertilizer Recommendations using the soil test results for Field 2 and Field 5 below. Use the Tables on Page 2 to record your results.

Example Reports- For Exercise 2

Soil Test Labs Inc.
4555 Buckeye Dr.
Buckeye, OH 55555
Phone: 555-555-3400

Report Number: 1200
Account Number: OSUE240

To: Example Farms
Corn-Soybean Rd
High Yield, OH 99999

Date Received: 5/28/2015 Date: Reported 06/02/2015

Soil Test Report

Sample Number	1	2	3	4	5
Lab Number	68816	68817	68824	68822	68823
Organic matter %	2.7	1.7	2.2	4.3	4.2
Phosphorus, Bray P1, ppm	10	9	29	58	24
Phosphorus, P2, ppm					
Potassium, K-M3, ppm	126	89	102	229	149
Magnesium, Mg-M3, ppm	265	309	261	391	741
Calcium, Ca-M3, ppm	1787	1393	1261	3100	3309
Sodium, Na-M3, ppm					
Soil pH	6.6	6.5	5.9	6.1	7.0
Buffer pH	6.9	6.9	6.9	6.7	
CEC meq/100g	12.7	11.0	9.9	22.9	23.1
% K	2.6	2.1	2.6	2.6	1.7
% Mg	17.4	23.5	21.9	14.2	26.7
% Ca	70.5	63.5	63.4	67.6	71.6
% H	9.5	10.9	12.1	15.7	

Yield Goals for Fields 1-5 expressed in bu/A.

Year	Crop	1	2	3	4	5
2016	Corn	170	170	170	200	200
2017	Soybeans	45	45	45	50	50

Recommendation and Fertilizer Worksheet-Exercise 2.

Field ID *Field 2*					
Nutrient Recommendation-Phosphorus					
2016 Crop *Corn* Yield *170 bu/A*					
2017 Crop *Soybeans* Yield *45 bu/A*					
			Recommendation-P_2O_5		
Nutrient	Reported as PPM Maintenance Range	My Soil Test Value	2016	2017	Total
P	15-30 Bray P1	*9*			
Fertilizer Need					
Nutrient	Needed Nutrient Recommendation in lbs/A	% P_2O_5 in Fertilizer Source	Amount of Fertilizer applied in lbs/A		Extra Nutrients
P		*11-52-0*			

Field ID *Field 5*					
Nutrient Recommendation-Phosphorus					
2016 Crop *Corn* Yield *200 bu/A*					
2017 Crop *Soybeans* Yield *50 bu/A*					
			Recommendation-P_2O_5		
Nutrient	Reported as PPM Maintenance Range	My Soil Test Value	2016	2017	Total
P	15-30 Bray P1	*24*			
Fertilizer Need					
Nutrient	Needed Nutrient Recommendation in lbs/A	% P_2O_5 in Fertilizer Source	Amount of Fertilizer applied in lbs/A		Extra Nutrients
P		*11-52-0*			

Tables from Tri-state Recommendations needed to complete exercise.

Table 13. Fertilizer (P_2O_5) Recommendations for Corn. (adapted from Tri-state Fertilizer Recommendations for Corn, Soybeans, Wheat and Alfalfa)

Soil Test Level (expressed as P) and Method		Realistic Yield Goal (bu/acre)					
Bray P1 Colorimetric	Mehlich III-ICP	120	145	170	200	225	250
PPM	PPM	lbs P_2O_5/acre recommended					
5	16	95	105	115	125	135	145
10	22	70	80	90	100	110	120
15-30	28-46	45	55	65	75	85	95
35	52	20	25	30	40	40	45
40	58	0	0	0	0	0	0

Table 15. Fertilizer (P_2O_5) Recommendations for Soybean. (adapted from Tri-state Fertilizer Recommendations for Corn, Soybeans, Wheat and Alfalfa)

Soil Test Level (expressed as P) and Method		Realistic Yield Goal (bu/acre)					
Bray P1 Colorimetric	Mehlich III-ICP	30	40	50	60	70	80
PPM	PPM	lbs P_2O_5/acre recommended					
5	16	75	80	90	100	105	115
10	22	50	55	65	75	80	90
15-30	28-46	25	30	40	50	55	65
35	52	10	15	20	25	30	35
40	58	0	0	0	0	0	0

Determining fertilizer amount needed to meet nutrient recommendation.

Fertilizer Phosphorus Source

Name	N Content*	P_2O_5 Content*	Common*	Water Solubility**	pH*
Rock Phosphate	0	3-8	0-3-0	0	
Triple Super Phosphate	0	44-48	0-46-0	>90%	1-3
Mono-ammonium Phosphate	10-12	48-61	11-52-0	100	4-4.5
Di-ammonium phosphate	18	46	18-46-0	100	7.5-8
Polyphosphate	10	34	10-34-0		5.9

Source: *4R Plant Nutrition IPNI
**Soil Fertility and Fertilizers

A granular fertilizer rate to meet a nutrient recommendation is determined in the following way:

We are selecting Mono-Ammonium Phosphate (MAP) or 11-52-0 as the nutrient source to meet 125 pound P_2O_5 need.

Nutrient Need P_2O_5	Divided by	% P_2O_5 content of the fertilizer source	Equals	Pounds of 11-52-0 per acre to meet nutrient need
125	÷	0.52	=	240

How much nitrogen is applied?

Pounds of 11-52-0 per acre to meet nutrient need	Multiplied by	% N content of the fertilizer source	Equals	Pounds of nitrogen per acre in the fertilizer application
240	x	0.11	=	26

A liquid fertilizer rate to meet a nutrient recommendation is determined in the following way:

We are selecting Polyphosphate or 10-34-0 which weighs 11.65 lbs per gallon as the nutrient source to meet 125 pound P_2O_5 need.

Nutrient Need P_2O_5	Divided by	% P_2O_5 content of the fertilizer source	Equals	Pounds of 10-34-0 per acre to meet nutrient need	Divided by	Liquid weight in pounds per gallon	Equals	Gallons of 10-34-0 applied per acre to meet nutrient need
125	÷	0.34	=	441	÷	11.65	=	37.8

How much nitrogen is applied?

Pounds of 10-34-0 per acre to meet nutrient need	Multiplied by	% N content of the fertilizer source	Equals	Pounds of nitrogen per acre in the fertilizer application
441	X	0.10	=	44

Recommendation and Fertilizer Worksheet-Exercise 2. (**Answer Key)**

Field ID *Field 2*					
Nutrient Recommendation-Phosphorus					
2016 Crop *Corn*		Yield *170 bu/A*			
2017 Crop *Soybeans*		Yield *45 bu/A*			
			Recommendation-P_2O_5		
Nutrient	Reported as PPM Maintenance Range	My Soil Test Value	2016	2017	Total
P	15-30 Bray P1	*9*	(From Table 13) *90*	(From Table 15) *60*	*150*
Fertilizer Need					
Nutrient	Needed Nutrient Recommendation in lbs/A	% P_2O_5 in Fertilizer Source	Amount of Fertilizer applied in lbs/A		Extra Nutrients
P	*150*	*11-52-0*	*(150 ÷ 0.52) 288 lbs 11-52-0*		*(288 x 0.11) 32 lbs of N*

Field ID *Field 5*					
Nutrient Recommendation-Phosphorus					
2016 Crop *Corn*		Yield *200 bu/A*			
2017 Crop *Soybeans*		Yield *50 bu/A*			
			Recommendation-P_2O_5		
Nutrient	Reported as PPM Maintenance Range	My Soil Test Value	2016	2017	Total
P	15-30 Bray P1	*24*	(From Table 13) *75*	(From Table 15) *40*	*115*
Fertilizer Need					
Nutrient	Needed Nutrient Recommendation in lbs/A	% P_2O_5 in Fertilizer Source	Amount of Fertilizer applied in lbs/A		Extra Nutrients
P	*115*	*11-52-0*	*(115 ÷ 0.52) 221 lbs 11-52-0*		*(221 x 0.11) 24 lbs of N*

Recommendation and Fertilizer Worksheet

Field ID					
Nutrient Recommendation-Phosphorus					
2016 Crop	Yield				
2017 Crop	Yield				
			Recommendation-P_2O_5		
Nutrient	Reported as PPM Maintenance Range	My Soil Test Value	2016	2017	Total
P	15-30 Bray P1				
Fertilizer Need					
Nutrient	Needed Nutrient Recommendation in lbs/A	% P_2O_5 in Fertilizer Source	Amount of Fertilizer applied in lbs/A		Extra Nutrients
P					

Field ID					
Nutrient Recommendation-Phosphorus					
2016 Crop	Yield				
2017 Crop	Yield				
			Recommendation-P_2O_5		
Nutrient	Reported as PPM Maintenance Range	My Soil Test Value	2016	2017	Total
P	15-30 Bray P1				
Fertilizer Need					
Nutrient	Needed Nutrient Recommendation in lbs/A	% P_2O_5 in Fertilizer Source	Amount of Fertilizer applied in lbs/A		Extra Nutrients
P					