

P & K Movement in Soil?

2016 Demo Project

- 2015 - P & K Fertilizer applied
- 4 Sites in MN, ND and MB
- Fertilizer rates applied (P_2O_5 and K_2O lb/a)
 - 50/50
 - 100/100
 - 200/200
 - 0/1000

P & K Movement in the soil?

- What happens to P & K fertilizer when it hits the soil?
- Does soil pH effect movement?
- Does soil texture effect movement?
- Does high rainfall or irrigation affect movement?



Locations

- Hillsboro, ND - Sarah Lovas
- Rose Isle, MB - John Heard
- Benson, MN - Richard Jenny
- Northwood, ND – John Lee

P & K Applied and Incorporated (Northwood site)



Phosphorus Movement in “Soil Profile”

- Phosphorus Fertilizer
 - Acid soil (pH < 7.0) – P precipitates with aluminum and iron to form compounds that have **lower solubility**
 - Alkaline soils (pH > 7.0) – P precipitates with calcium to form compounds that have **lower solubility**
 - Very little P in soil solution – Not much P in soil solution to be leached away

P Fertilizer Movement in Soil


Treatment lb/a P ₂ O ₅	Sample depth	*Sandy loam ppm	*Loam ppm	*Silty Clay Loam ppm	*Clay ppm
0	0-6"	4	4	42	14
	6-12"	2	3	3	3
50 lb/a	0-6"	8	6	54	16
	6-12"	2	2	6	4
100 lb/a	0-6"	8	7	54	22
	6-12"	2	2	7	5
200 lb/a	0-6"	15	18	88	28
	6-12"	3	2	6	4

*Sandy Loam - Rose Isle MB, Loam – Northwood ND, Silty Clay Loam - Benson MN, Clay – Hillsboro ND,

Phosphorus Results?

- Very little P moved into 6-12" profile
- Even high "P" rates had little effect
- This shows how important sampling depth is!!!
- Sample Too deep = Lower P test!!!!

Potassium Movement in Soil

- Potassium is held to soil by positive charge (K^+)
- Soil particles have negative charge 
- Soil texture is a factor
 - Sandy soils with low cation exchange capacity (CEC) (not as many sites to hold K^+)
 - K fertilizer rate can exceed capacity of soil to hold K^+ on very sandy soil
- Soil pH is not a factor

K Fertilizer Movement in Soil

Treatment lb/a K ₂ O	Sample depth	*Sandy loam ppm	*Loam ppm	*Silty Clay Loam ppm	*Clay ppm
0	0-6"	100	200	320	460
	6-12"	40	150	140	370
50 lb/a	0-6"	60	220	290	480
	6-12"	45	160	140	390
100 lb/a	0-6"	140	240	320	510
	6-12"	35	160	155	370
200 lb/a	0-6"	90	280	430	520
	6-12"	40	150	160	390
1000 lb/a	0-6"	270	420	Na	740
	6-12"	45	200	Na	400

*Sandy Loam - Rose Isle MB, Loam - Northwood ND, Silty Clay Loam - Benson MN, Clay - Hillsboro ND,

***K movement on “Irrigated Loamy Sand”
U of Minnesota – Carl Rosen 2014-15***

Treatment K ₂ O lb/a	Sample depth	K - ppm
Check	0-6	38
	6-12	25
	12-24	29
90 lb/a	0-6	50
	6-12	27
	12-24	32
180 lb/a	0-6	58
	6-12	28
	12-24	33

K movement on “Irrigated Loamy Sand”

U of M – Rosen 2014-15

Treatment K ₂ O lb/a	Sample depth	K - ppm
270 lb/a	0-6	78
	6-12	25
	12-24	37
360 lb/a	0-6	113
	6-12	33
	12-24	69
180 + 180 lb/a ¹	0-6	81
	6-12	30
	12-24	39

Potassium Results?

- Very little K moved into 6-12" profile
- Even high rates had little effect
- K can move in Irrigated Sandy Soils with very high rates
- Sampling depth important for K too!

Questions??



P & K Treatment Affect on Tissue levels (Northwood Location)

Treatment lb/a P₂O₅ & K₂O	*%P Concentration in Plant Tissue	*%K Concentration In Plant tissue
Check	0.15	1.5
50 /50	0.18	1.8
100/100	0.21	1.6
200/200	0.29	1.9
Uffda TRT - 0/1000	0.13	1.7

*P sufficiency range is .30 - .50%, K sufficiency range is 2.0-3.0%

P soil test is 3 ppm Olsen, K soil test is 150-200 ppm