

# **Regulatory Survey on Micronutrients**

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University of Kentucky**

Methods Forum  
Albuquerque, NM  
Feb 13, 2019

 College of Agriculture,  
Food and Environment  
*Regulatory Services*

What state does your laboratory analyze micronutrients for regulation?

Florida

Arkansas

New Jersey

Iowa

Kentucky

North Carolina

Oklahoma

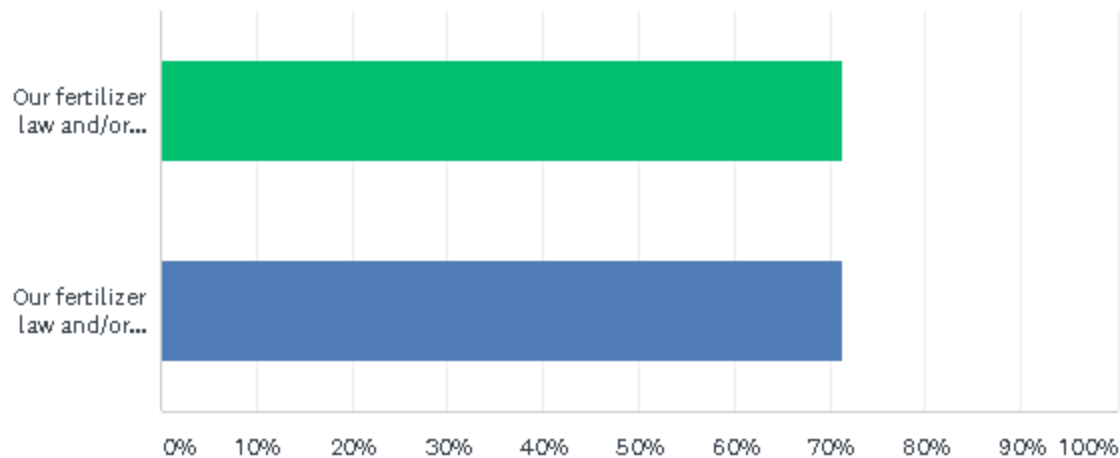
Utah

Q2

Customize Save As ▼

Check the statements that apply to regulatory control of fertilizer in your state.

Answered: 7 Skipped: 1



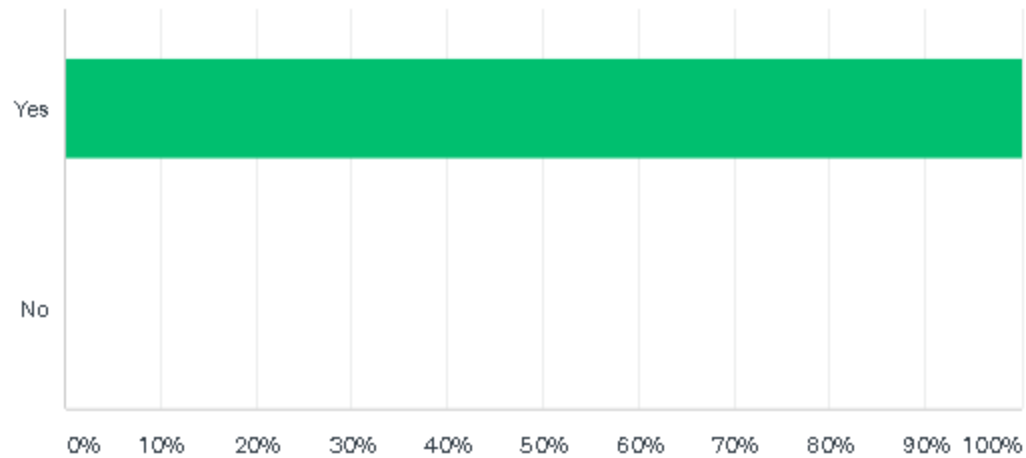
ANSWER CHOICES ▼	RESPONSES ▼
▼ Our fertilizer law and/or regulations are based on the AAPFCO Uniform State Fertilizer Bill.	71.43% 5
▼ Our fertilizer law and/or regulations reference AAPFCO Terms and Definitions.	71.43% 5
Total Respondents: 7	

### Q3

Customize Save As ▼

## Does your state review labels for micronutrient claims?

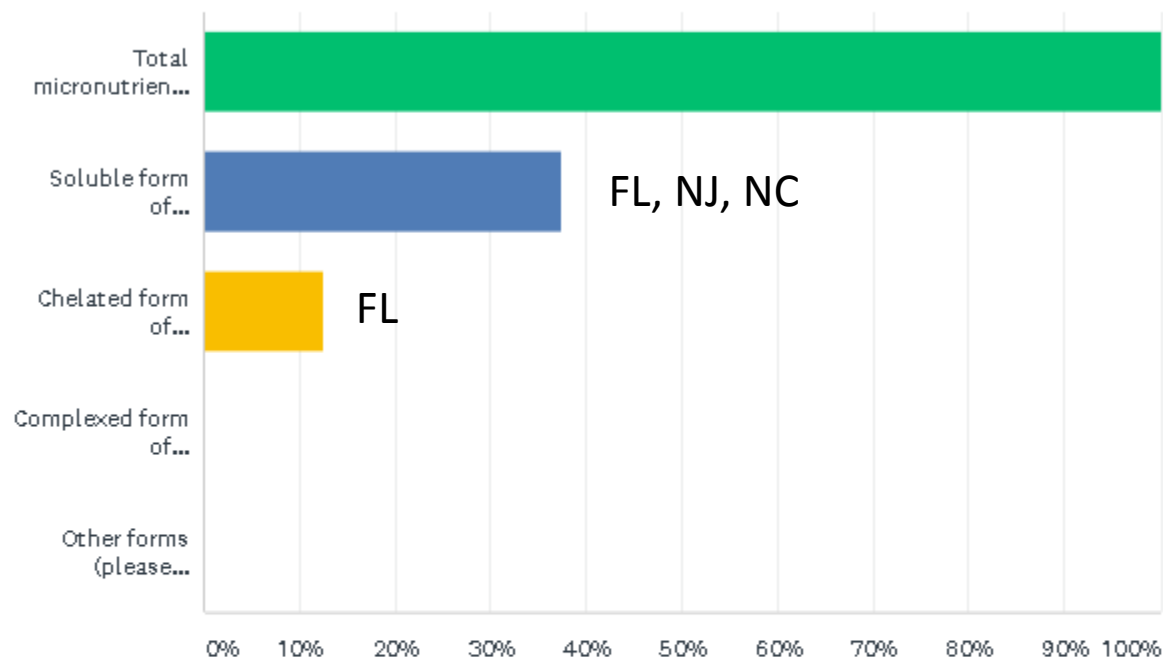
Answered: 7 Skipped: 1



ANSWER CHOICES ▼	RESPONSES ▼
▼ Yes	100.00% 7
▼ No	0.00% 0
<b>TOTAL</b>	<b>7</b>

Check the type of micronutrient analyses you perform in your laboratory.

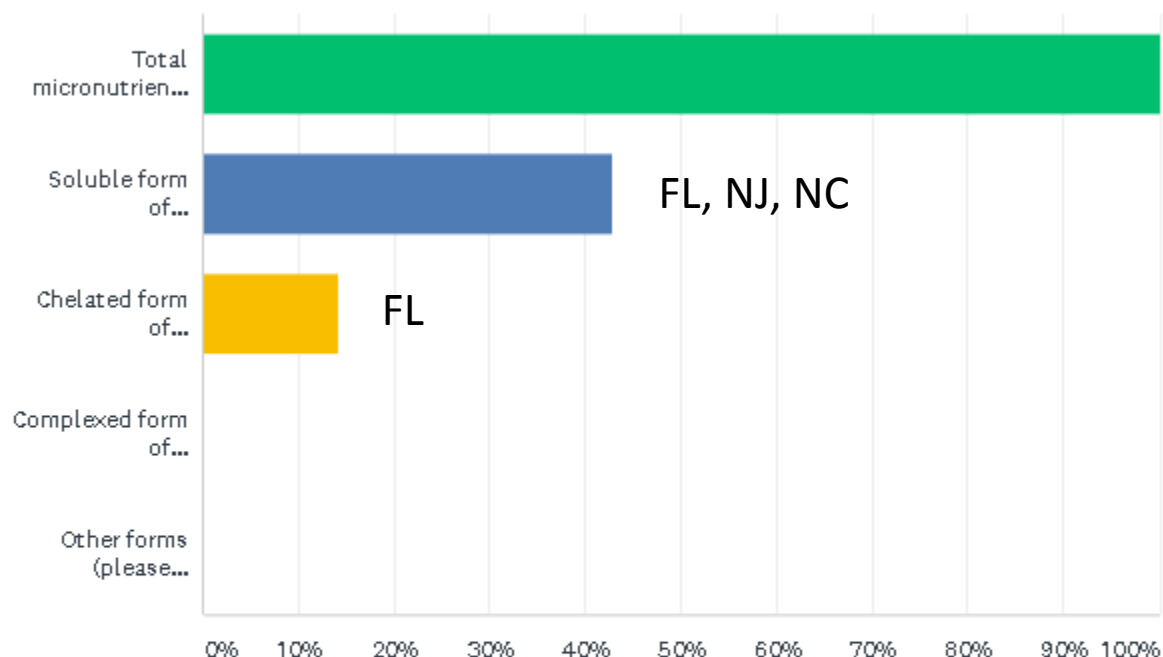
Answered: 8 Skipped: 0



ANSWER CHOICES	RESPONSES
▼ Total micronutrients in fertilizer	100.00% 8
▼ Soluble form of micronutrients in fertilizer	37.50% 3
▼ Chelated form of micronutrients in fertilizer	12.50% 1
▼ Complexed form of micronutrients in fertilizer	0.00% 0
▼ Other forms (please specify)	<a href="#">Responses</a> 0.00% 0
Total Respondents: 8	

Check the micronutrient analyses your state takes regulatory action on based on your laboratory results.

Answered: 7 Skipped: 1

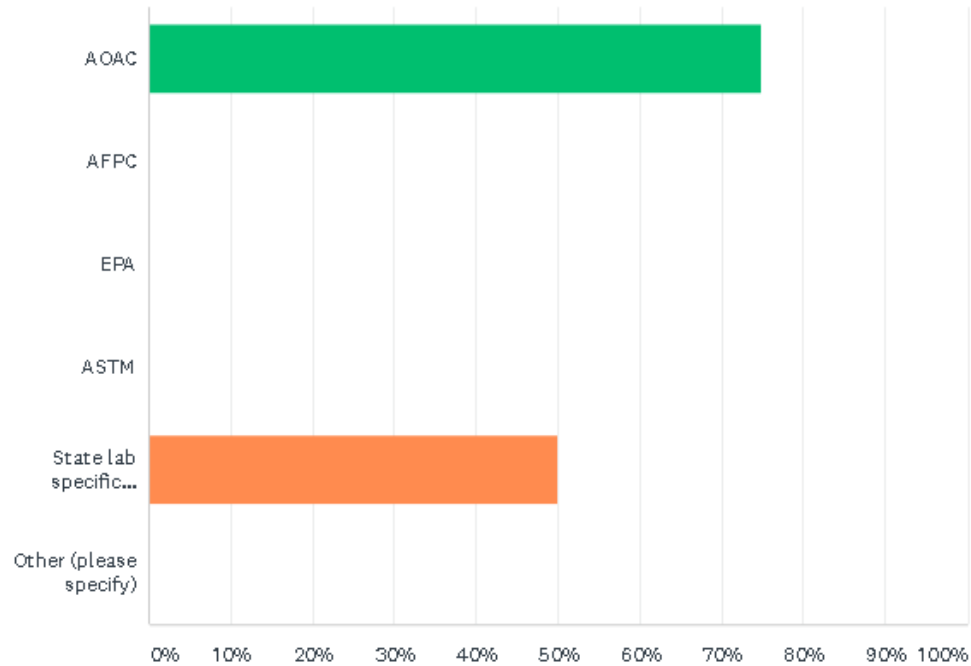


ANSWER CHOICES	RESPONSES
▼ Total micronutrients in fertilizer	100.00% 7
▼ Soluble form of micronutrients in fertilizer	42.86% 3
▼ Chelated form of micronutrients in fertilizer	14.29% 1
▼ Complexed form of micronutrients in fertilizer	0.00% 0
▼ Other forms (please specify) <a href="#">Responses</a>	0.00% 0

Total Respondents: 7

Check the following methods used in your laboratory to analyze micronutrients in fertilizer?

Answered: 8 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼
▼ AOAC	75.00% 6
▼ AFPC	0.00% 0
▼ EPA	0.00% 0
▼ ASTM	0.00% 0
▼ State lab specific methods	50.00% 4
▼ Other (please specify)	<a href="#">Responses</a> 0.00% 0
Total Respondents: 8	

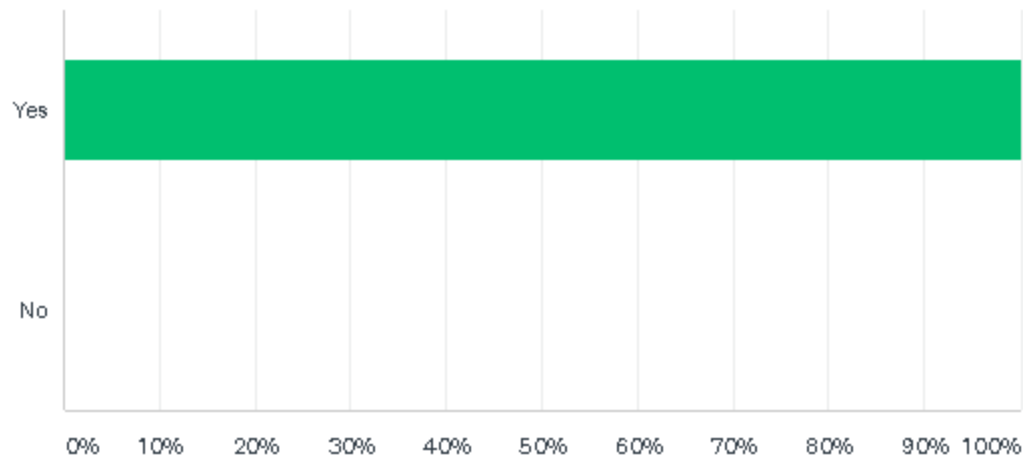
Q7

Customize

Save As ▼

Does your laboratory participate in a Proficiency Testing Program to evaluate your laboratory performance for micronutrient analyses?

Answered: 8 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼
▼ Yes	100.00% 8
▼ No	0.00% 0
TOTAL	8



What improvement(s) would you like to see made to current methods of analysis of micronutrients in fertilizer?

Looking forward to implementing new method going through AOAC.

N/A

no comments, ask the lab personnel

Add heavy metals analysis

Q9

Save As ▼

What instrumentation would be used in the method of your choice for micronutrient analysis?

ICP-OES

ICP-OES

ICP

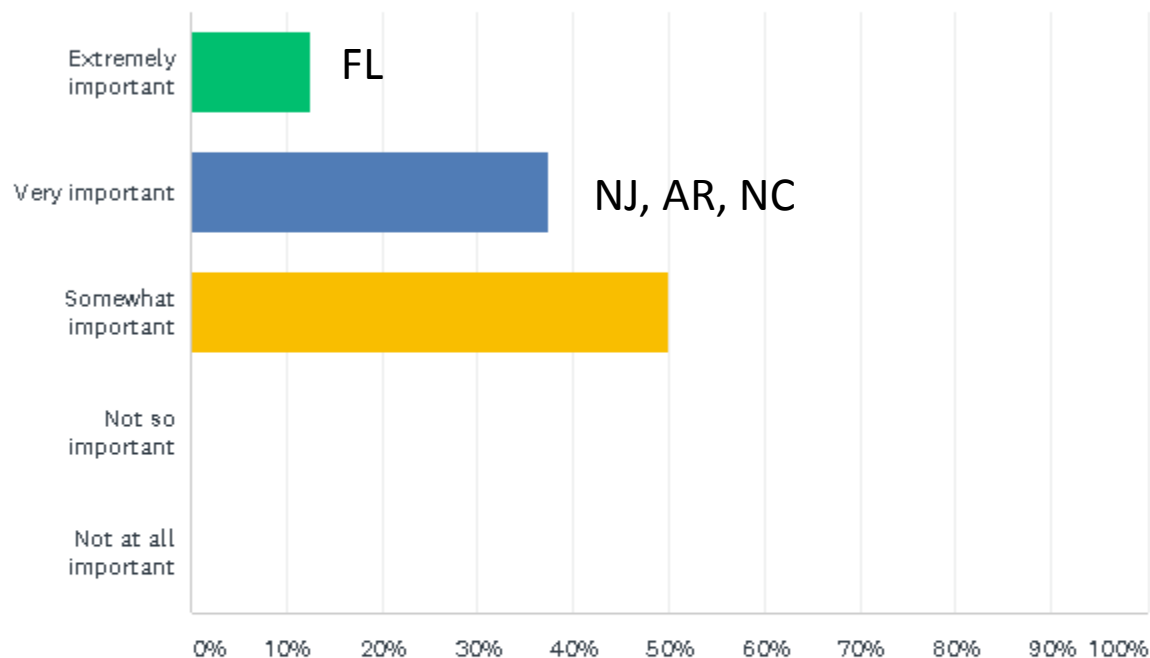
ICP-OES

The most accurate instrument is fine with me.

ICP-OES

Select the level of importance concerning the regulation of micronutrients in your state.

Answered: 8 Skipped: 0



ANSWER CHOICES ▼	RESPONSES ▼
Extremely important	12.50% 1
Very important	37.50% 3
Somewhat important	50.00% 4
Not so important	0.00% 0
Not at all important	0.00% 0
<b>TOTAL</b>	<b>8</b>

# Magruder Methods

131.00	Water Soluble Magnesium	AA	%	965.09	AA
131.30	Water Soluble Magnesium	ICP	%		ICP
131.70	Water Soluble Magnesium	Titrimetric (EDTA)	%	937.02	Titrimetric
131.99	Water Soluble Magnesium	Other	%		

171.00	Water Soluble Boron	AA, JAOAC 52.950	%	JAOAC 52.590	
171.10	Water Soluble Boron	Spectrophotometric	%	982.01	
171.70	Water Soluble Boron	Titrimetric	%	949.03	
171.99	Water Soluble Boron	Other	%		

190.00	Water Soluble Chlorine	Titrimetric	%	928.02	Titrimetric
190.99	Water Soluble Chlorine	Other	%		

271.00	Water Soluble Manganese	AA	%	972.03	AA
271.30	Water Soluble Manganese	ICP, Ext. 972.03	%		Prep as 972.03, Dete
271.99	Water Soluble Manganese	Other	%		

325.00	Water Soluble Zinc	AA	%		
325.10	Water Soluble Zinc	Gravimetric	%		
325.30	Water Soluble Zinc	ICP	%		
325.99	Water Soluble Zinc	Other	%		

# Magruder 180211 14 - 14 -14

*Results due March 15, 2018*

## Guaranteed Analysis

Total Nitrogen (N) .....	14.0 %
14.0 % Ammoniacal Nitrogen	
Available phosphate (P <sub>2</sub> O <sub>5</sub> ) .....	14.0 %
Soluble Potash (K <sub>2</sub> O) .....	14.0 %
Total Magnesium (Mg) .....	1.0 %
1.0 % Water soluble Magnesium	
Sulfur (S) .....	7.75 %
7.75 % Combined Sulfur	
Iron (Fe) .....	1.0 %
0.50 % Soluble Iron	
Copper (Cu) .....	0.06 %
0.03 % Soluble Copper	
Manganese (Mn) .....	0.16 %
0.10 % Soluble Manganese	
Zinc (Zn) .....	0.13 %
0.10 % Soluble Zinc	
Boron (B) .....	0.20 %
0.10 % Soluble Boron	
Molybdenum (Mo) .....	50 ppm

Derived from: Ammonium Sulfate, Ammonium Phosphate, Muriate of Potash, Sulfate of Potash Magnesium, Iron Oxysulfate, Copper Oxysulfate, Manganese Oxysulfate, Zinc Oxysulfate, Sodium Borate and Ammonium Molybdate.

Analyte Code	Analyte Sample # 180211	# Tests Submitted	# Tests in Robust Calculations	Raw Mean	Raw SD	Assigned Value Robust Mean	IA at Analyte Value	Robust sd
101	Acid Soluble Calcium (%)	14	13	0.3243	0.0935	0.3004	0.2150	0.0446
121	Acid Soluble Magnesium (1%)	49	48	0.5881	0.1294	0.5800	0.2290	0.0525
131	Water Soluble Magnesium (%)	10	9	0.3312	0.1699	0.3267		0.1768
143	Elemental Sulfur (%)	6	5	8.291	4.456	8.291		4.456
145	Sulfate Sulfur, HCl soluble (%)	11	11	10.28	0.8830	10.46		0.4606
148	Total Sulfur (7.75%)	46	45	10.47	0.7354	10.48	0.7239	0.4015
149	Sulfur - HNO3 soluble (%)	4	4	10.01	1.644	10.01		1.644
151	Acid Soluble Arsenic (ppm)	21	20	150.8	32.16	157.4		17.36
165	Acid Soluble Boron (0.2%)	47	47	0.2046	0.0234	0.2058	0.0339	0.0165
171	Water Soluble Boron (%)	8	8	0.1414	0.0395	0.1404		0.0426
181	Acid Soluble Cadmium (ppm)	24	23	185.5	22.04	188.6		16.98
190	Water Soluble Chlorine (%)	2	2	7.333	7.068			
191	Acid Soluble Chromium (ppm)	21	20	560.4	157.3	589.4		75.71
202	Acid Soluble Cobalt (ppm)	22	21	362.5	84.35	375.8	113.7464	26.12
221	Acid Soluble Copper (0.06%)	53	52	0.1214	0.0345	0.1266	0.0177	0.0173
241	Acid Soluble Iron (1%)	57	56	0.6160	0.1527	0.6342	0.0684	0.1053
251	Acid Soluble Lead (ppm)	25	24	890.5	205.8	923.1		121.2
261	Acid Soluble Manganese (0.16%)	52	49	0.1621	0.0143	0.1623	0.0212	0.0120
271	Water Soluble Manganese (%)	6	5	0.0287	0.0403	0.0287		0.0403
281	Acid Soluble Mercury (ppm)	7	7	40.98	20.07	40.98		22.76
289	Acid Soluble Molybdenum (50ppm)	29	27	780.1	313.7	826.5	248.9441	115.4
291	Acid Soluble Nickel (ppm)	26	24	13.13	3.250	13.41		2.824
301	Acid Soluble Selenium (ppm)	16	16	301.2	57.65	310.5		38.14
311	Sodium (%)	12	12	0.4636	0.0510	0.4599	0.0510	0.0488
321	Acid Soluble Zinc (0.13%)	56	55	0.1814	0.0389	0.1844	0.0234	0.0198
325	Water Soluble Zinc (%)	8	7	0.1251	0.1465	0.1032		0.1111

# **Total versus “soluble”**

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**Phosphorus and Silicon in Fertilizer**

**NPK and micronutrients in soil**

**Toxicity Characteristic Leaching Procedure  
(TCLP) of metals in hazardous waste**