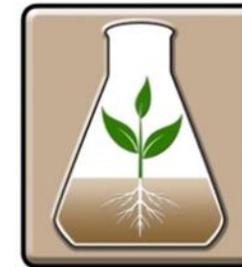




# Bridging Science & Practice

## *Insights from a Stakeholder Survey on Soil-Test-Based P and K Fertilization*

Megan Bourns, Deanna Osmond, Nathan Slaton, Luke Gatiboni,  
John Spargo, Dustin Sawyer, and Corey Lacey



**ALTA**  
AGRICULTURAL LABORATORY  
TESTING ASSOCIATION

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<https://soiltestfrst.org/>

# The Survey

WHY

To better understand soil-test-based P and K fertilizer decisions across the US, ultimately to inform further development of the FRST web-based tool.

WHAT

Survey of 23 questions pertaining to demographics, soil testing goals, fertilizer decision-making, recommendation philosophy, and FRST tool use. Additional 9 questions on soil sampling practices – optional.

WHO

Targeting stakeholders who actively engage in developing/implementing farm-level, soil-test-based P and K recommendations.

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## WHEN

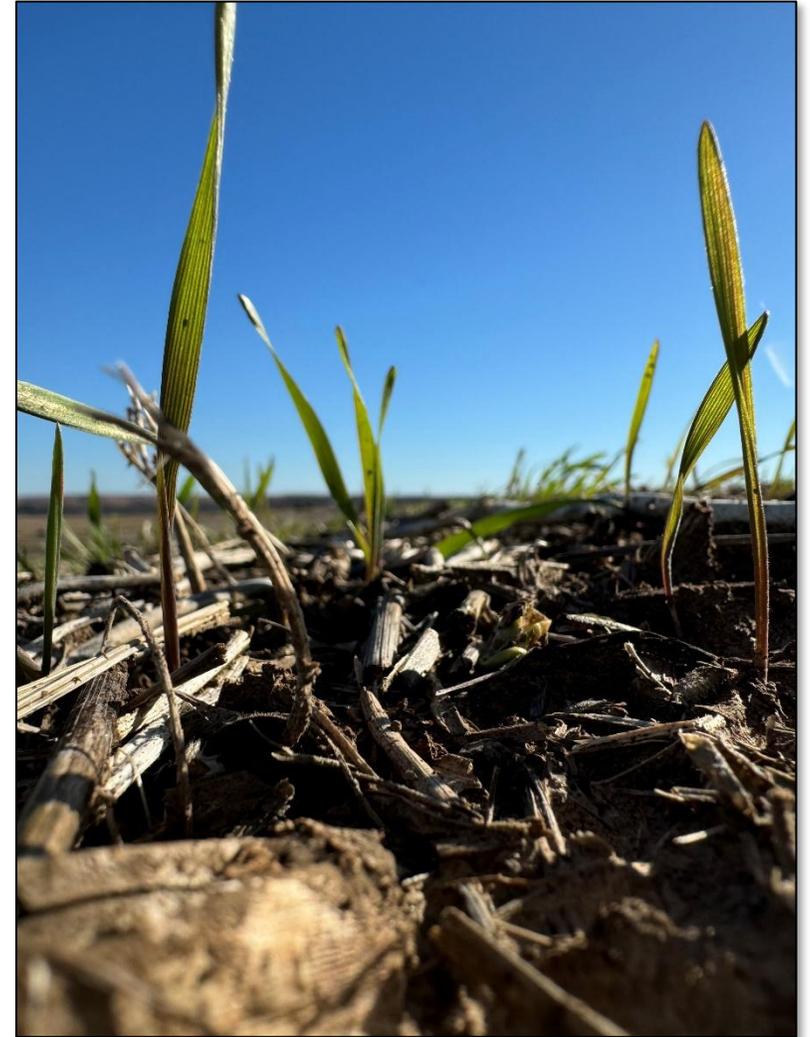
The survey was shared in early 2024, via Twitter/X and emailed to CCAs through ASA.

## HOW

The survey was conducted using Qualtrics. Questions were multiple choice and ratings.

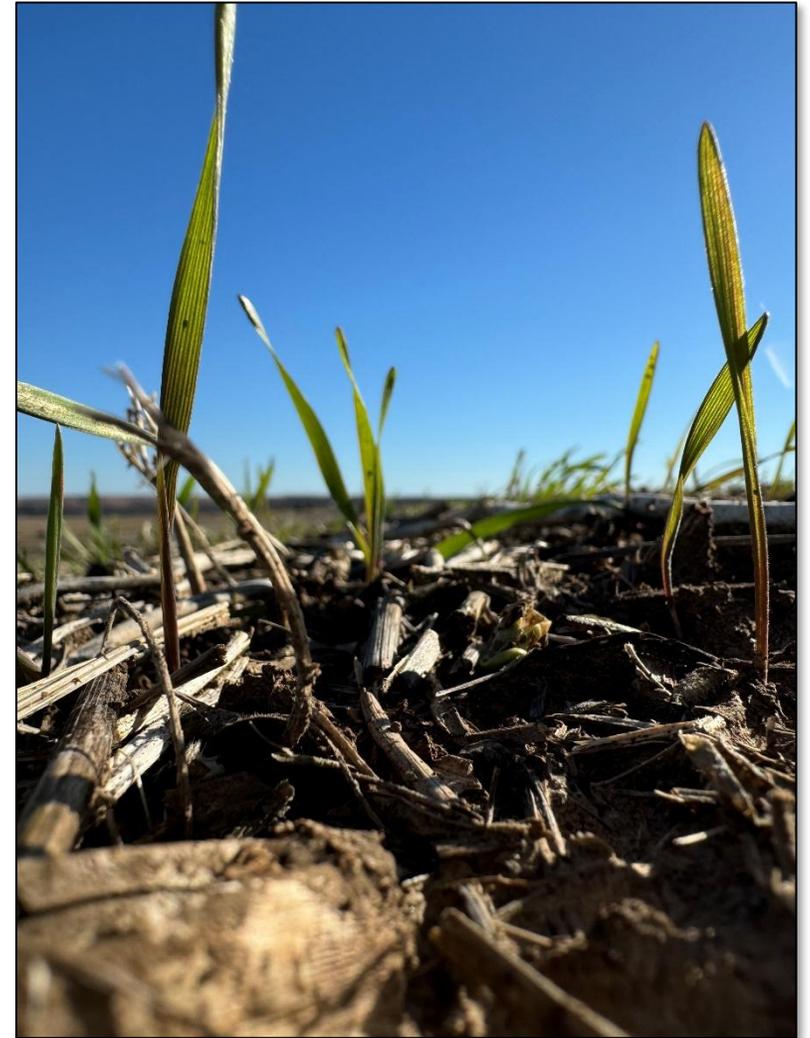
# Specific Objectives

1. Describe the views of survey respondents regarding the role of soil test data in P and K fertilization
2. Identify the factors influencing soil test laboratory selection among respondents
3. Examine respondent-reported drivers of P and K recommendations and fertilization decisions
4. Use respondents' feedback to identify potential areas for enhancing the FRST tool to better support science-based fertilizer-P and -K recommendations.



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# Respondents

- 238 respondents to work with after removing:
  - Those that did not work in the U.S.
  - Those that did not answer any 'meat & potatoes' survey questions
  - Those whose occupations did not fit within our groupings
    - Farmer
    - Independent crop advisors
    - Industry agronomists
    - Public sector



**CERTIFIED CROP ADVISER**  
A Program of the American Society of Agronomy

**UofA** **DIVISION OF AGRICULTURE**  
**RESEARCH & EXTENSION**  
*University of Arkansas System*

**The University of Arkansas Division of Agriculture invites you to participate in a survey regarding the Fertilizer Recommendation Support Tool (FRST).**

**We need your valuable input!**

# Respondents

- Generally very experienced
  - >60% of respondents had >15 years of experience

Ranking	Multi-Region	North Central	Northeast	South	West
1	Corn (81%)	Soybean (97%)	Corn (100%)	Corn (87%)	Alfalfa (64%) & Other (64%)
2	Soybean (70%)	Corn (96%)	Soybean (89%)	Soybean (83%)	Winter Wheat (53%)
3	Alfalfa (41%) & Winter Wheat (41%)	Alfalfa (63%)	Alfalfa (67%)	Winter Wheat (55%) & Cotton (55%)	Corn (49%)

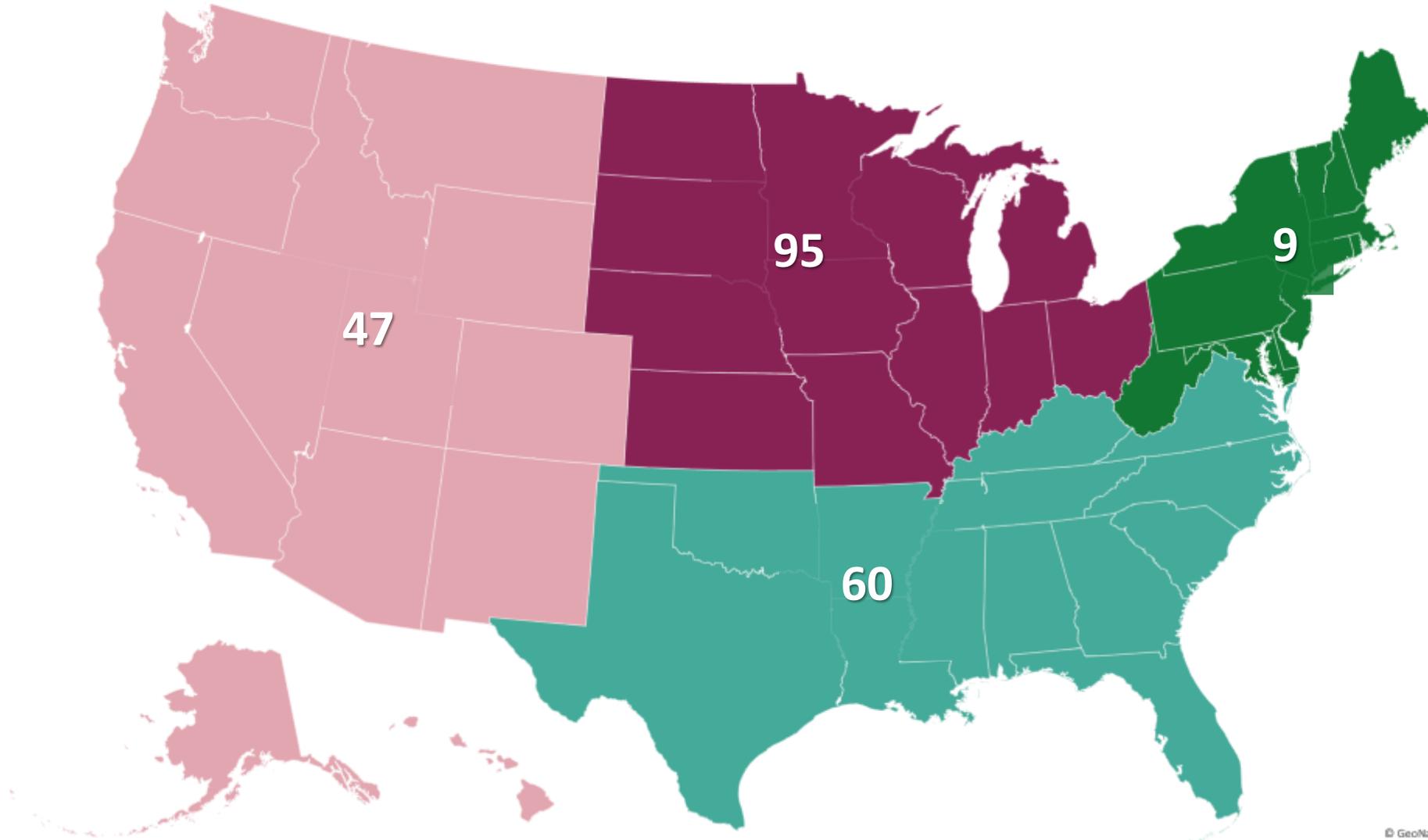
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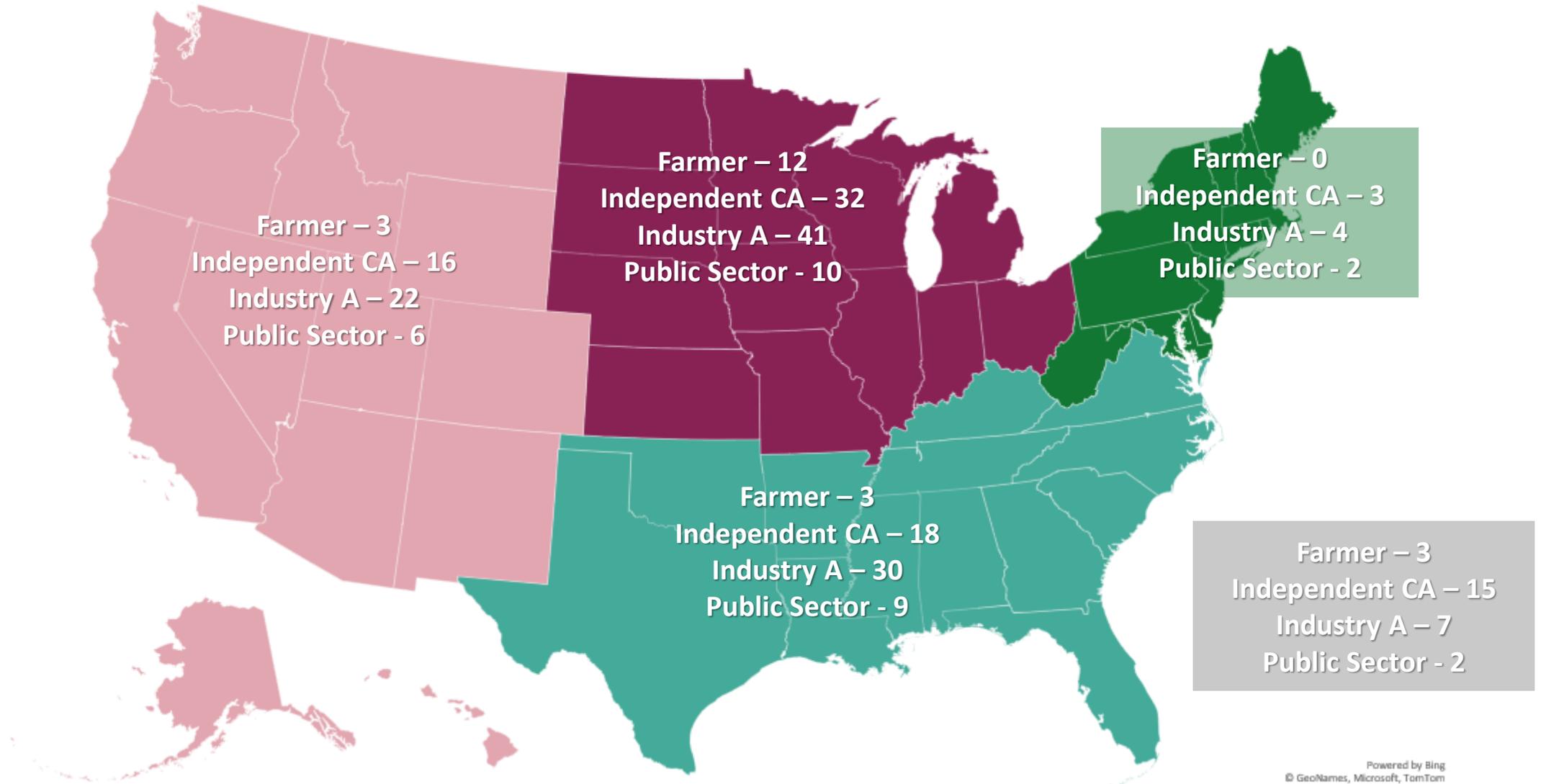
# Respondents

■ North Central ■ Northeastern ■ Southern ■ Western



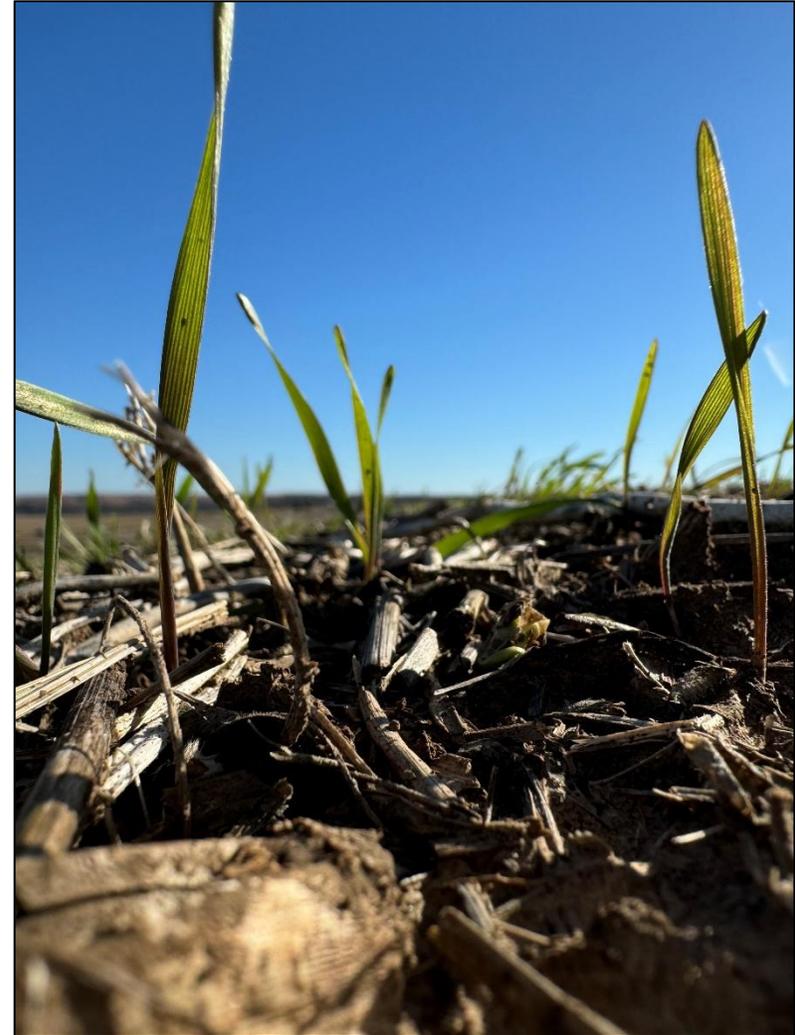
# Respondents

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# Our Focus, Today

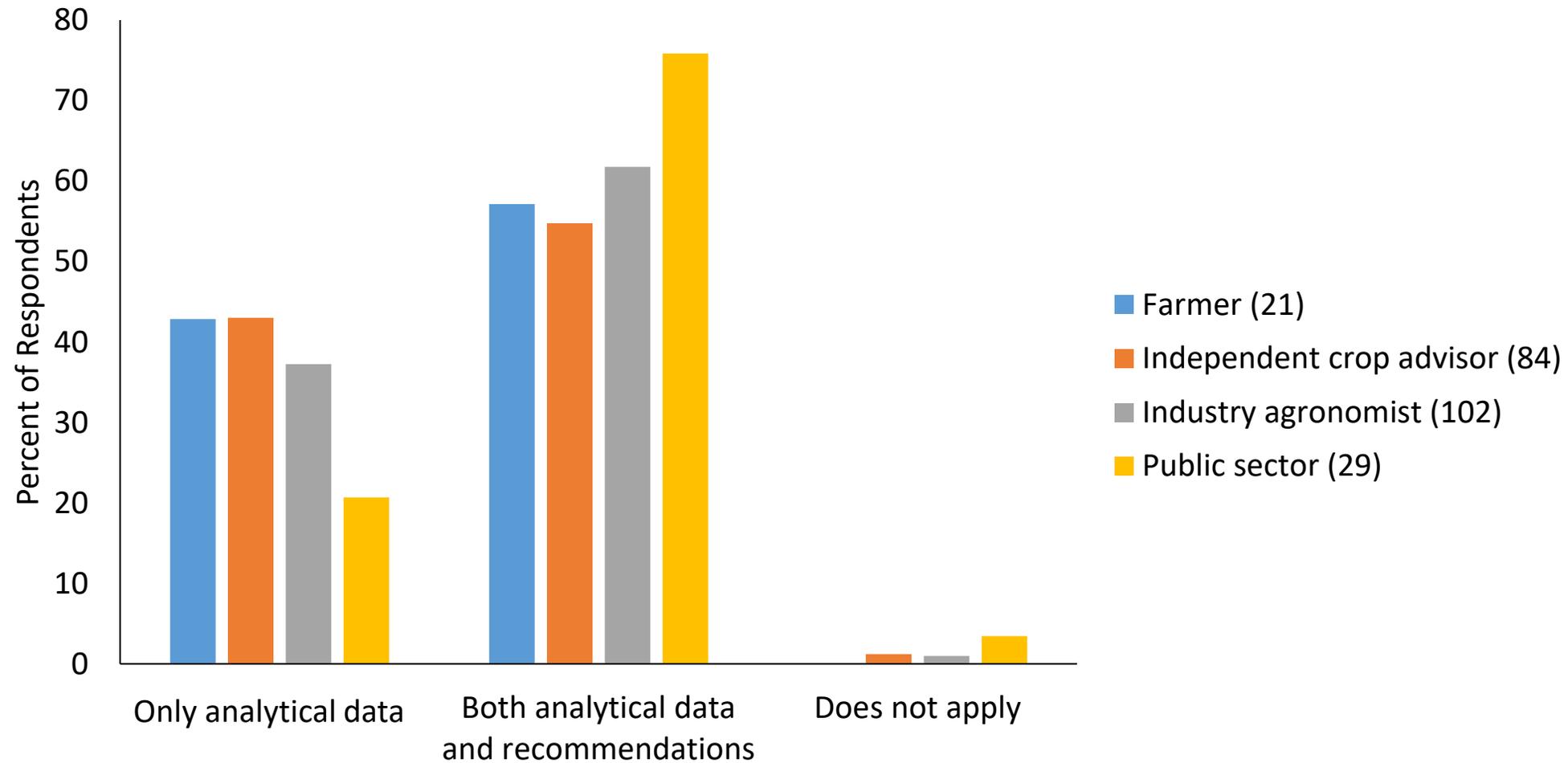
1. How do stakeholders view soil testing and its role in fertilizer decision making?
2. What are key factors in rate determination for P and K?
3. How would stakeholders interact with a web-based tool like FRST?
4. What do typical soil sampling practices look like for our stakeholders?



# The Role of Soil Testing

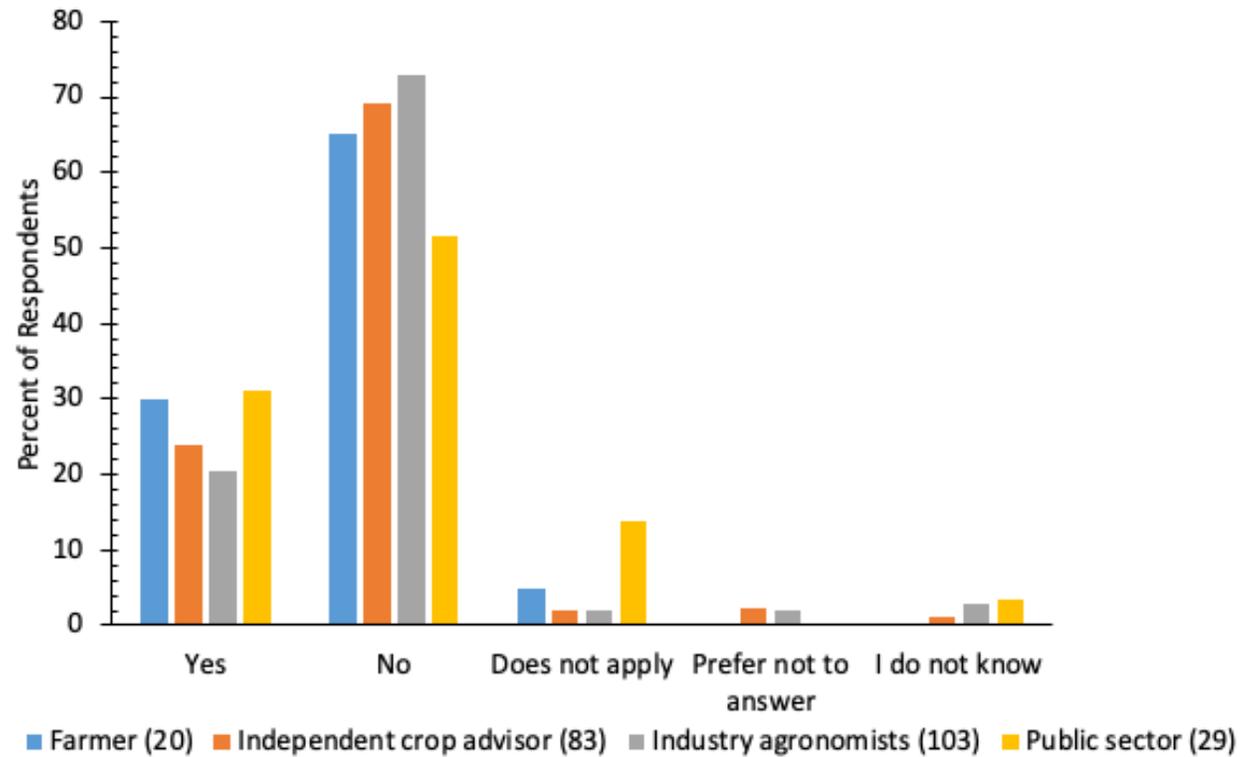
	Occupation Group			
	Farmer (n=20)	Independent Crop Advisor (n=84)	Industry Agronomist (n=104)	Public sector (n=28)
<i>Rate the importance of soil testing as a component of fertilization decisions from 1 (not important) to 10 (essential)</i>				
8-10	90%	92%	92%	89%
<i>How frequently is soil testing used as a component of P and K recommendation strategy?</i>				
Sometimes	15%	15%	19%	11%
Always	85%	85%	81%	89%

# Use of Lab Recommendations



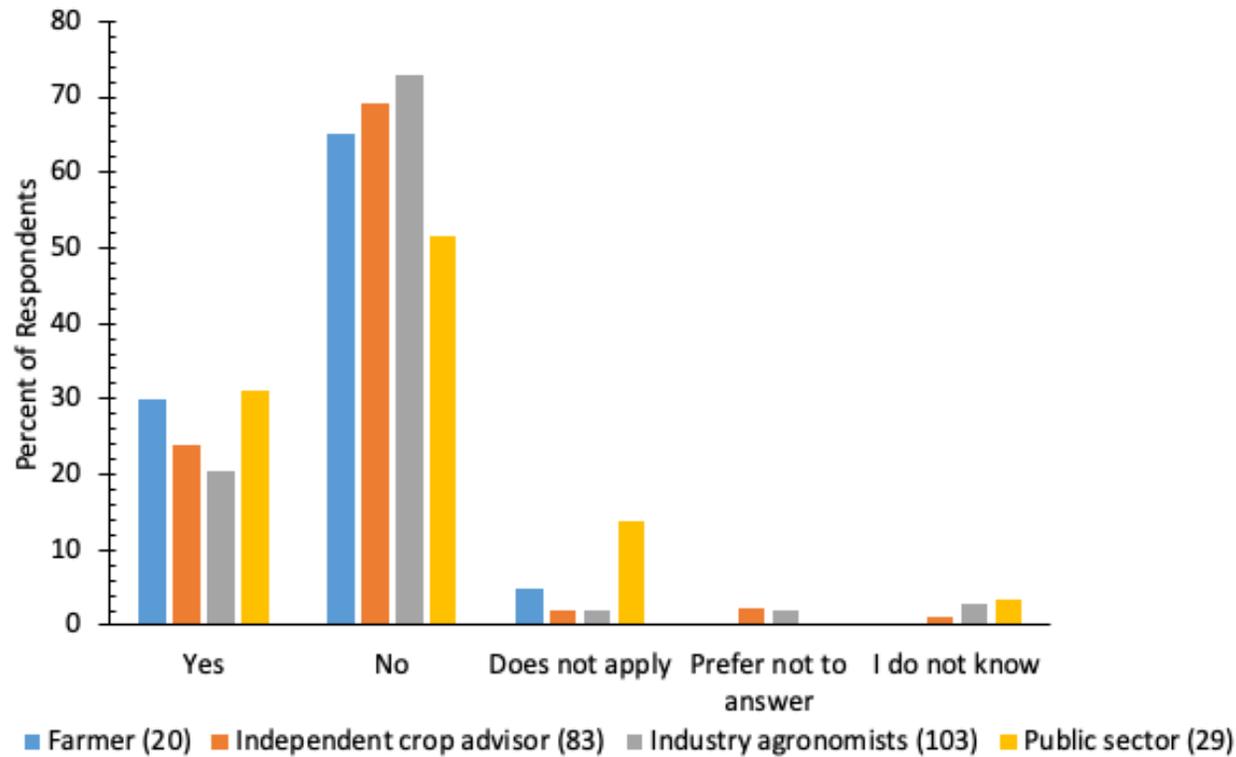
# Lab Selection

Select labs based on recommended P/K rates?

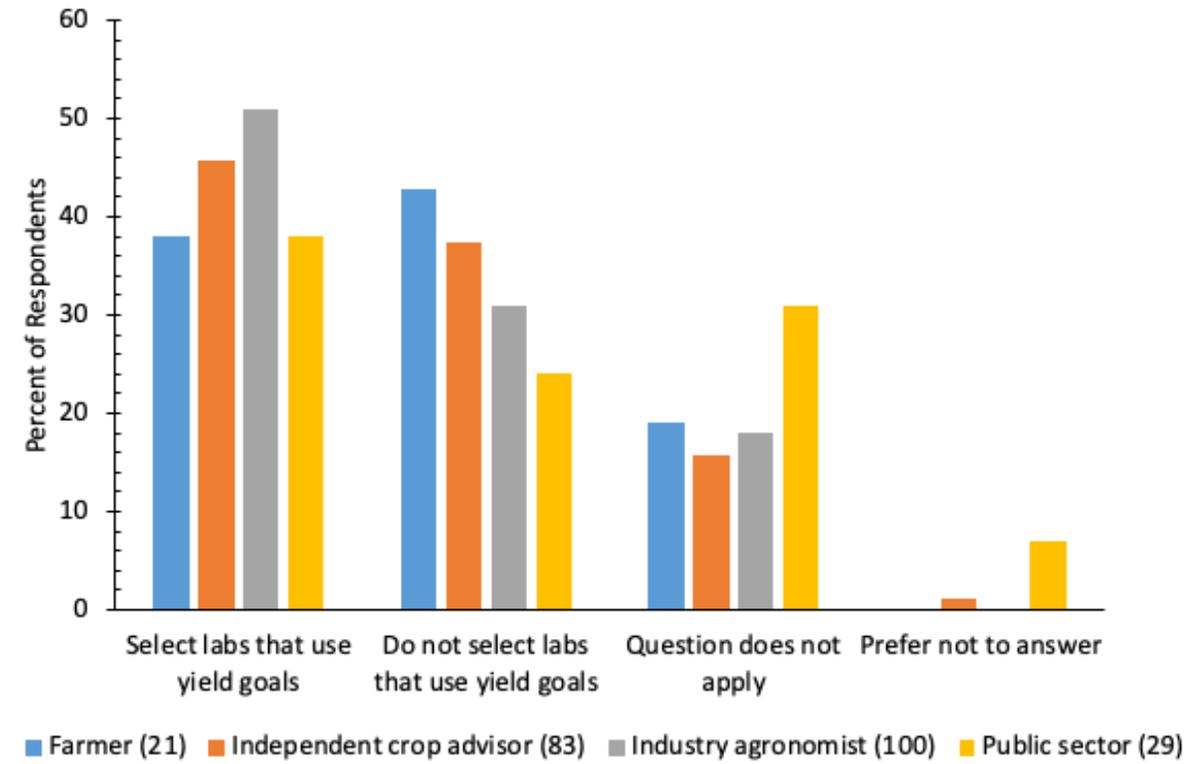


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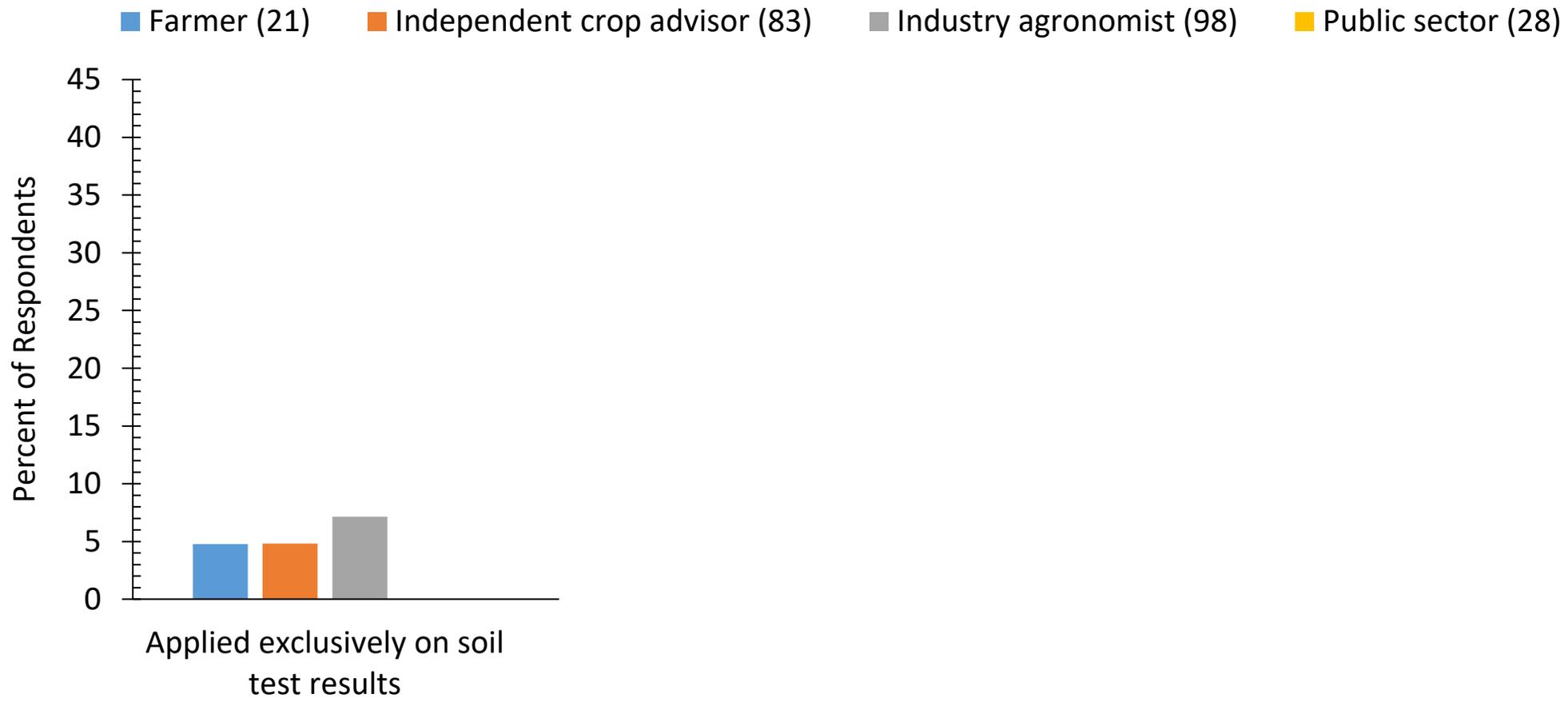
Select labs based on use of yield goal in rate recs?



# Primary Goal of Soil Testing & Fertilization – P



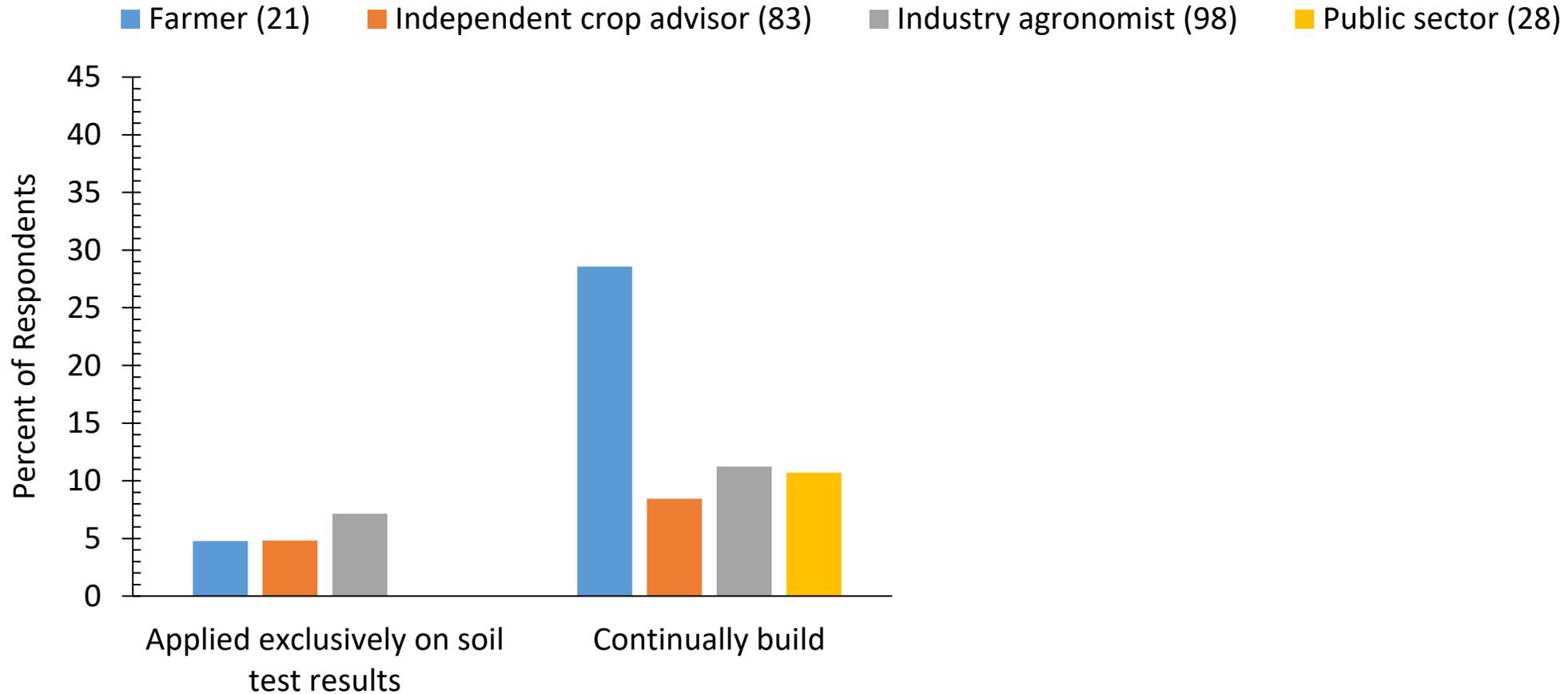
*\*very similar for K*



# Primary Goal of Soil Testing & Fertilization – P



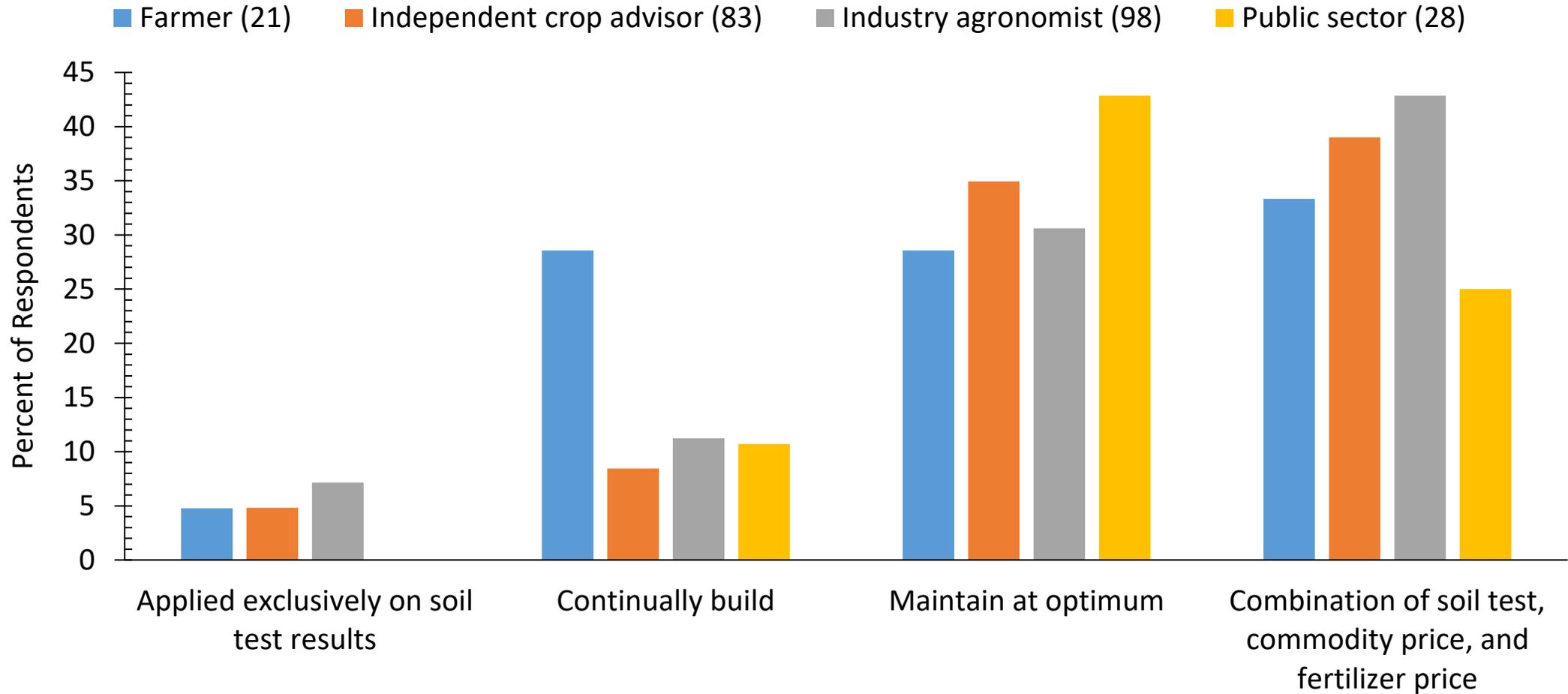
*\*very similar for K*



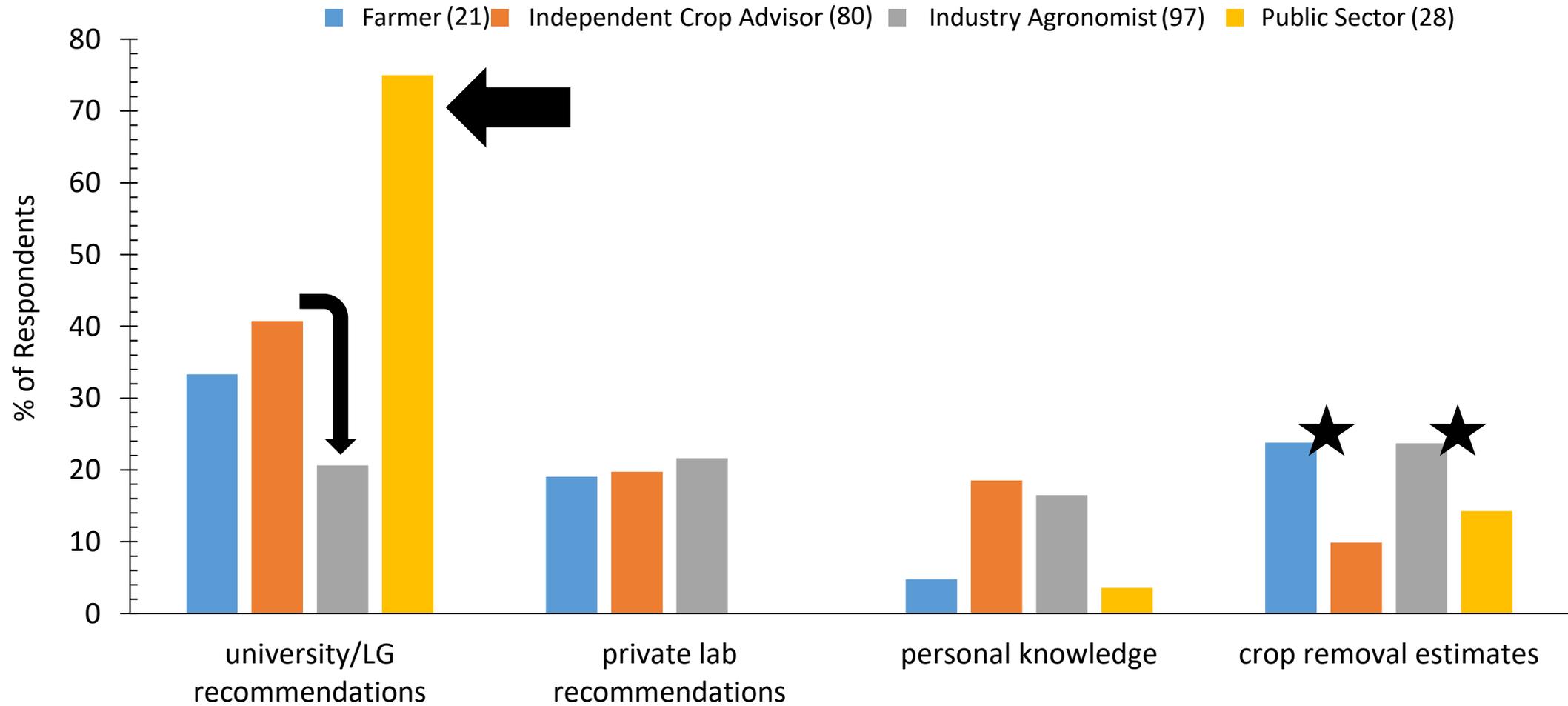
# Primary Goal of Soil Testing & Fertilization – P



*\*very similar for K*



# Primary Information Source



# Beneficial Information Sources for P/K Recs

**FARMERS (n=20)**

**PUBLIC SECTOR (n=26)**

**INDEPENDENT CROP ADVISOR (n=78)**

**INDUSTRY AGRONOMIST (n=93)**

# Beneficial Information Sources for P/K Recs

## FARMERS (n=20)

- ✓ Estimate of ROI (75%)
- ✓ Estimate of crop removal (60%) ★
- ✓ Magnitude of crop response (55%) ←

## PUBLIC SECTOR (n=26)

- ✓ Research-based CSTV (65%)
- ✓ Probability/frequency of crop response (62%) ←
- ✓ Estimate of crop removal (58%) ★

## INDEPENDENT CROP ADVISOR (n=78)

- ✓ Estimate of ROI (65%)
- ✓ Probability/frequency of crop response (55%) ←
- ✓ Estimate of crop removal (53%) ★

## INDUSTRY AGRONOMIST (n=93)

- ✓ Estimate of crop removal (59%) ★
- ✓ Estimate of ROI (58%)
- ✓ Probability/frequency of crop response (53%) ←

# Beneficial Information Sources for P/K Recs

## FARMERS (n=20)

- ✓ Estimate of ROI (75%)
- ✓ Estimate of crop removal (60%)
- ✓ Magnitude of crop response (55%)
- ✓ Probability/frequency of crop response (50%)
- ✓ Estimate of nutrient uptake (50%)
- ✓ Research-based CSTV (40%)
- ✓ ~~Estimate of error associated with CSTV (0%)~~ ←

## PUBLIC SECTOR (n=26)

- ✓ Research-based CSTV (65%)
- ✓ Probability/frequency of crop response (62%)
- ✓ Estimate of crop removal (58%)
- ✓ Estimate of ROI (50%)
- ✓ Magnitude of crop response (46%)
- ✓ Estimate of crop nutrient uptake (42%)
- ✓ Estimate of error associated with CSTV (23%) ←

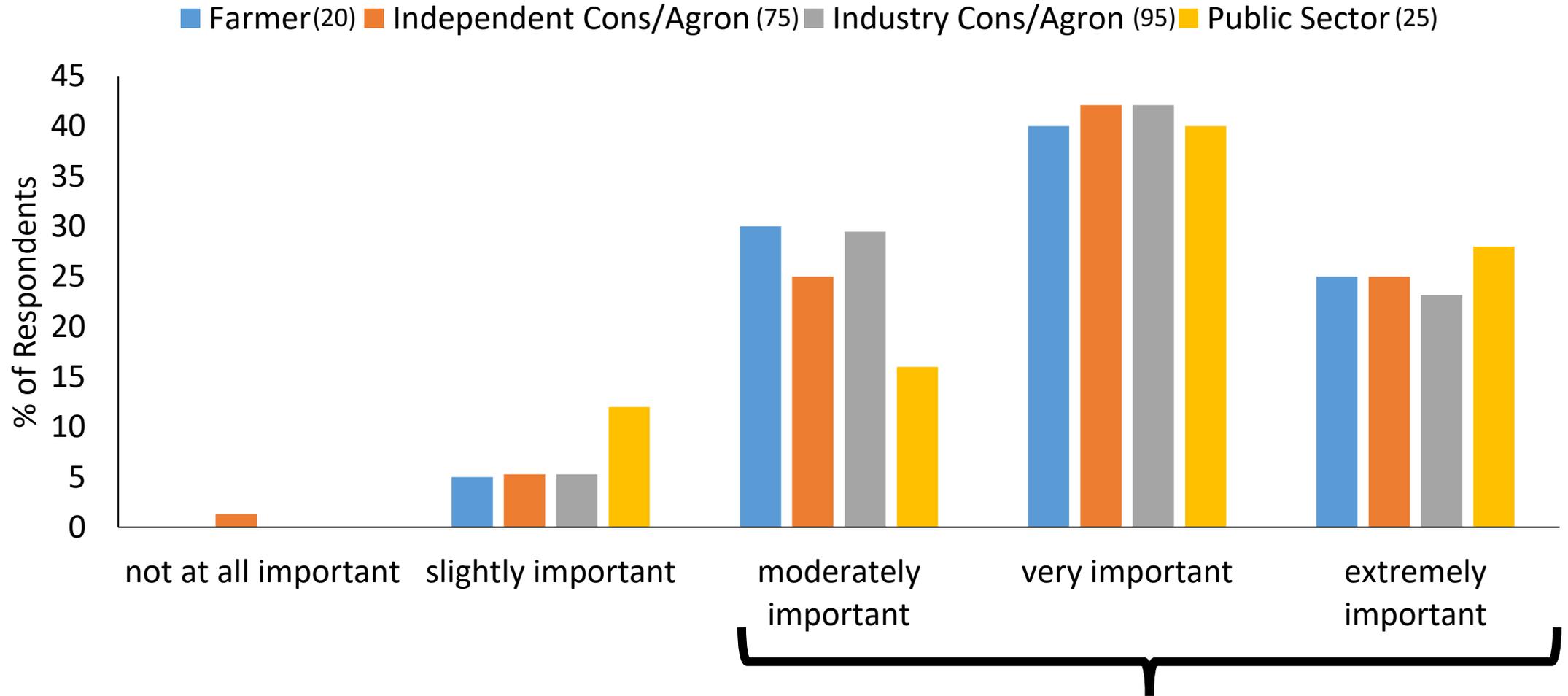
## INDEPENDENT CROP ADVISOR (n=78)

- ✓ Estimate of ROI (65%)
- ✓ Probability/frequency of crop response (55%)
- ✓ Estimate of crop removal (53%)
- ✓ ~~Estimate of crop nutrient uptake (51%)~~
- ✓ Research-based CSTV (44%)
- ✓ ~~Magnitude of crop response (41%)~~
- ✓ Estimate of error associated with CSTV (14%) ←

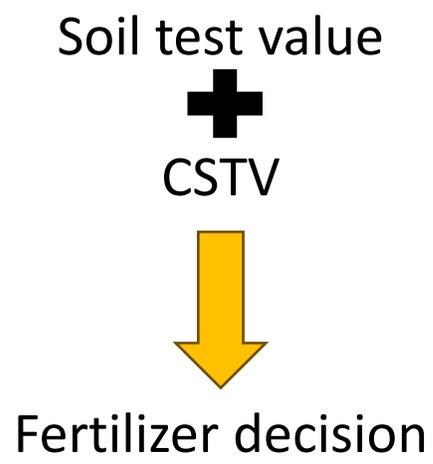
## INDUSTRY AGRONOMIST (n=93)

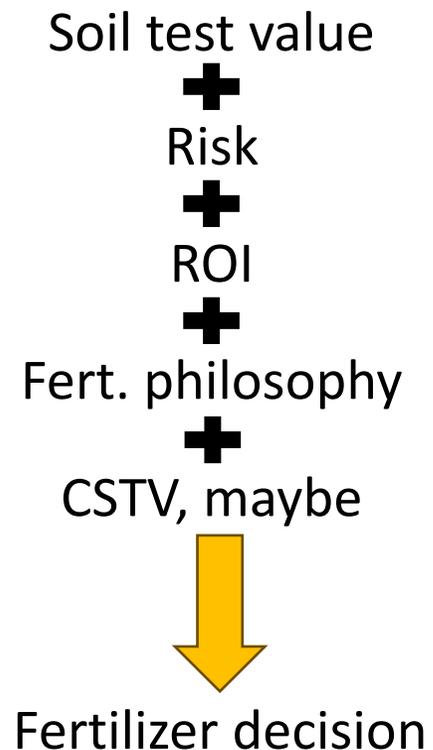
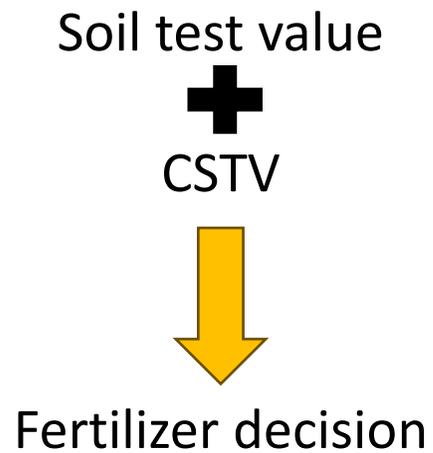
- ✓ Estimate of crop removal (59%)
- ✓ Estimate of ROI (58%)
- ✓ Probability/frequency of crop response (53%)
- ✓ Estimate of crop nutrient uptake (46%)
- ✓ Research-based CSTV (43%)
- ✓ ~~Magnitude of crop response (35%)~~
- ✓ Estimate of error associated with CSTV (13%) ←

# Importance of ROI in P/K Decisions



95% of farmers and consultants/agronomists, and 88% of public sector employees rated ROI as moderately to extremely important



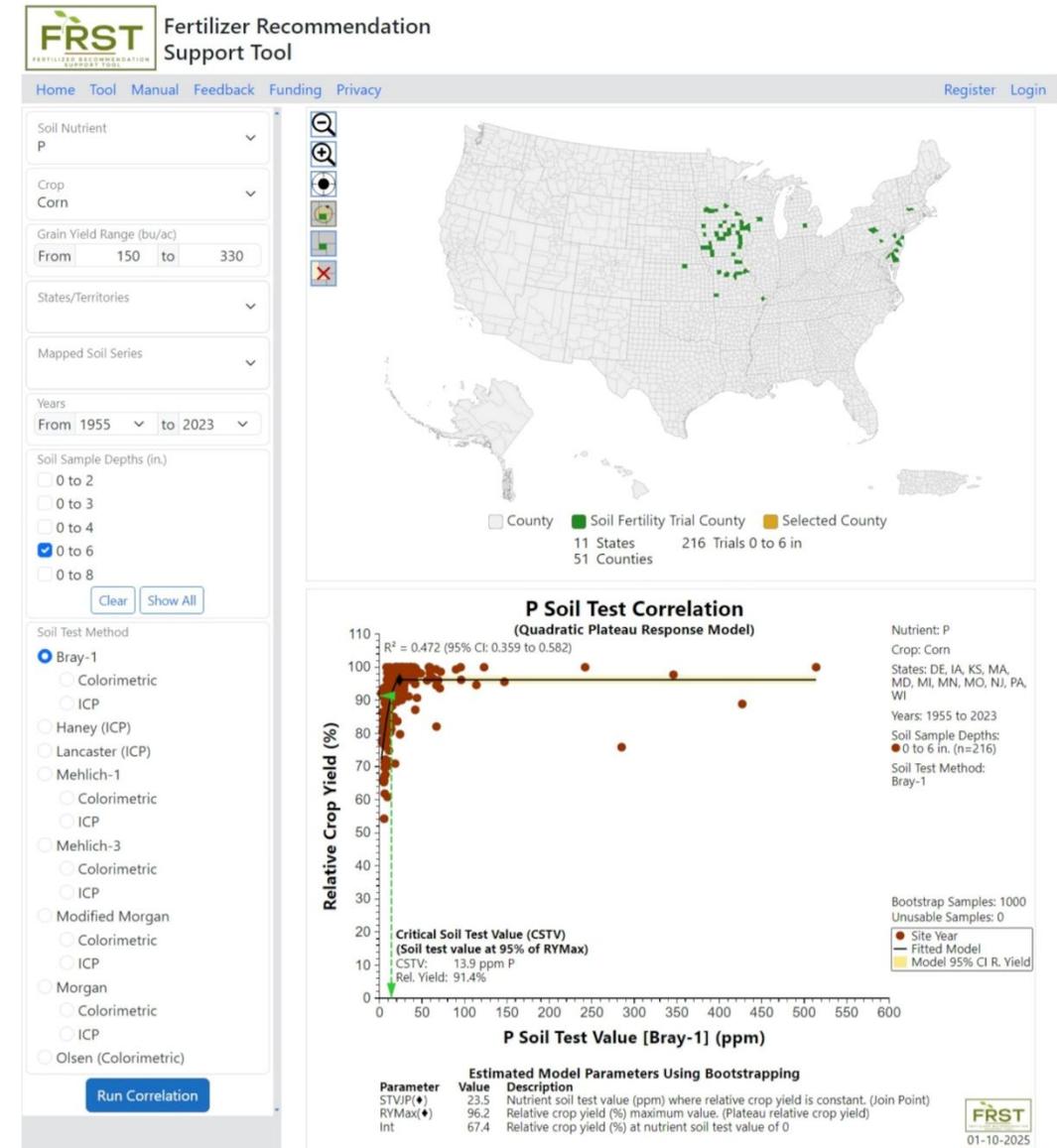


# FRST Use

➤ Likelihood of using a web-based interactive tool that includes research trial data and the relationship between soil test values and crop relative yield response to fertilization → *on average, 80% said they would sometimes to regularly use a tool*

➤ Use for...

- Comparing current recommendations
- Making farm specific decisions
- Examine ROI



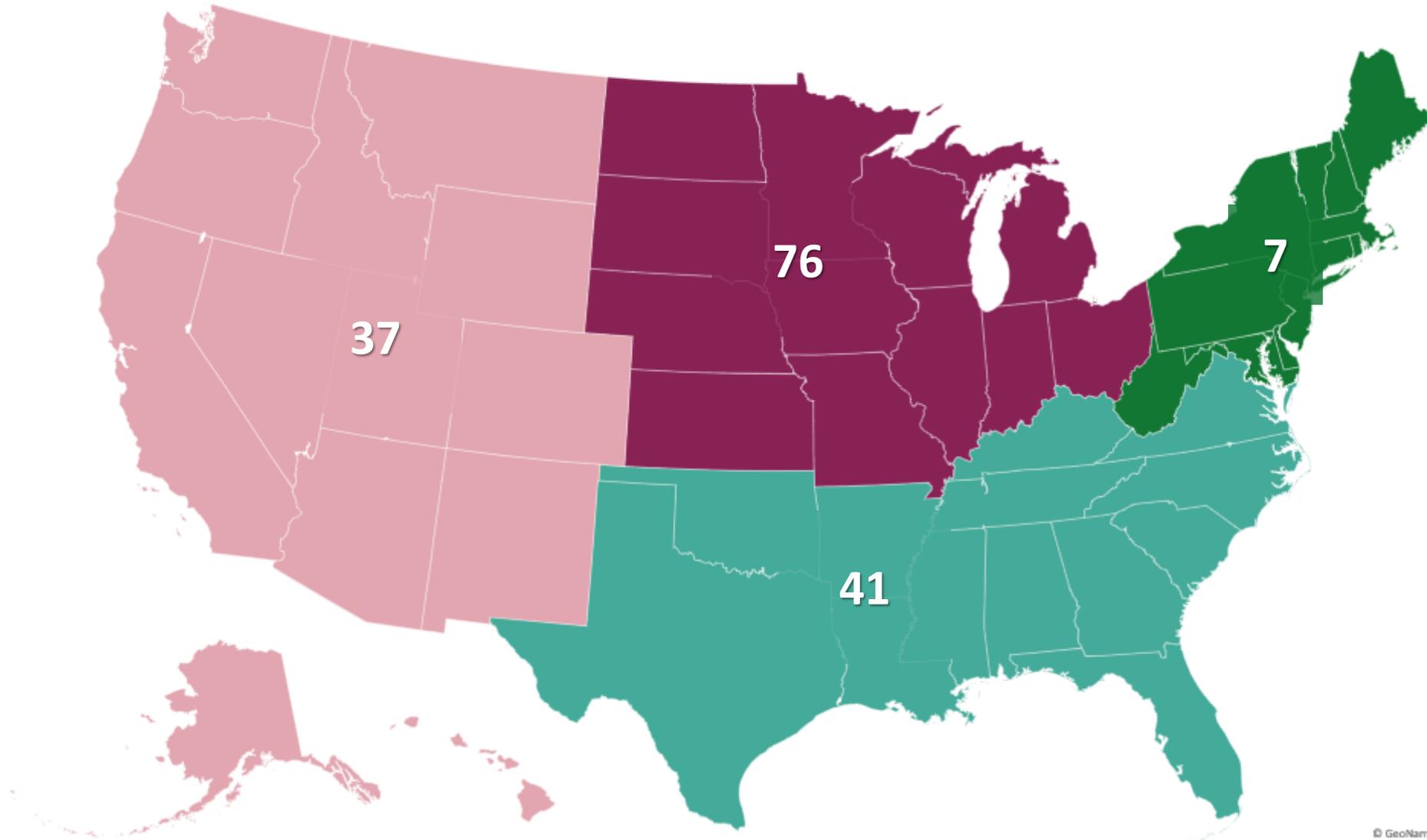
# Optional Part II – Soil Sampling Practices

- Additional 9 questions on soil sampling practices that respondents could opt into answering
  1. Do your crop fertilization practices/recs change **if land is owned vs. leased**?
  2. What is the **primary sample depth** used to assess P/K availability?
  3. How **often** are soil samples for P/K fertility collected?
  4. What **factors are considered in sampling frequency**?
  5. Which **months** do you collect P/K soil samples?
  6. Do **factors influencing frequency sampling affect timing** of sampling?
  7. What % of your managed acreage is **grid/zone sampled**?
  8. What % of your managed acreage **receives VR P**?
  9. What % of you managed acreage **receives VR K**?

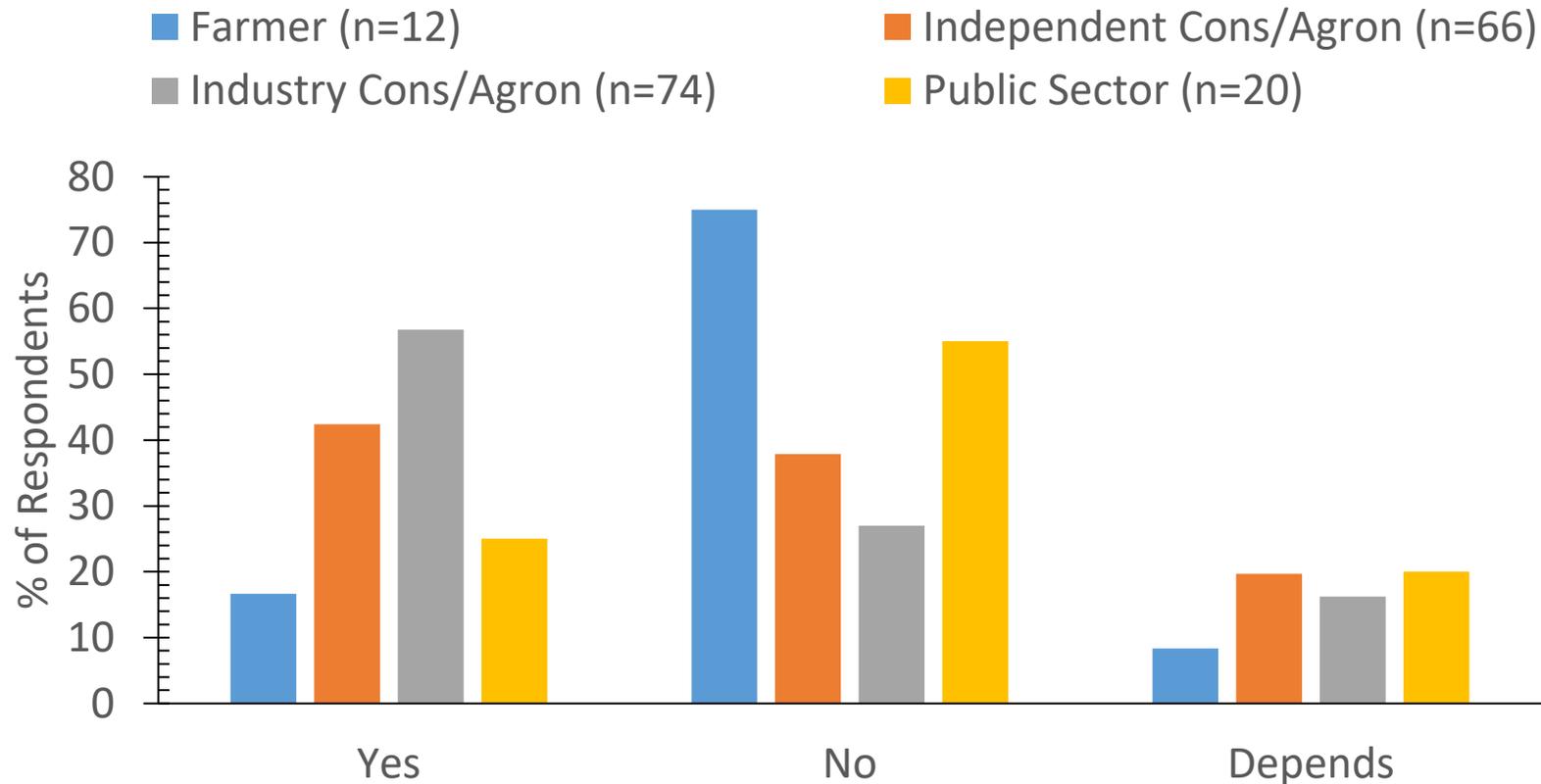
# Respondents

**173 Total**

■ North Central ■ Northeastern ■ Southern ■ Western

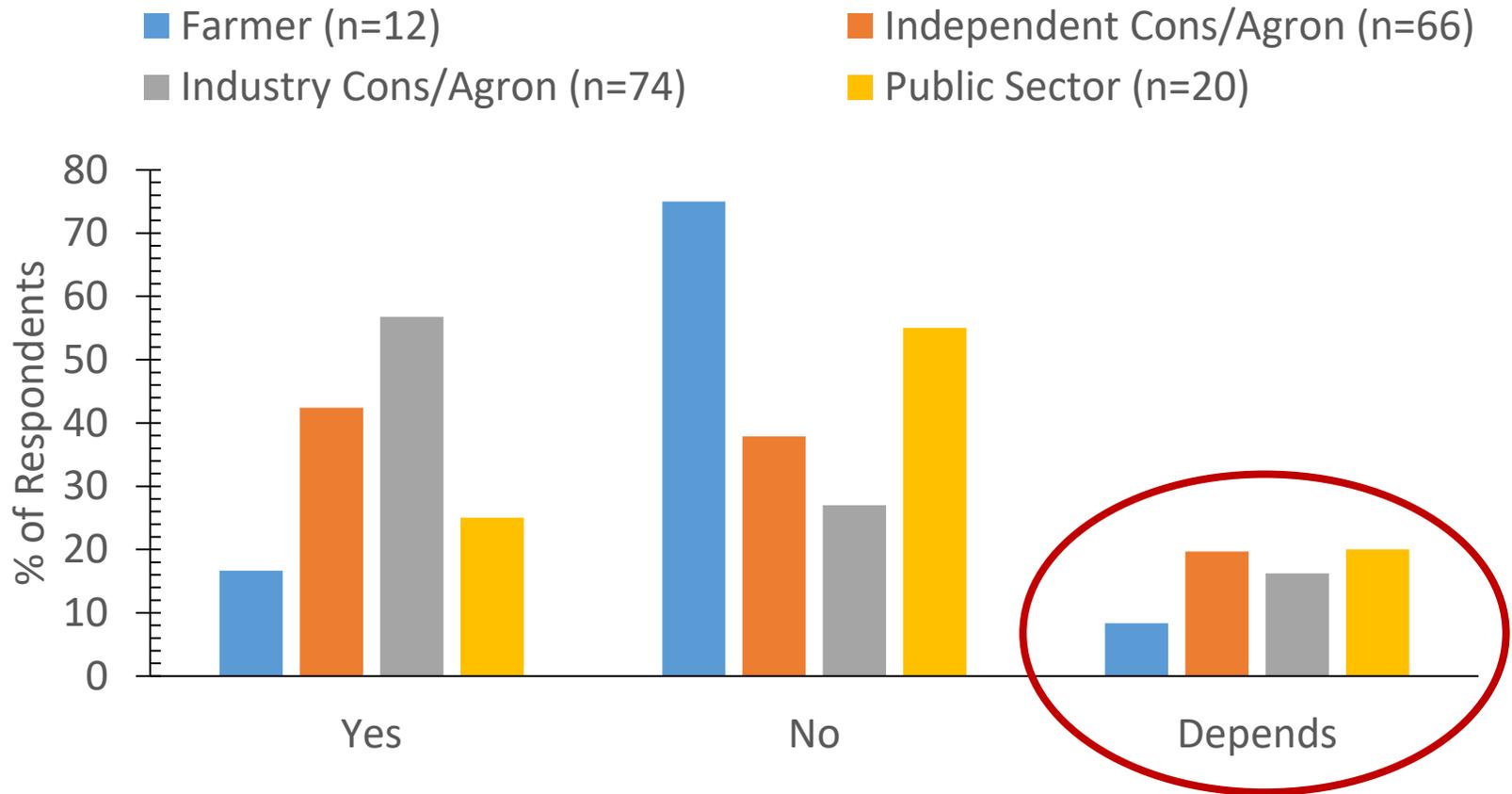


# Do your crop fertilization practices/recs change if land is owned vs. leased?



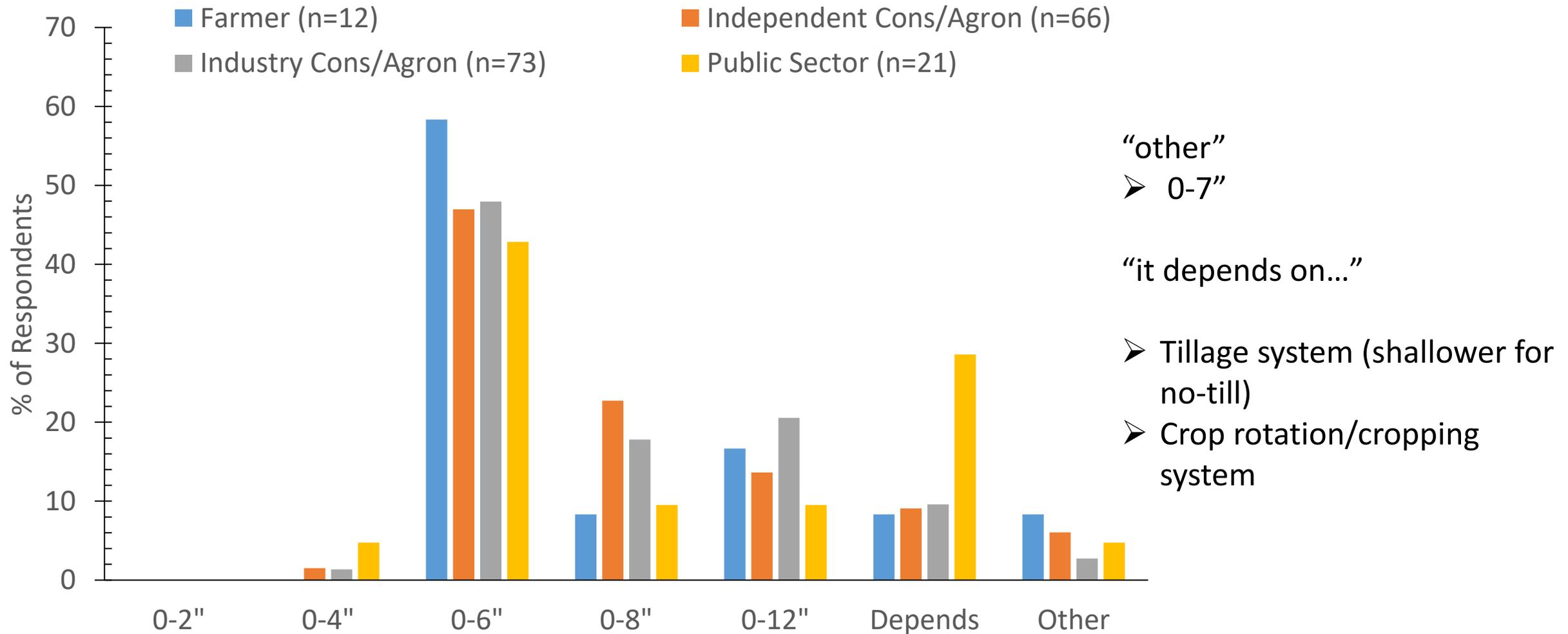
- Most farmers said no
- >50% of public sector said no
- Industry leaned yes
- Independent split

# Do your crop fertilization practices/recs change if land is owned vs. leased?

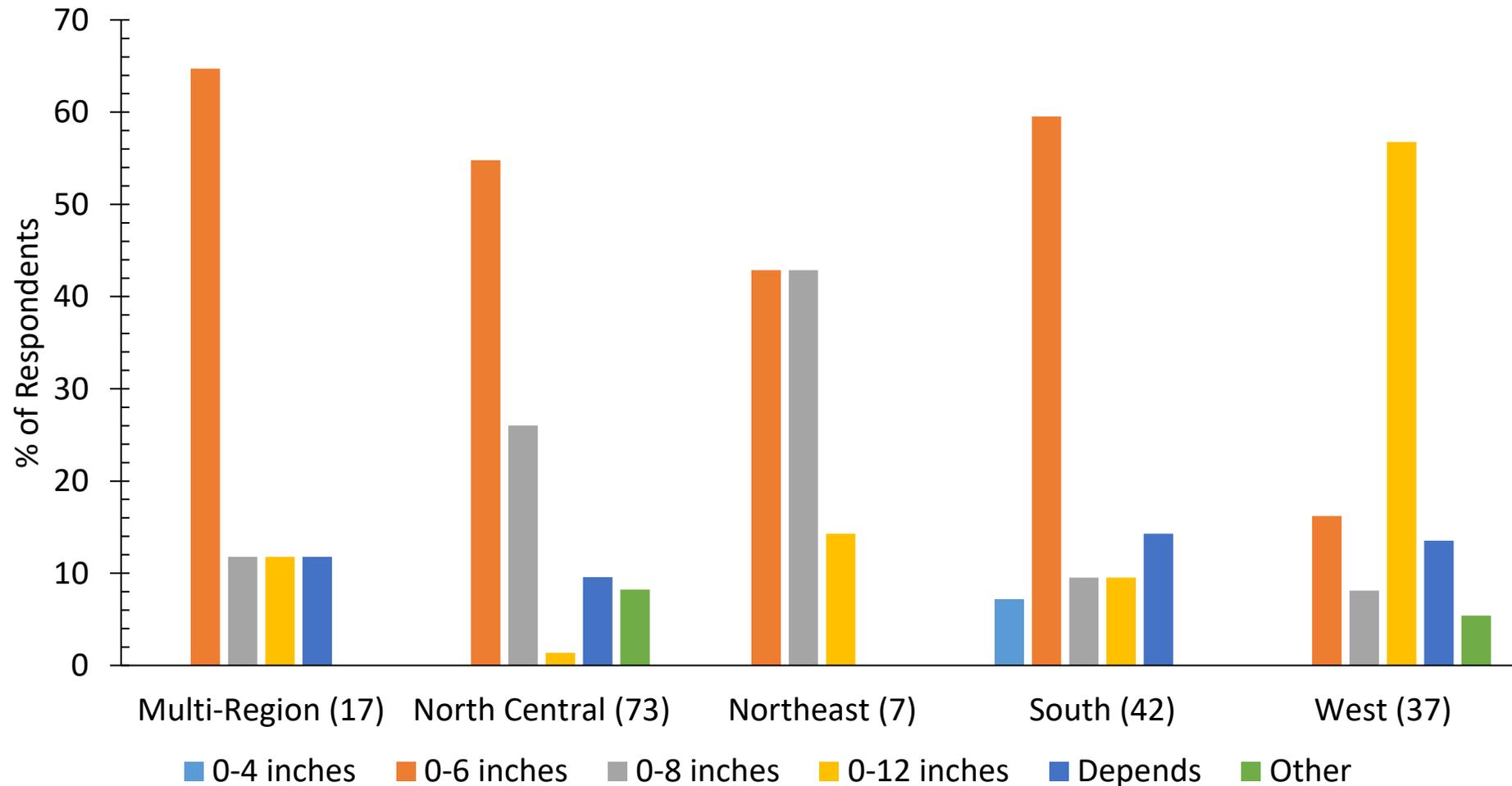


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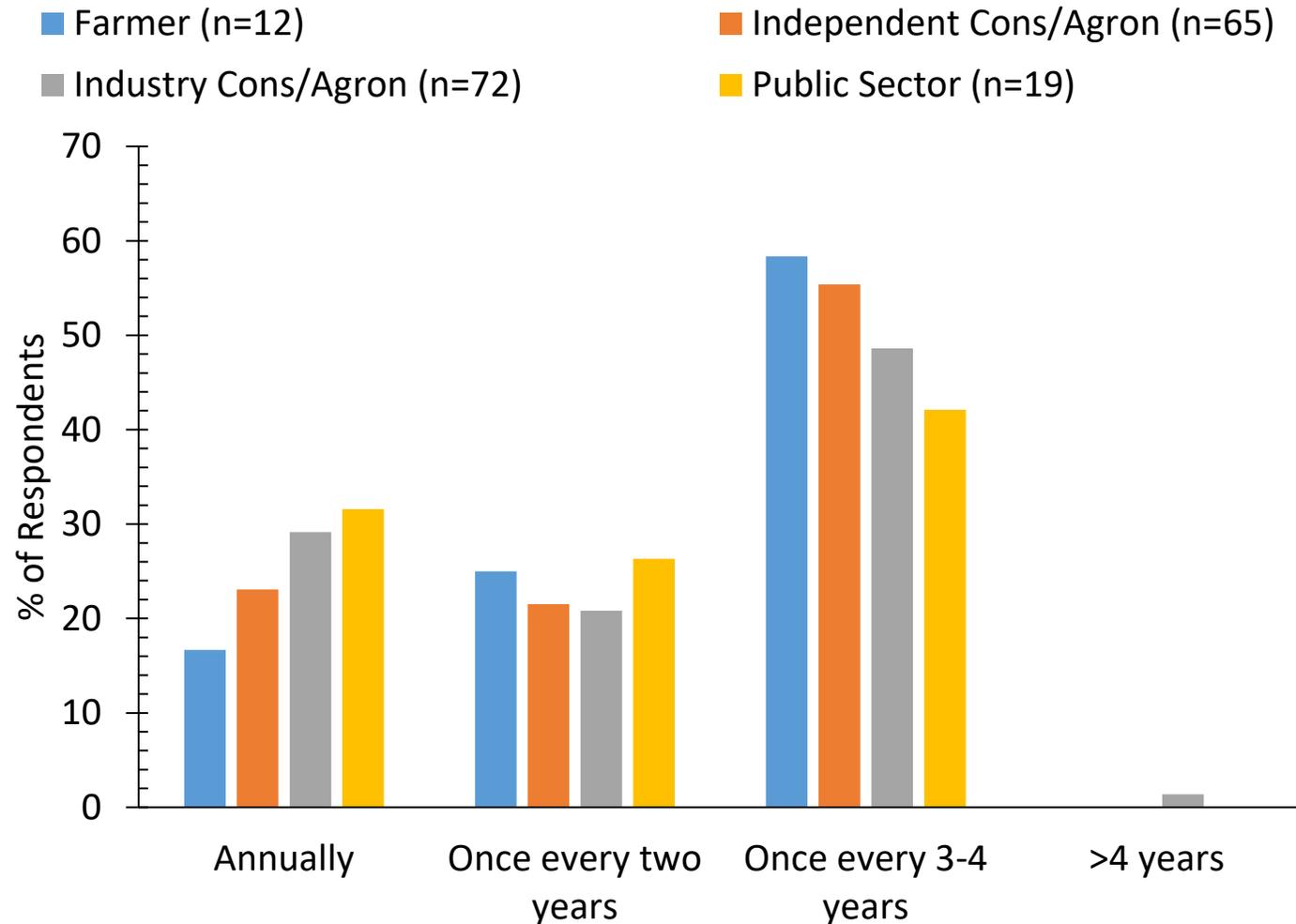
# What is the primary sample depth used to assess P/K availability?



# What is the primary sample depth used to assess P/K availability?



# How often are soil samples for P/K fertility collected?



## Common factors in frequency decision:

### ➤ Farmers

- Crop rotation sequence
- P/K fertility levels
- Soil buffering capacity
- Soil pH
- Crop yield

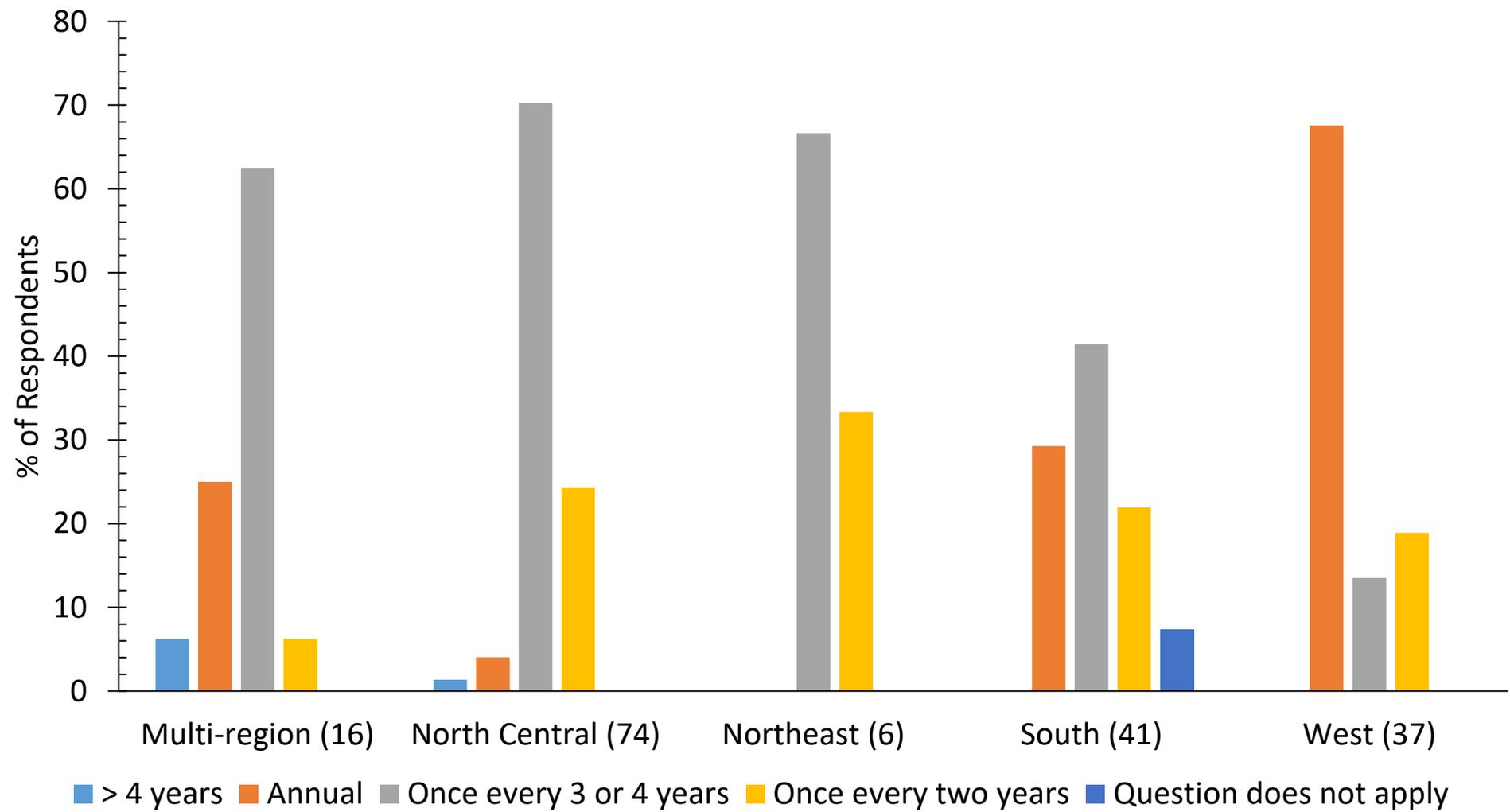
### ➤ Consultant/Agronomists

- Crop rotation sequence
- P/K fertility levels
- Crop yield

### ➤ Public Sector

- Crop rotation sequence
- P/K fertility levels
- Crop yield

# How often are soil samples for P/K fertility collected?



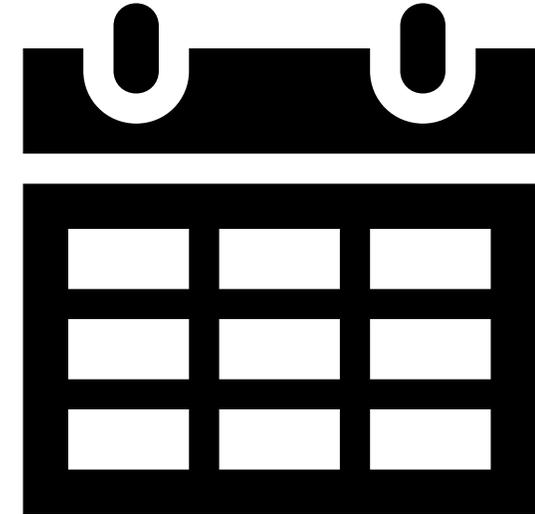
# Which months do you collect P/K soil samples?

## Months when soil samples are normally collected to inform P/K fertilizer decisions:

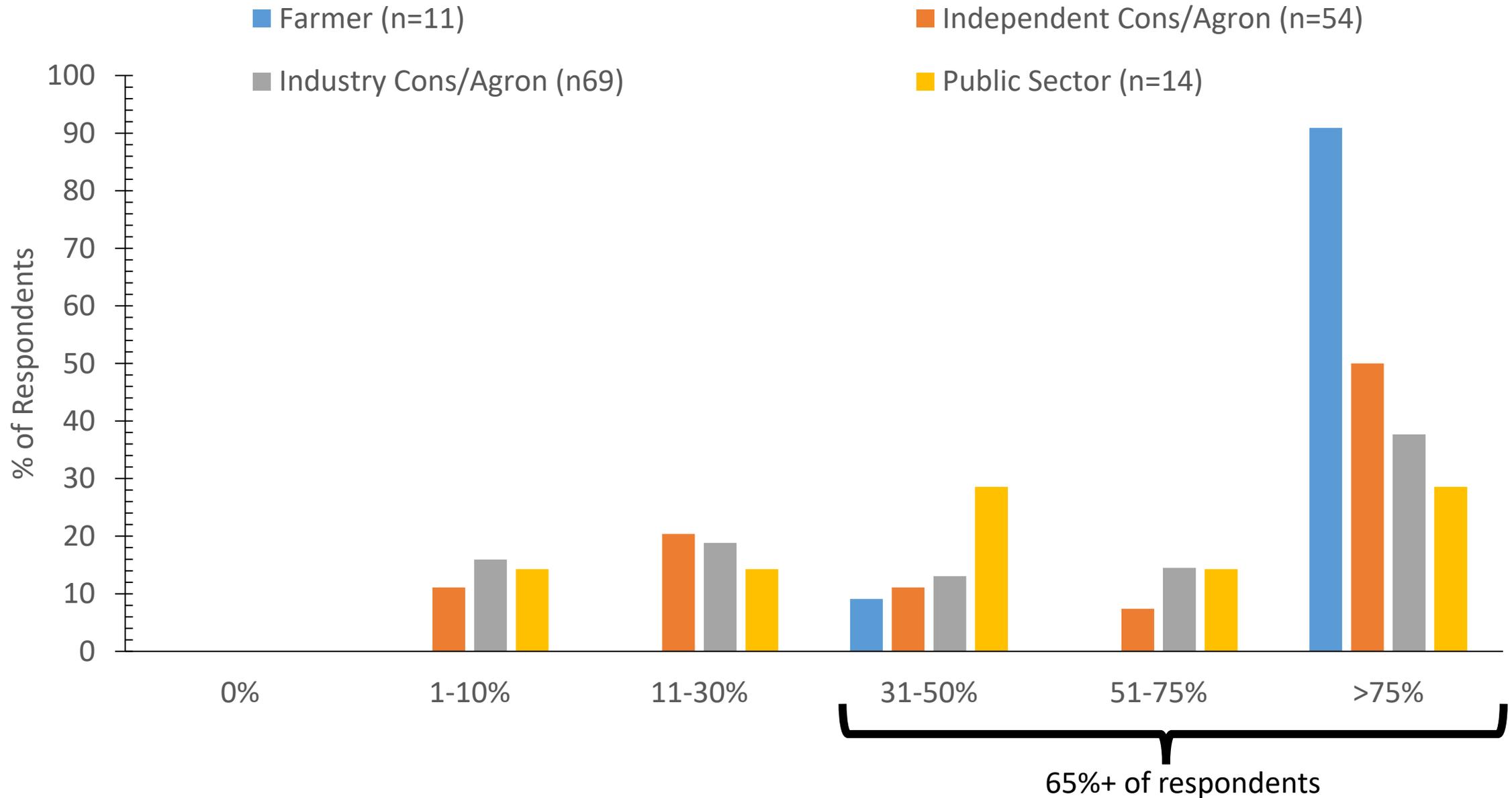
- October/November were most popular, across the board
- March/April was the next most popular time

## Do factors affecting soil sampling frequency affect timing of soil sample collection?

- Farmers: 100% no
- Consultant/agronomist groups: 60-40, no-yes
- Public sector: 50-50, no-yes



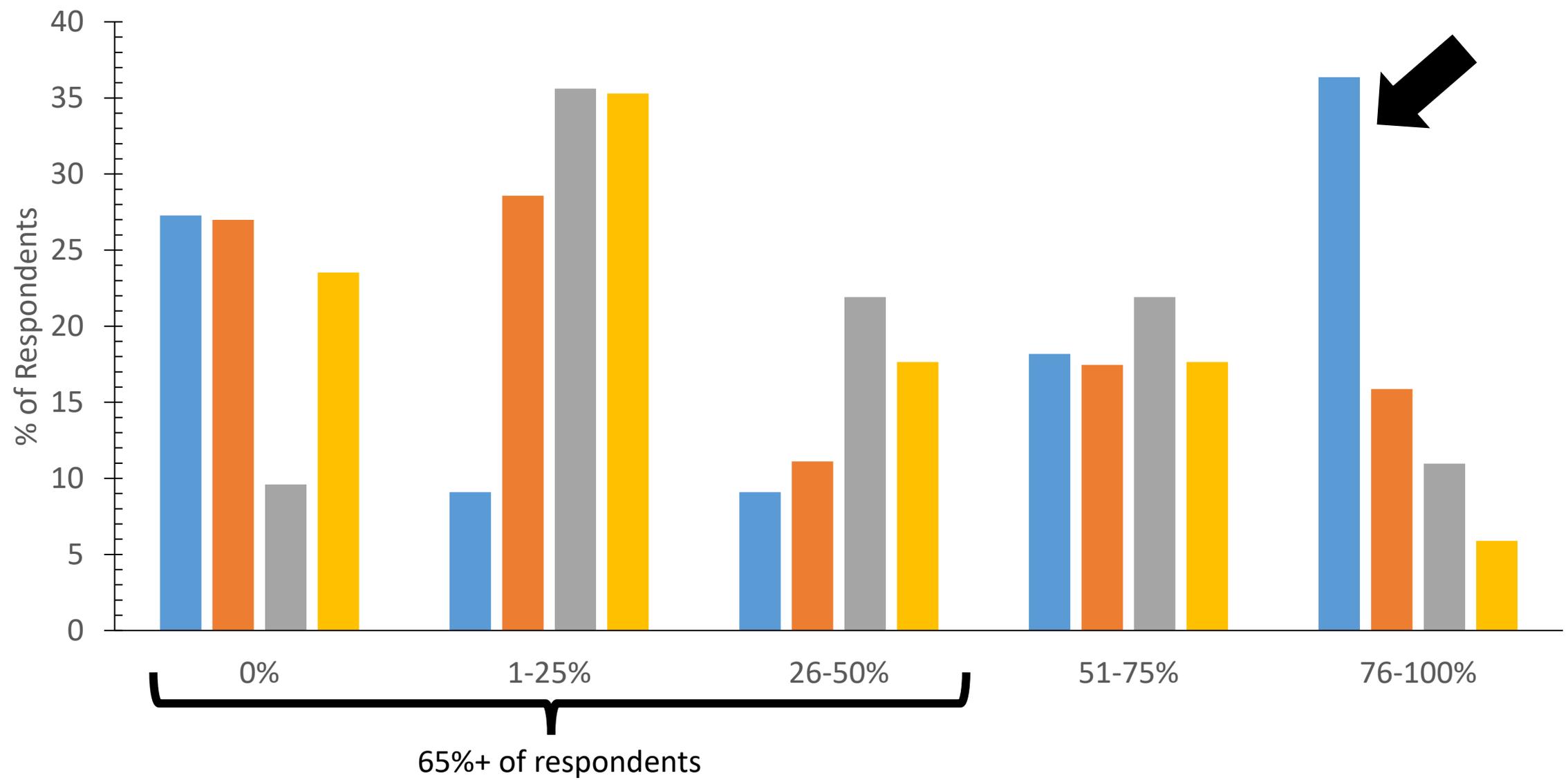
# What % of your managed acreage is grid/zone sampled?



# What % of your managed acreage receives VR P?

*\*very similar for K*

■ Farmer (n=12) 
 ■ Independent Cons/Agron (n=65) 
 ■ Industry Cons/Agron (n=74) 
 ■ Public Sector (n=17)



# What did we learn?

- ✓ Owned vs. leased land sometimes affects fertilization for P and K, particularly depending on length of lease and terms of the lease
- ✓ Common soil sample depths include 0-6", 0-8", and 0-12", but sample depth may depend on tillage regime and/or cropping system
- ✓ Soil samples are most commonly collected every 3-4 years, but factors like crop rotation, crop yield, and P/K fertility may change this
- ✓ October/November is most common soil sampling time
- ✓ Grid sampling occurs on at least a portion of all respondents' managed acres, but not all respondents report at least some acres being VR managed for P or K.

# FRST Team + Collaborators



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**Chris Bandura** University of Wisconsin  
**Alan Blaylock** Nutrien  
**Carl Bolster** USDA-ARS  
**Megan Bourns** Purdue University  
**Sylvie Brouder** Purdue University  
**Tom Bruulsema** IPNI-Canada  
**Greg Buol** North Carolina State University  
**Miguel Cabrera** University of Georgia  
**Daniela Carrijo** Penn State University  
**Ignacio Ciampitti** Purdue University  
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**Chris Clark** University of Wisconsin  
**Jason Clark** South Dakota State University  
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**Steve Culman** Oregon State University  
**Leo Deiss** Ohio State University  
**Jagman Dhillon** Mississippi State University  
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**Brady Goettl** North Dakota State University  
**John Grove** University of Kentucky  
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**Bryan Hopkins** Brigham Young University  
**Glenn Howell** Calcium Products  
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**Sindhu Jagadamma** University of Tennessee  
**Brad Joern** Precision Planting  
**Clain Jones** Montana State University  
**John Jones** University of Illinois  
**Daniel Kaiser** University of Minnesota  
**Gurpreet Kaur** University of Missouri  
**Quirine Ketterings** Cornell University  
**Gene Kim** USDA-NRCS  
**David Kissel\*** University of Georgia  
**Pete Kleinman** USDA-ARS  
**John Kovar** USDA-ARS  
**Greg LaBarge** Ohio State University  
**Gabe LaHue** Washington State University  
**Corey Lacey** Illinois Soybean Association  
**Jay Lessl** University of Georgia  
**Steve Levitsky** Phospholutions  
**Sarah Lyons** FFAR  
**Rory Maguire** Virginia Tech University  
**Krishna Maruvada** Phospholutions

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**Renuka Mathur** University of New Hampshire  
**Marshall McDaniel** Iowa State University  
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**Fernando Miguez** Iowa State University  
**Robert Miller** ALP  
**Grace Miner** USDA-ARS  
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**Joshua Mott** Virginia Tech University  
**Jake Mowrer** Texas A&M University  
**Stephanie Murphy** Rutgers University  
**Rao Mylavarapu** University of Florida  
**Kelly Nelson** University of Missouri  
**Nathan Nelson** Kansas State University  
**Shannon Nelson** Brigham Young University  
**Leanna Nigon** The Fertilizer Institute  
**Deanna Osmond\*** North Carolina State University  
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**Austin Pearce** Field to Market  
**E. Pena-Yewtukhiw** Univ. of West Virginia  
**Steve Philips** Oklahoma State University  
**Rishi Prasad** Auburn University  
**Tony Provin** Texas A&M University  
**Manbir Rakkar** Ohio State University  
**Vaughn Reed** Mississippi State University  
**Mark Reiter** Virginia Tech University  
**Edwin Ritchey** University of Kentucky  
**Matthew Ruark** University of Wisconsin  
**Dorivar Ruiz Diaz** Kansas State University  
**Amir Sadeghpour** Southern Illinois University

**Dustin Sawyer** Rock River Lab  
**Lakesh Sharma** University of Florida  
**Kurt Shroeder** University of Idaho  
**Hardeep Singh** University of Florida  
**Rajveer Singh** University of Arkansas  
**Henry Sintem** University of Georgia  
**Nathan Slaton** University of Arkansas  
**Joao Souza** Montana State University  
**Jared Spackman** University of Idaho  
**Carissa Spencer** USDA-FSA  
**Juan Solomon** University of Nevada, Reno  
**David Sotomayor** University of Puerto Rico  
**John Spargo** Penn State University  
**Kurt Steinke** Michigan State University  
**Haiying Tao** University of Connecticut  
**David Tarkalson** USDA-ARS  
**Gurpal Toor** University of Maryland  
**Wilma Trujillo** Colorado State University  
**Teferi Tsegaye** USDA-ARS  
**Jeff Volenec** Purdue University  
**Forbes Walker** University of Tennessee  
**Jim Wang** LSU AgCenter  
**Charles White** Penn State University  
**Stephen Wood** The Nature Conservancy  
**Frank Yin** University of Tennessee  
**Matt Yost** Utah State University  
**Amy Shober** University of Delaware  
**Frank Sikora\*** University of Kentucky  
**Gurbir Singh** University of Missouri



UNIVERSITY OF MINNESOTA



MICHIGAN STATE UNIVERSITY



SOUTH DAKOTA STATE UNIVERSITY



PURDUE UNIVERSITY



UNIVERSITY OF NEBRASKA LINCOLN



University of Nevada, Reno

IOWA STATE UNIVERSITY



58-8070-8-016



United States Department of Agriculture Natural Resources Conservation Service



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