

Summary of Soil Fertility Status in Missouri by County, Soil Region and Cropping Systems

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Introduction

The soil fertility summary provides a valuable index of the soil fertility status of Missouri farmland by county, soil region, cropping systems, and identifies broad soil fertility trends over years. The soil fertility summary also helps in identifying areas that need additional soil fertility research, and in recognizing areas which pose a potential threat to the environment.

Objectives

1. Summarize the soil test data for samples analyzed by University of Missouri soil testing labs from 1996-2006, by counties, soil region, and cropping option.
2. To study trends in soil test data for soil pH, P and K over the past decade in Missouri soils.
3. Use of the soil test data summary to enhance awareness and to improve nutrient and lime management practices amongst producers to optimize production.

Methodology

The soil fertility summary of over 252,000 agronomic crop soil samples analyzed by the University of Missouri Soil Testing labs for the period of 1996-2006. The percentage of samples falling under very low, low, medium, high, and very high levels for the pHs, P and K were calculated by counties, soil regions, and cropping options. The statewide trend in pHs, P and K over the past decade was studied. Soil fertility data summarized by county, soil region, cropping option and statewide trends from 1996 - 2006 are presented in graphical and table format. Relationship between soil test P data and the mean total P in reservoirs in SW Missouri was estimated. The soil regions used in Missouri in summarizing the soil fertility status is presented in Fig. 1.

Soil Test Procedures and Rating:

pHs: 1:1 (0.01 M CaCl₂) - Low: ≤ 5.3 ; Medium: 5.4 - 6.0; High: ≥ 6.1

P: Bray 1 P mg/kg - Low: ≤ 11 ; Medium: 12 - 22; High: 23-35; Very High: ≥ 36

K: Ammonium Acetate Extractable K mg/kg - Low: ≤ 55 ; Medium: 56 - 110; High: 111-165; Very High: ≥ 166



Fig. 1: Missouri Soil Regions

- | No. | Soil Areas |
|-----|-------------------------------------|
| 1 | Knox, Marshall, Sharpsburg |
| 2 | Armstrong, Grundy, Lagonda, Shelby |
| 3 | Putnam, Mexico, Lindley, Keswick |
| 4 | Menfro, Winfield, Wrengart |
| 5 | Barden, Hartwell, Parsons, Sampsel |
| 6 | Goss, Tonte, Creldon |
| 7 | Clarksville, Viration, Wilderness |
| 8 | Olred, Goss, Reuter, Union, Wrengar |
| 9 | Bosket, Calhoun, Tuckerman |
| 10 | Maden, Scotco |
| 11 | Sharkey |
| 12 | Commerce, Caruthersville |

Results and Discussion

Dominant Soil pH, P, and K levels in Missouri counties for soil samples tested from 1996 – 2006 are presented in Fig. 2. Majority of the counties in Missouri have low P (≤ 11 mg/kg; Fig. 2). This is also evident from the statewide trend data presented in Fig. 3.

Fig. 2: Dominant Soil pH, P and K levels by Counties in Missouri (1996-2006)

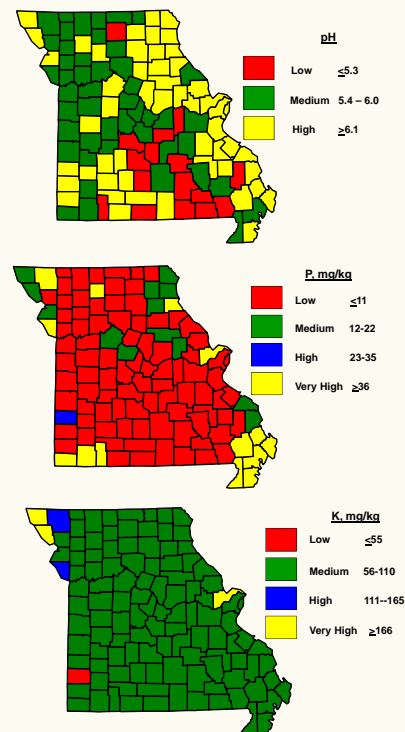
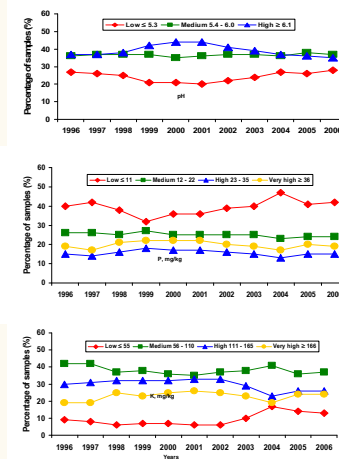


Fig. 3: Trends in soil pH, P and K in Missouri Soils (1996-2006)



Soil test pH and P summarized by Missouri soil regions shows that the majority of samples from soil regions 6, 7 & 8 (Ozarks and Ozarks boarder) had higher percentage of soil pHs of low (≤ 5.1) to medium (5.2-6.0) (Table 1). Majority of samples received from the same soil regions had higher percentage of low P (≤ 11 mg/kg) soils (Table 2). The soils in the Ozarks and Ozarks boarder region are highly weathered, highly acidic and are inherently low in soil P. The soil test summary by soil region reflects the same. On the other hand soil regions 10, 11 & 12 (Bootheel) had higher percentage of soils testing high in pH (≥ 6.1) and P (≥ 23 mg/kg).

Tables 1-3: Soil pH, P and K Distribution by Soil Regions in Missouri(1996-2006)

Soil Region	Sample No.	Low	Medium	High	Very High
1	13602	17	42	36	45
2	23631	23	41	36	33
3	26794	17	34	44	43
4	19632	17	31	52	42
5	23544	20	40	40	40
6	20601	22	36	42	42
7	20373	22	36	33	33
8	21260	28	34	36	36
9	8502	32	34	45	45
10	9803	16	34	50	50
11	12319	21	38	48	48
12	11251	16	29	45	45
Statewide	252969	24	38	44	44

Soil Region	Sample No.	Low	Medium	High	Very High
1	11952	28	23	20	24
2	25861	41	24	16	19
3	23229	36	31	19	14
4	17627	19	26	26	19
5	20940	40	26	17	17
6	23295	39	23	14	24
7	91961	48	21	12	19
8	18818	46	22	15	16
9	7720	14	26	26	32
10	9233	6	18	27	49
11	11411	5	22	31	42
12	1411	5	26	31	38
Statewide	232326	35	24	18	23

Soil Region	Sample No.	Low	Medium	High	Very High
1	13609	7	40	33	20
2	22246	16	33	21	30
3	26346	20	18	16	46
4	19380	15	42	21	11
5	23384	21	52	19	8
6	20684	25	44	19	12
7	98369	29	47	16	8
8	20883	27	53	14	6
9	8402	14	52	26	9
10	9804	6	38	32	24
11	12182	9	52	29	10
12	1509	7	34	33	26
Statewide	148958	30	50	38	16

Soil test summary by cropping options (Tables 4 - 6) shows that the higher percentage of the soils tested for corn, soybean, wheat, and alfalfa had higher percent of soils with high pHs (≥ 6.1). Alternatively, the soils tested for cool and warm season grass pasture/hay had higher percentage of soils testing in low (≤ 5.1) to medium (5.2-6.0) levels of pHs (Table 4). The similar trend is observed with soil test P for cropping options (Table 5).

Tables 4-6: Soil pH, P and K Distribution by Crop Options in Missouri(1996-2006)

Cropping Option	Sample No.	Low	Medium	High	Very High
CORN	53801	15	36	43	43
SOYBEANS	33899	17	37	46	46
WHEAT	3875	19	36	45	45
COOL SEASON GRASS	65359	27	37	36	36
WARM SEASON GRASS	13167	28	37	35	35
CLOVER-GRASS	44050	31	36	33	33
ALFALFA-GRASS	13460	21	32	47	47
COTTON	6086	27	38	35	35
STATEWIDE	249762	24	38	49	49

Cropping Option	Sample No.	Low	Medium	High	Very High
CORN	48159	14	29	28	28
SOYBEANS	20802	20	29	25	26
WHEAT	8874	18	27	25	30
COOL SEASON GRASS	57287	49	21	12	18
WARM SEASON GRASS	11969	50	21	11	17
CLOVER-GRASS	38379	55	20	11	15
ALFALFA-GRASS	11748	33	25	15	21
COTTON	5796	1	13	24	61
STATEWIDE	229561	38	24	18	32

Cropping Option	Sample No.	Low	Medium	High	Very High
CORN	53162	12	53	24	11
SOYBEANS	33255	14	52	22	12
WHEAT	6749	16	52	21	11
COOL SEASON GRASS	64325	26	46	18	10
WARM SEASON GRASS	12963	24	49	18	9
CLOVER-GRASS	43340	27	45	18	9
ALFALFA-GRASS	13222	23	51	18	8
COTTON	6036	5	41	40	14
STATEWIDE	248198	20	50	20	10

Table 7: Relationship Between the Soil Test P and Mean Total P in Reservoirs

% STP High or Very High	Number of Reservoirs	Mean Reservoir TP (µg/l)
0 - 25	46	35.8
26 - 50	61	46.3
> 50	9	59.8

ANOVA significant at p=0.057

There is a direct relationship between the percentage of high P testing soils and Mean Reservoir Total P (Table 7).

Summary

The soil test summary provides invaluable information regarding the soil fertility status at the county, soil region and state levels. Higher percentage of adequately fertilized soils occurs in intensively cropped Bootheel region. Alternatively, the highest percentage of low fertility soils occur in the highly weathered Ozarks region. Soil test data summary by cropping options clearly indicates that corn, soybean, and wheat fields are better managed than the forage crops.

References

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