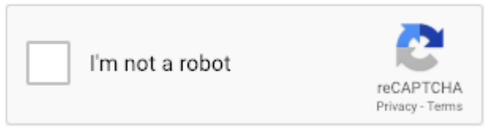
I. General Information

1.1. Please confirm you are not a robot.



1.2. **A Survey to Evaluate the Current Status of Land Grant University/State Department of Agriculture Soil Fertility Recommendations and Analytical Methods**

The goal of this survey is to gain a better understanding of the current status of soil testing across the U.S. to inform collaborative efforts among states and regions, and to identify where opportunities exist to harmonize nutrient management guidelines. The survey objectives are to collect information regarding state soil test recommendations, fertilization philosophy, analytical methods, and the provenance of the correlation/calibration data used to support recommendations. The last known, published survey of Land Grant University soil-test recommendations was by Voss (1998). The survey results will be summarized for presentation at regional and national professional meetings and published in an appropriate journal.

In some states, multiple faculty may be involved in soil fertility and crop fertilization Research and Extension activities pertaining to statewide nutrient management recommendations. We encourage all involved individuals to take the survey. Only one person per state may have the full knowledge needed to answer some questions pertaining to laboratory- or field-specific issues. Please answer all questions as completely as possible. If you do not know the answer to a specific question, please select the answer 'unknown'.

We estimate 60 to 90 minutes are required to complete the entire survey and it would be helpful to have a copy of your institutions soil test recommendations available while taking the survey. The survey may be paused and resumed at a later time. At the end of the survey, you will be given an opportunity to review and revise your responses, as-needed, prior to final submission. We recommend the survey be taken on a computer rather than a mobile device.

Questions or comments about the survey may be directed to John Spargo (jts29@psu.edu), Nathan Slaton (nslaton@uark.edu), or Deanna Osmond (dosmond@ncsu.edu).

Voss, R. 1998. Fertility recommendations: past and present. Comm. Soil Sci. Plant Anal. 29(11-14):1429-1440.

1.4. Please provide the following general information about you/your position.

- [ ] First Name
- [ ] Last Name
- [ ] Email Address
- [ ] Your Current Position
- [ ] Name of Institution
- [ ] Number of years in current and similar positions at your respective institution.
- [ ] Website(s) providing your state's nutrient and limestone recommendations. If unavailable, enter "NA"
- [ ] Please identify all soil testing/fertility working groups or committees that you are a member. If none, enter "None"

1.5. Please list your state.

Select One

1.6. Which of the following best describes your position?

- ○ Lab Director
- ○ Extension Soil Specialist
- ○ Research Scientist
- ○ Other

1.7. Does *your state* have a ***public soil fertility lab?***

- ○ Yes
- ○ No

1.8. Please provide the following information.

- ☐ Full Name of Laboratory
- ☐ Homepage Web Address

1.9.
How is the lab funded? Please consider all funds that comprise the lab's Maintenance/Operation budget and salary/fringes. (*Check all that apply*).

- ☐ Service Fees
- ☐ University Budgeted Funding
- ☐ Fertilizer Tonnage Fees/Taxes
- ☐ Funding Source Unknown
- ☐ Other

1.10. Please provide an estimate of total faculty (research or extension) ***Full Time Equivalents*** (FTE nearest 0.1) currently involved in and/or responsible for soil test calibration/correlation research and updating (or validating) soil test recommendations in *your state*.

1.11. For the FTEs responsible for soil test calibration research/recommendations in Question 1.10, please select the crops that are being worked with. *(Select all that apply).*

- [ ] Field Crops (Cotton, Grains, Corn, Etc.)
- [ ] Vegetable Crops
- [ ] Tree Fruits
- [ ] Small Fruits
- [ ] Turfgrass (Lawn and Recreation/Sports)
- [ ] Forage Crops (Pasture and Hay)

1.12. Who is responsible for the majority of the field research to validate or develop soil test methods and recommendations in *your state*? (*Select all that apply)*

- [ ] Research Faculty and Staff
- [ ] Extension Specialists
- [ ] County/Parish Extension Agents or Advisors
- [ ] Laboratory Staff
- [ ] Lab Director
- [ ] Industry
- [ ] Other
- [ ] Unknown

1.13. Is funding (competitive or noncompetitive) from fertilizer taxes/tonnage fees specifically allocated to support soil testing, soil fertility and nutrient management research and/or extension efforts in *your state*?

	Yes	No
Research	○	○
Extension	○	○

1.14. If yes, provide an estimated amount of annual/year support (in dollars). If funds are not specifically allocated to research or extension, list the amount of available funding as a total. If amounts are allocated to research and/or extension, enter the amounts for each and enter the sum for total.

- ☐ Research
- ☐ Extension
- ☐ Total Research and Extension Combined

II. Soil Test Recommendations P

2.1. Soil Test Recommendations P

2.2. Complete the following information about *your state* soil-test-based P recommendations for each of the following major US crops (>1.0 million acres in USA) for which your state makes recommendations. If any of the listed crops are not applicable to your state then leave information blank. If there are important crops in *your state* not listed, please add them under *Other*. If uncertain of the year, select unknown. (If responses are identical for multiple crops, you can copy/paste to save time).

	What **year** (approximately) was the current soil test P field correlation established and/or last validated?	What **year** was the existing P recommendations last revised and/or validated?	*Soil Test Method.* Ex. Bray 1	*Critical soil-test P value or range (ppm).* Ex. 25-35	Minimum soil-test P where no fertilizer P (including starter) is recommended (ppm). Ex. 35	Provide comments and/or other soil-test information used to refine P recommendations (e.g., expected yield, soil texture, etc.). Comments
All crops (if same for all)						
Corn						
Soybean						
Winter Wheat						
Spring Wheat						
Cotton						
Grain Sorghum						
Barley						
Rice						
Sunflower						
Canola						
Dry Edible Beans						
Peanuts						
Sugar Beets						
Oats						
Potato						
Alfalfa						
Cool Season Grass Hay						
Bermudagrass Hay						
Pasture						
Other 1						
Other 2						

III. Soil Test Recommendations K

3.1. Soil Test Recommendations K

3.2.

Complete the following information about *your state* soil-test-based K recommendations for each of the following major US crops (>1.0 million acres in USA) for which your state makes recommendations. If any of the listed crops are not applicable to your state then leave information blank. If there are important crops in *your state* not listed, please add them under *Other*. If uncertain of the year, select unknown. (If responses are identical for multiple crops, you can copy/paste to save time).

	What **year** (approximately) was the current soil test K field correlation established and/or last validated?	What **year** was the existing K recommendations last revised and/or validated?	*Soil Test Method.* Ex. Mehlich 1	*Critical soil-test K value or range (ppm).* Ex. 91-130	Minimum soil-test K where no fertilizer K is recommended (ppm). Ex. 130	Provide comments and/or other soil-test information used to refine K recommendations (e.g., expected yield, soil texture, etc.). Comments
All Crops (if same for all)						
Corn						
Soybean						
Winter Wheat						
Spring Wheat						
Cotton						
Grain Sorghum						
Barley						
Rice						
Sunflower						
Canola						
Dry Edible Beans						
Peanuts						
Sugar Beets						
Oats						
Potato						
Alfalfa						
Cool Season Grass Hay						
Bermudagrass Hay						
Pasture						
Other 1						
Other 2						

IV. Laboratory Recommendations

4.1. Soil Test Recommendations

4.2. Does your laboratory provide qualitative classes for soil test nutrients *(e.g., Low, Medium, High, Below Optimum, Optimum, Etc.)?*

Yes ○ No ○ Unknown ○

4.3. Please list up to six soil test categories or classes (e.g., Low, Medium, High, Below Optimum, Optimum, etc.) used for P and K by your institution and complete the following information. Enter soil test level name in first column.

	Expected Yield Response to Fertilizer.		Estimated Relative Yield without fertilization. Write in range.	Is Fertilizer Recommended?		Probability of Response. Write in range.	Comments
	Yes	No	Ex. 80-90%	Yes	No	Ex. 80-90%	
	○	○		○	○		
	○	○		○	○		
	○	○		○	○		
	○	○		○	○		
	○	○		○	○		
	○	○		○	○		

4.4. Select the strategy that best describes your institution's approach to making nutrient recommendation.

- ○ ***Build and Maintain***
- ○ ***Sufficiency***
- ○ Hybrid Between Build and Maintain and Sufficiency
- ○ ***(BCSR) Base Cation Saturation Ratio Approach***
- ○ Multiple strategies
- ○ Other
- ○ Unknown

4.5. What year did your institution last revise/validate the procedure used for making lime recommendations?

- ○
- ○ Unknown

4.6. What inputs does your lab use to determine lime requirements? *(Select all that apply).*

- ☐ Target pH
- ☐ Measured pH
- ☐ Buffer pH
- ☐ Time/Amount Since Lime Applied
- ☐ Other, please describe
- ☐ My Institution does not have a public soil test lab.
- ☐ Unknown

4.7. Does your lab limit the maximum lime recommendations made at one time?

Yes ○ No ○ Unknown ○

4.8. What is the highest recommended application of lime made at once (*in lbs. per acre*).

4.9. Is neutralizing value and/or calcium carbonate equivalence specified with your lime recommendations?

Yes ○ No ○ Unknown ○

4.10. Please describe how the neutralizing value and/or calcium carbonate equivalence are specified with your lime recommendation?

4.11. What is the typical target soil pH used for field corn?

○ Target pH

○ Unknown

4.12. Has sulfur deficiency become more common in *your state* over the last ten years?

Yes ○ No ○ Unknown ○

4.13. Does your Institution routinely test for sulfur?

Yes ○ No ○ Unknown ○

4.14. Does your institution make sulfur recommendations based on soil test results? (If yes, please provide a brief description of the approach used).

4.15. In the last 10 years, have any soil test correlation and calibration trials for sulfur been conducted in *your state*?

Yes ○ No ○ Unknown ○

4.16. Please provide description of sulfur research (e.g., researcher name, report location, and years of research).

4.17.
Has average soil test magnesium changed over the last ten years?

Yes ○ No ○ Unknown ○

4.18. Please describe how soil test magnesium levels have changed over the last ten years?

4.19. Does your state/lab provide soil test magnesium recommendations?

Yes ○ No ○ No Laboratory ○ Unknown ○

4.20. Has there been field research to evaluate magnesium fertility in *your state* in the last 10 years?

Yes ○ No ○ Unknown ○

4.21. Please describe magnesium research (e.g., researcher name, report location, and years of research).

4.22. Has your institution validated and/or reviewed recommendations for micronutrient fertilization in the last 10 years?

Yes ○ No ○ Unknown ○

4.23.
Does your lab/state make micronutrient fertilizer recommendations based on soil-test results?

Yes ○ No ○ Unknown ○

4.24.
Select the micronutrients for which soil-test based recommendations are made by your lab/state. (*Select all that apply*).

- [ ] Boron
- [ ] Copper
- [ ] Iron
- [ ] Manganese
- [ ] Zinc
- [ ] Molybdenum
- [ ] Chloride

4.25. Select the micronutrients that are routinely reported on your state/lab soil test report. *(Select all that apply).*

- [ ] Boron
- [ ] Copper
- [ ] Iron
- [ ] Manganese
- [ ] Zinc
- [ ] Molybdenum
- [ ] Micronutrients Not Reported
- [ ] Micronutrients Provided by Special Request
- [ ] Chloride

4.26. What soil test methods are used by your institution (or recommended) for the following determinations (if unknown or testing for the following is not recommended, leave blank).

- [ ] B
- [ ] Fe
- [ ] Zn
- [ ] Cu
- [ ] Mn

4.27. Has your state/laboratory collaborated with surrounding states to unify soil test recommendations for P and K for all and/or select crops?

Yes	No	Unknown
○	○	○

4.28. Please provide the following information.

List States

List Crops

What issues were addressed and/or actions taken?

What factors complicated collaboration?

V. Soil Health

5.1. Soil Health

5.2. Please identify the statement(s) that best describe the goals and objectives of soil health research at your institution. *(Select all that apply).*

- [ ] No soil health research being conducted.
- [ ] To determine how soil health measurements may be used to augment routine soil test results to make fertilizer recommendations.
- [ ] To determine how soil health measurements may be used to inform management decisions (e.g., cover cropping, crop rotation, tillage).
- [ ] To determine how soil health measurements may be used to identify site specific limitations.
- [ ] To determine how soil health measurements compare to routine soil test methods for making nutrient management recommendations.
- [ ] To determine how soil health measurements are correlated to soil productivity in the absence of fertilization.
- [ ] Unknown
- [ ] Other

5.3. Does your institution currently offer soil health testing?

Yes ○ No ○ Unknown ○

5.4. Please briefly describe soil health testing services offered by your institution:

5.5. Does your institution currently recommend soil health testing?

Yes ○ No ○ Unknown ○

5.6. Please briefly describe how soil health testing is being used to make management recommendations:

5.7. Is soil organic matter a standard measurement included with the routine soil fertility test package?

Yes ○ | No ○ | No Laboratory ○ | Unknown ○

5.8. What method is used for organic matter determination? *(Select one).*

- ○ Loss on Ignition
- ○ Walkley Black
- ○ Total Carbon by Combustion
- ○ Humic Matter
- ○ Analysis by NIRS
- ○ Other
- ○ Organic Matter Analysis is Not Offered

5.9. Is organic matter used to modify fertilizer recommendations?

Yes ○ | No ○ | Unknown ○

5.10. Please describe how organic matter is used in fertilizer recommendations:

VI. Soil Sampling

6.1. **Soil Sampling**

6.2. How often does your state recommend soil sampling?

- ○ Once every year
- ○ Once every 2 years
- ○ Once every 3 years
- ○ Once every 4 years
- ○ Greater Than 4 Years
- ○ No Specific Recommendation
- ○ Unknown
- ○ Other

6.3. Does recommended sampling depth for P and K vary by tillage management?

Yes	No	Unknown
○	○	○

6.4. Please provide the following depth information for P and K recommendations *(in inches)*. Depth must be entered as a range (Ex. '0-4" rather than "4"). *(Select all that apply).*

- ☐ Conventional Tillage
- ☐ No-Till
- ☐ Other
- ☐ Unknown

6.5. Does recommended sampling depth for P and K recommendations vary by cropping systems *(e.g., pasture, row crop, or fruit trees)*?

Yes	No	Unknown
○	○	○

6.6. Please list sample depth range *(in inches*). Enter depth as a range (Ex. '0-4' rather than '4').

	Sample Depth Range (Inches)	Comments
Corn		
Grain Sorghum		
Soybean		
Wheat		
Cotton		
Rice		
Alfalfa		
Commercial Vegetable Production Crops		
Tree Fruits		
Small Fruits		
Turfgrass (Lawn and Sports Turf)		
Forages (Pasture and Hay)		
Other		

6.7. For variable rate fertilizer application, does your state/lab provide guidelines for precision soil sampling?

Yes ○ No ○ Unknown ○

VII. Methods of Analysis

7.1. **Methods of Analysis**

7.2. Regardless of whether *your state* does or does not have a public soil test lab, please provide information about ***recommended methods*** as they pertain to your state nutrient management recommendations in your responses.

7.3. (Scroll right to see all 5 columns.)

	Routinely reported and/or recommended for routine testing.		Recommended Extraction/Analysis Methods (If more than one, please list most common here and provide additional information in comments).	Number of Years Used (If unknown, enter "0"),	Reporting Units	Comments
	Yes	No				Comments
P	○	○				
K	○	○				
Ca	○	○				
Mg	○	○				
Na	○	○				
S	○	○				
Fe	○	○				
Zn	○	○				
Cu	○	○				
Mn	○	○				
B	○	○				
Al	○	○				
Cl	○	○				

VIII. Laboratory Methods

8.1.

Laboratory Methods

8.2.

Regardless of whether *your state* does or does not have a public soil test lab, please provide information about ***recommended methods*** as they pertain to your state nutrient management recommendations in your responses. If question is not applicable, leave answer blank.

8.3. What size sub-sample *(scoop volume or weight)* is used for routine P extraction? *(Select one answer).*

- ○ 1.77 cc (NCR-13)
- ○ 2.00 cc
- ○ 2.50 cc
- ○ Other cc Scoop Size
- ○ Samples are not scooped, they are directly weighed.
- ○ Unknown

8.4. What is the weight of the sub-sample used for routine P extraction *(in grams)?*

- ○
- ○ Unknown

8.5. Scoop Density *(Select one answer)*.

- ○ Assumed
- ○ Weighed
- ○ Results expressed on a volume basis *(e.g., mg/dm^3)*.
- ○ Unknown

8.6. What is the assumed scoop density *(g/cm^3)* *(Select one answer)*?

- ○ 1.18 g/cm^3 (NCR-13)
- ○ Other
- ○ Unknown

8.7. Is scoop density reported to clients?

Yes	No	Unknown
○	○	○

8.8. What volume of P extractant is used (mL)? *(Select one answer)*.

- ○ 20 mL
- ○ 25 mL
- ○ Other (mL)
- ○ Unknown

8.9. Is the same extraction method *(extractant, sample size, etc.)* used for both P and K?

Yes	No	Unknown
○	○	○

8.10. What size sub-sample *(scoop volume or weight)* is used for routine K extraction? *(Select one answer).*

- ○ 1.77 cc (NCR-13)
- ○ 2.00 cc
- ○ 2.50 cc
- ○ Other cc Scoop Size
- ○ Samples are not scooped, they are directly weighed.
- ○ Unknown

8.11. What is the weight of the sub-sample used for routine K extraction *(in grams)*?

- ○
- ○ Unknown

8.12. Is scoop density *(Select one answer)*:

Assumed	Weighed	Results expressed on a volume basis (e.g., mg/dm^3)	Unknown
○	○	○	○

8.13. What is the assumed scoop density g/cm^3)? *(Select one answer)*.

- ○ 1.18 g/cm^3 (NCR-13)
- ○ Other
- ○ Unknown

8.14. Is scoop density reported to clients?

Yes ○ No ○ Unknown ○

8.15. What volume of K extractant is used (mL)? *(Select one answer)*.

- ○ 20 mL
- ○ 25 mL
- ○ Other in mL
- ○ Unknown

8.16. What method does your laboratory use to measure soil pH? *(Select one answer)*.

- ○ Water pH 1:1 (soil:water)
- ○ Water pH 1:2 (soil:water)
- ○ 0.01 M $CaCl_2$ pH 1:1
- ○ 0.01 M $CaCl_2$ pH 1:2
- ○ Saturated Paste pH
- ○ Other
- ○ Unknown

8.17. Is pH measured while the sample is being stirred?

Yes ○ No ○ Unknown ○

8.18. Are electrodes rinsed between pH measurements? *(Select one answer).*

- ○ Yes
- ○ No
- ○ Other
- ○ Unknown

8.19. What methods does your laboratory use to determine buffering capacity *(lime requirement)*? *(Select all that apply).*

- ☐ Mehlich
- ☐ Modified Mehlich
- ☐ Adams-Evans
- ☐ SMP
- ☐ Sikora
- ☐ Sikora-Moore
- ☐ Sikora-2
- ☐ Titratable Acidity
- ☐ Water pH
- ☐ Single Tit. $Ca(OH)_2$
- ☐ Buffering Capacity Not Measured
- ☐ Other

8.20. Are electrodes rinsed between BpH measurements?

Yes	No	Unknown	Not Applicable
○	○	○	○

8.21. Is BpH or exchangeable acidity measured for every sample? *(Select one answer)*.

- ○ Yes
- ○ No
- ○ Other
- ○ Unknown

8.22. What is the recommended soil to solution ratio used for EC measurement in *your state*?

- ○ Soil to Solution Ratio
- ○ Unknown

8.23. What is the recommended equilibration time used for EC measurement in *your state*?

- ○ Equilibration Time in Minutes
- ○ Unknown

8.24. Is EC included as a routine measurement on all samples?

Yes	No	Unknown
○	○	○

8.25. Is nitrate-N included as a standard measurement?

Yes	Yes, but not routinely	No	Unknown
○	○	○	○

8.26.
Please select the laboratory methods used for nitrate determination. *(Select all that apply).*

- [ ] Ion Specific Electrode (ISE)
- [ ] Flow Injection Cd-Reduction
- [ ] Discrete Analyzer
- [ ] Ion Chromatography
- [ ] Diffusion-Conductivity
- [ ] Other

8.27. Is the soil nitrate-N measurement used to adjust row crop N rate recommendation?

- ○ Yes
- ○ No
- ○ Other
- ○ Unknown

8.28. Does your lab provide a measure of CEC in the routine/standard soil report?

Yes	No	Unknown
○	○	○

8.29. Please select the method used for CEC determination. *(Select one answer).*

- ○ Estimated CEC by Cation Summation
- ○ CEC by 1 *N* Ammonium Acetate
- ○ Other
- ○ Unknown

8.30. Are soil test methods listed and/or footnoted on the report?

- ○ Yes
- ○ No
- ○ Other
- ○ Unknown

8.31. Does your lab participate in NAPT/ALP programs?

	Yes	No	Not Applicable (no lab)	Unknown
NAPT	○	○	○	○
ALP	○	○	○	○

IX. Upload Supporting Documents

9.1.
Upload documents providing *your state's* nutrient and limestone recommendations.

9.2. Upload documents summarizing common recommendations.

9.3. Or, provide url(s) for supporting documents.

- URL
- URL
- URL