



Economics of Reduced Tillage and Cover Crops

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Outline

- Ag Economy Barometer
- Carbon Markets
- Reduced Tillage
- Cover Crops
- Future Work

Ag Economy Barometer

Ag Economy Barometer

Survey Details

- **Monthly survey of 400 U.S. agricultural producers, focused on major crop and livestock enterprises**
 - Corn and Soybeans: 53%
 - Wheat: 14%
 - Cotton: 3%
 - Beef: 19%
 - Swine: 6%
 - Dairy: 5%

Ag Economy Barometer Survey Details (continued)

- Respondents value of farm production is greater than \$500,000.
- Do not survey the same producers each month, but characteristics of survey sample are held constant from month to month.

Ag Economy Barometer

Index

200

175

150

125

100

75

08/16

08/17

08/18

08/19

08/20

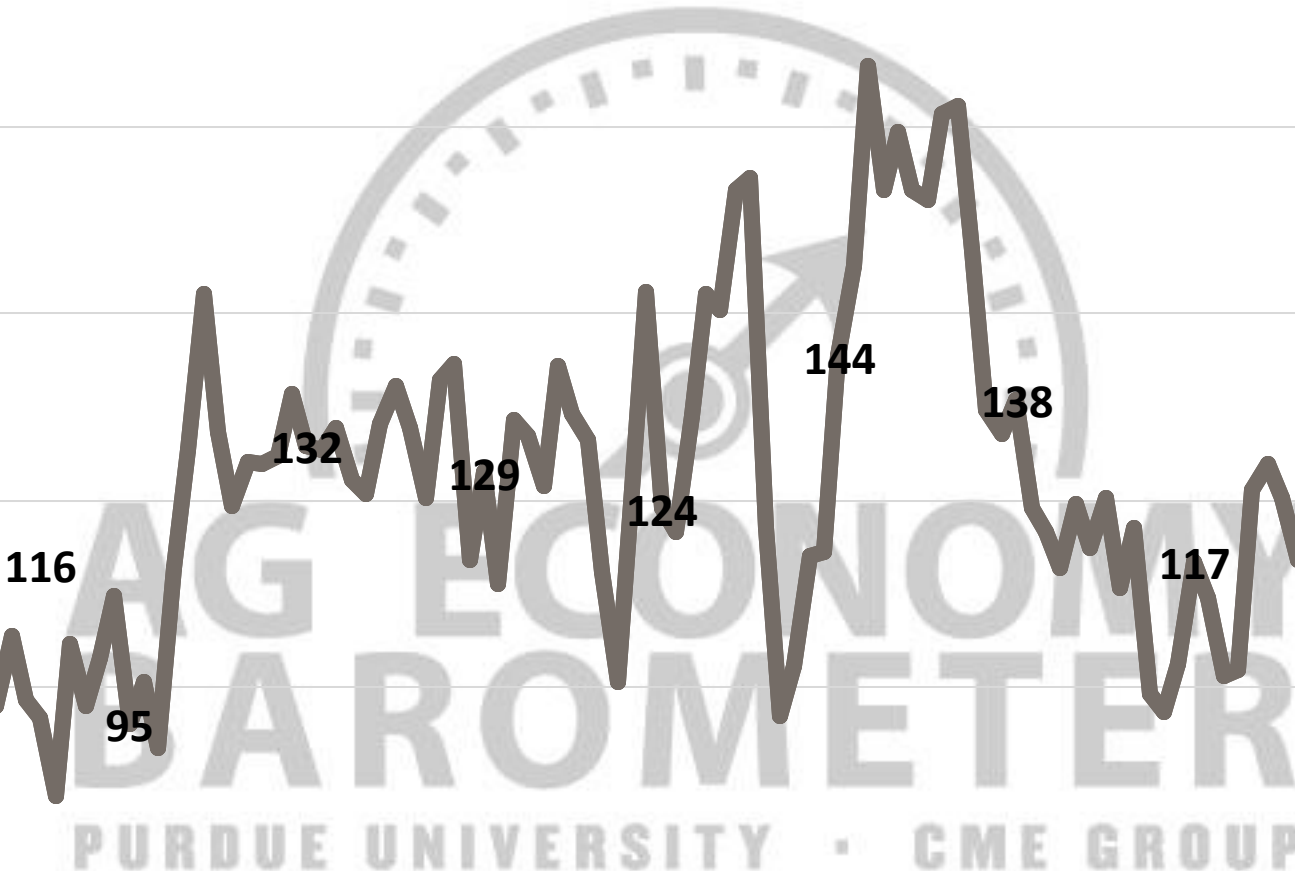
08/21

08/22

08/23

08/24

Month & Year



116

95

132

129

124

144

138

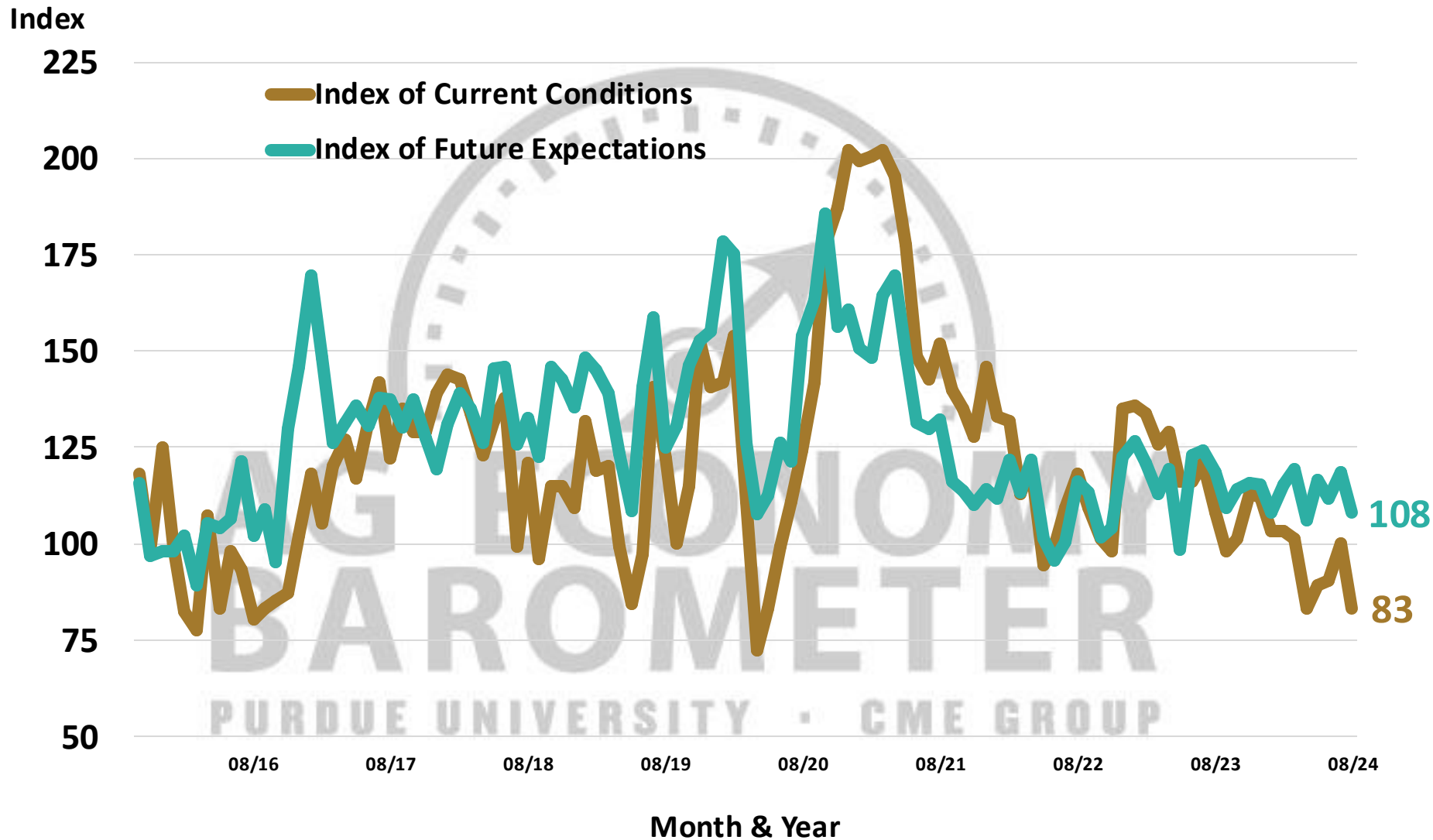
117

115

100

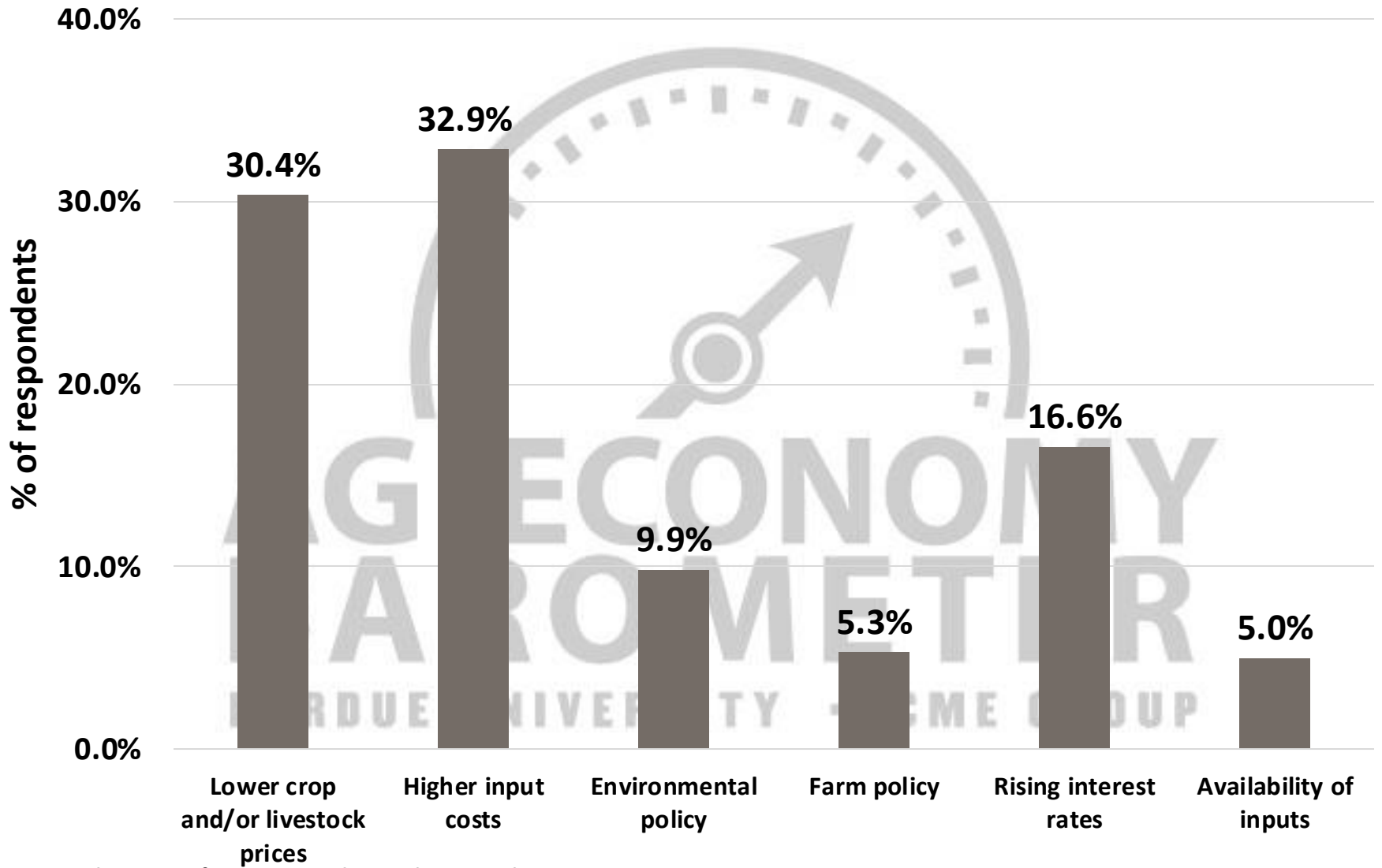
Source: Purdue University Center for Commercial Agriculture, Producer Survey, August 2024

Indices of Current Conditions and Future Expectations



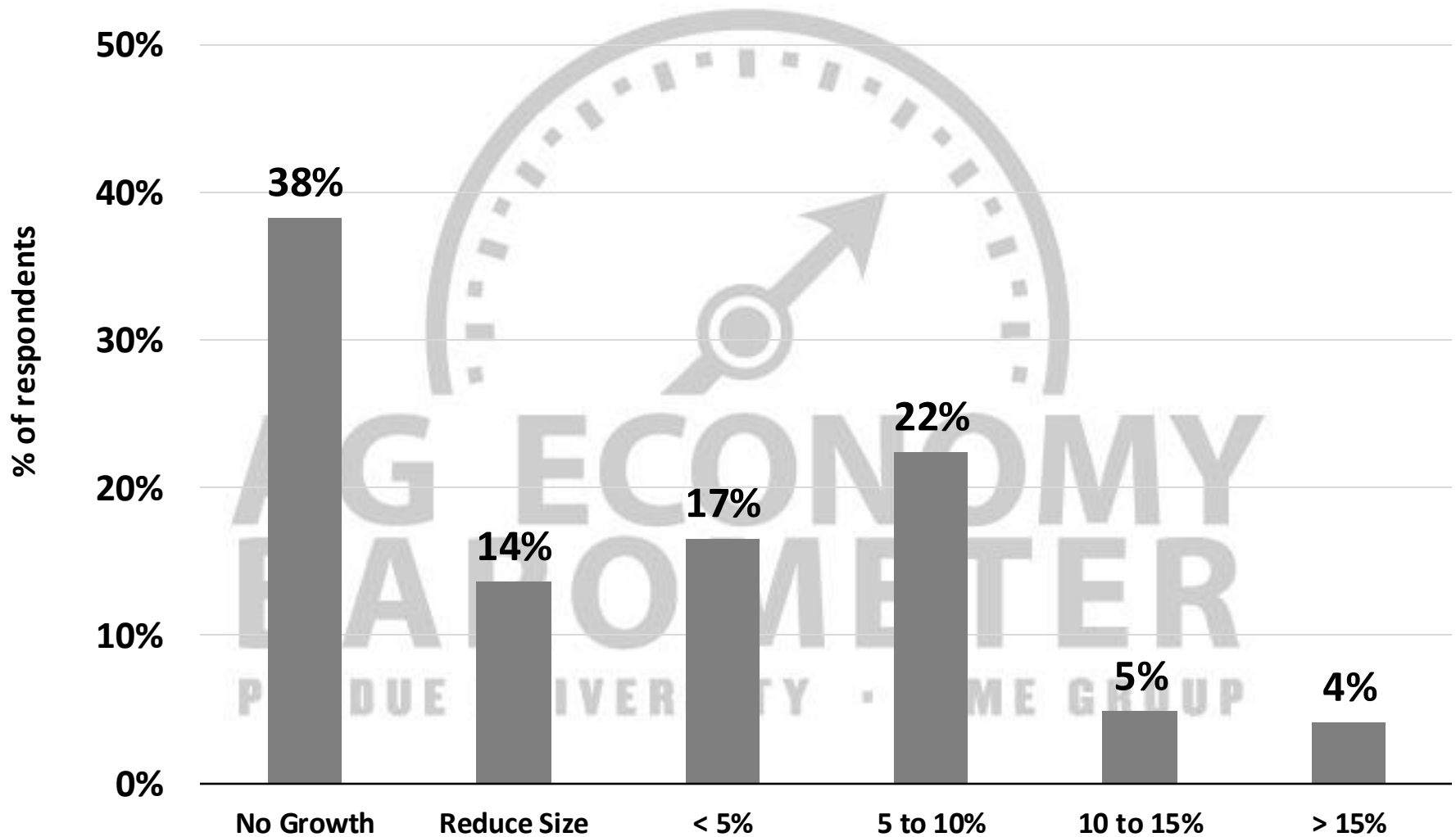
Source: Purdue University Center for Commercial Agriculture, Producer Survey, August 2024

Looking ahead to next year what are your biggest concerns for your farming operation?



Source: Purdue Center for Commercial Agriculture, Producer Survey, August 2024

What is a reasonable annual growth rate expectation you have for your farm over the next 5 years?



Source: Purdue Center for Commercial Agriculture, Producer Survey, February 2024

Carbon Markets

Summary of Previous Literature

Carbon Farming

Havens et al. (2023)

- How is carbon measured?
 - The most accurate way to identify changes in soil is to estimate the carbon content before and after the change in practice. This is very expensive.
 - Typically, the farm provides information pertaining to practices and this information is then used to estimate the change in carbon with a computer model.

Carbon Farming

Havens et al. (2023)

- How much carbon is sequestered?
 - No-till: 0.77 metric tons per acre per year
 - Cover crops: 0.76 metric tons per acre per year
 - Wide range in estimates for both of these practices.

Carbon Farming

Havens et al. (2023)

- What are the costs and benefits of sequestering a ton of carbon?
 - Costs:
 - No-till: \$17 per acre (\$22 per ton of carbon)
 - Cover crops: \$45 per acre (\$60 per ton of carbon)
 - Benefits:
 - \$15 to \$20 per ton of carbon sequestered

Carbon Farming

Havens et al. (2023)

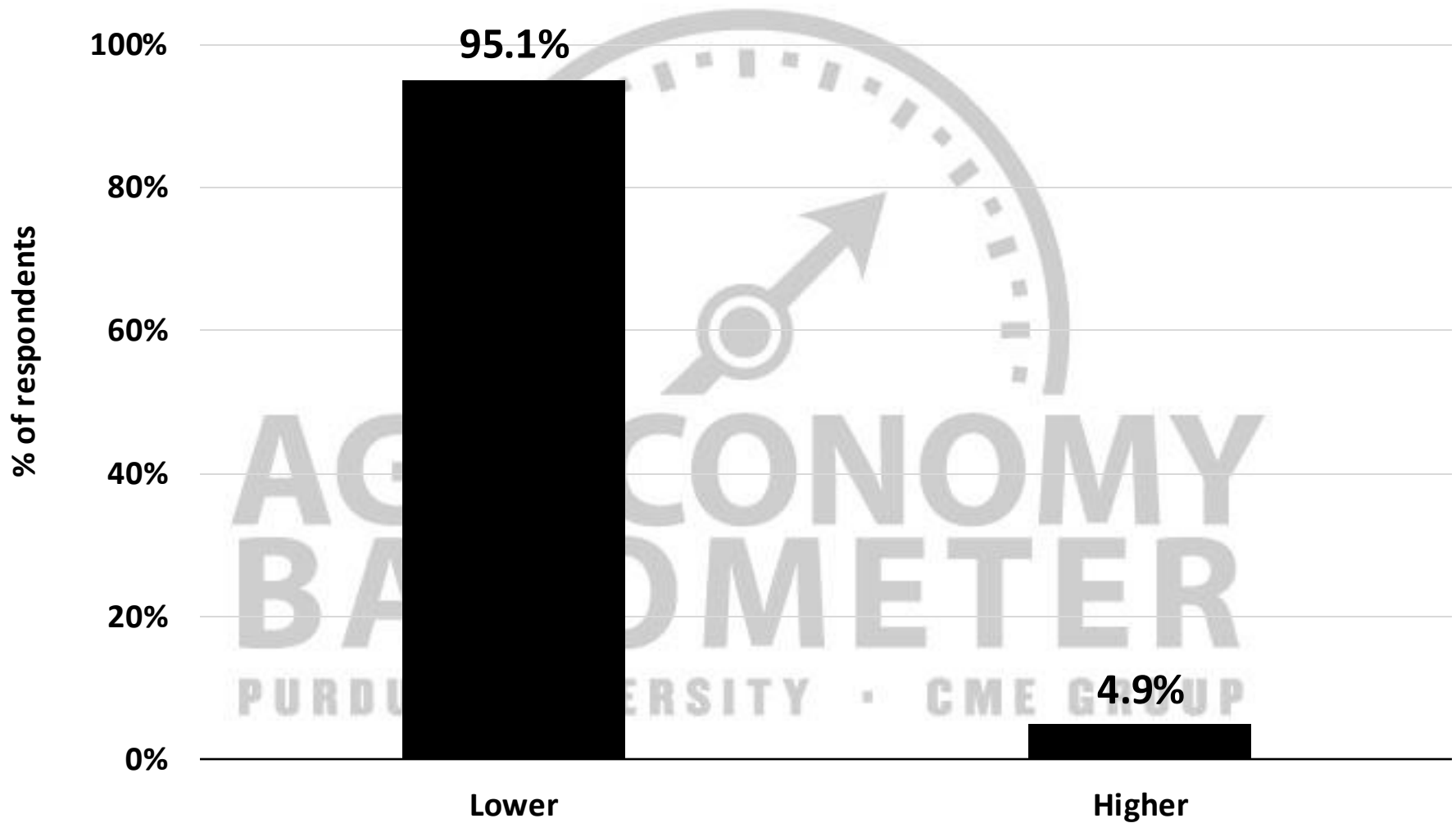
- What about social benefits?
 - Federal Government Estimates:
 - \$51 per metric ton of carbon
 - From a societal standpoint, targeting the fields with the highest benefits would be prudent.
- Other benefits?
 - The analysis above focused on costs and benefits of sequestering carbon.
 - Obviously, there are many other benefits associated with no-till and cover crops that also need to be considered.

Carbon Markets

Agricultural Economy Barometer

Survey Results

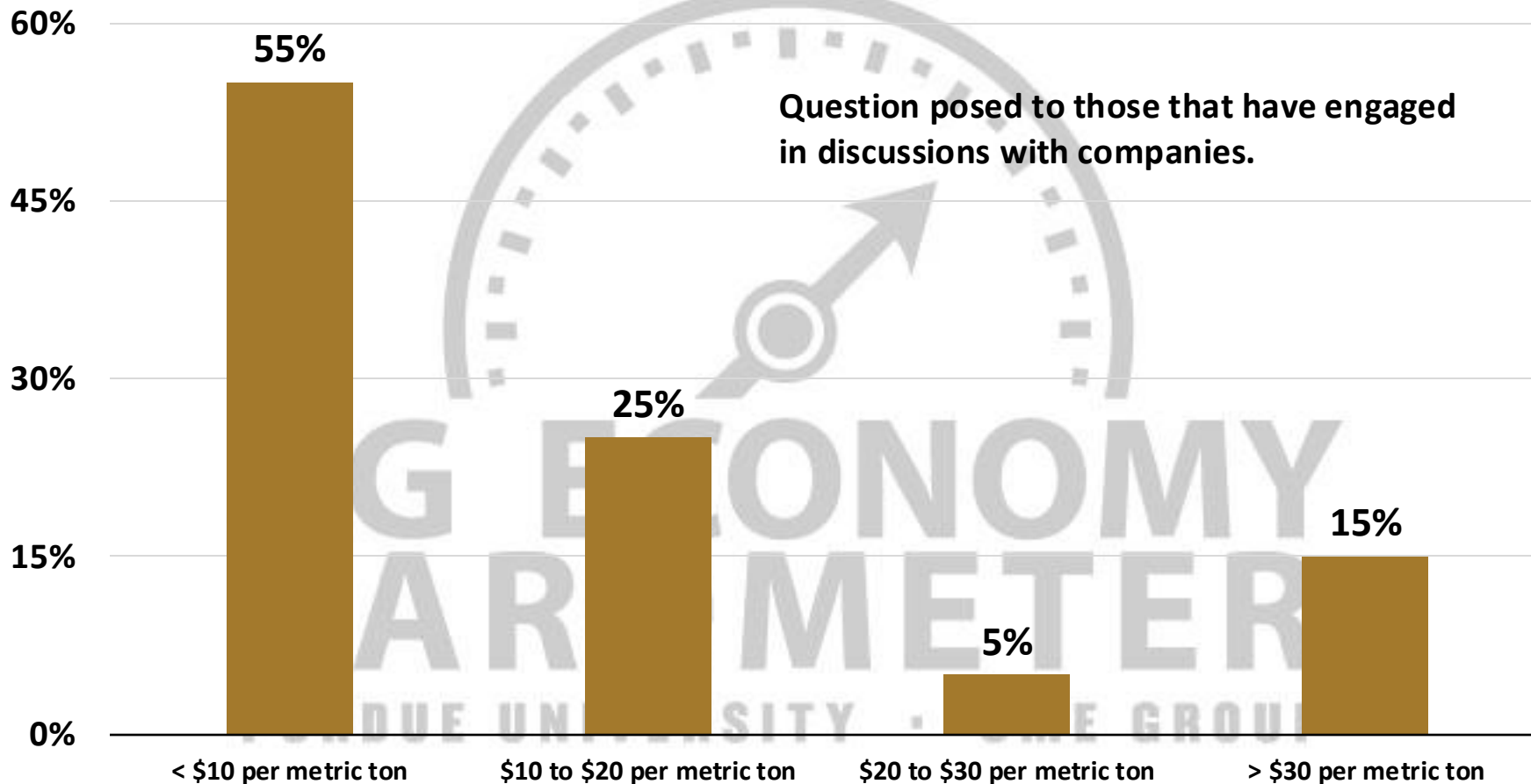
In the last 6 months, have you actively engage in discussions with any companies regarding receiving payments for capturing carbon on your farm?



Source: Purdue Center for Commercial Agriculture, Producer Survey, February 2024

What is the payment rate per metric ton you were offered to capture carbon on your farm?

% of respondents



Question posed to those that have engaged in discussions with companies.

Source: Purdue Center for Commercial Agriculture, Producer Survey, February 2024

Reduced Tillage
FINBIN
2019 to 2023 Data

Tillage System Analysis

Cash Rent Ground

| | All Farms | Chisel/Reduced | No-Till |
|------------------------------------|-------------------|-------------------|-------------------|
| Corn | | | |
| Net Return to Labor and Management | \$123/acre | \$127/acre | \$136/acre |
| Soybeans | | | |
| Net Return to Labor and Management | \$91/acre | \$100/acre | \$100/acre |

Reduced Tillage

**Precision Conservation
Management Results**

Precision Conservation Management

precisionconservation.org

- Farm Conservation Service Program serving Illinois, Nebraska, and Kentucky
- Goal is to integrate conservation practices and financial data to help farmers understand how specific management changes can impact both their environmental impact and their bottom line.
- Results below are for Illinois (2015 to 2023 data).

Tillage Data for Corn

- No-Till
 - 19% of fields
 - 219 bushels per acre
 - \$360; operator and land return
 - 0.66; estimated soil loss (tons per acre)
 - 0.69; soil carbon index
 - 0.62; GHG emissions (metric tons per acre)
- 2-Pass Light
 - 30% of fields
 - 227 bushels per acre
 - \$367; operator and land return
 - 1.87; estimated soil loss (tons per acre)
 - 0.54; soil carbon index
 - 0.83; GHG emissions (metric tons per acre)

Tillage Data for Soybeans

- No-Till
 - 52% of fields
 - 68 bushels per acre
 - \$434; operator and land return
 - 1.15; estimated soil loss (tons per acre)
 - 0.49; soil carbon index
 - -0.23; GHG emissions (metric tons per acre)
- 2-Pass Moderate
 - 16% of fields
 - 72 bushels per acre
 - \$455; operator and land return
 - 2.67; estimated soil loss (tons per acre)
 - 0.23; soil carbon index
 - 0.02; GHG emissions (metric tons per acre)

Most Profitable Fields (Top 25%)

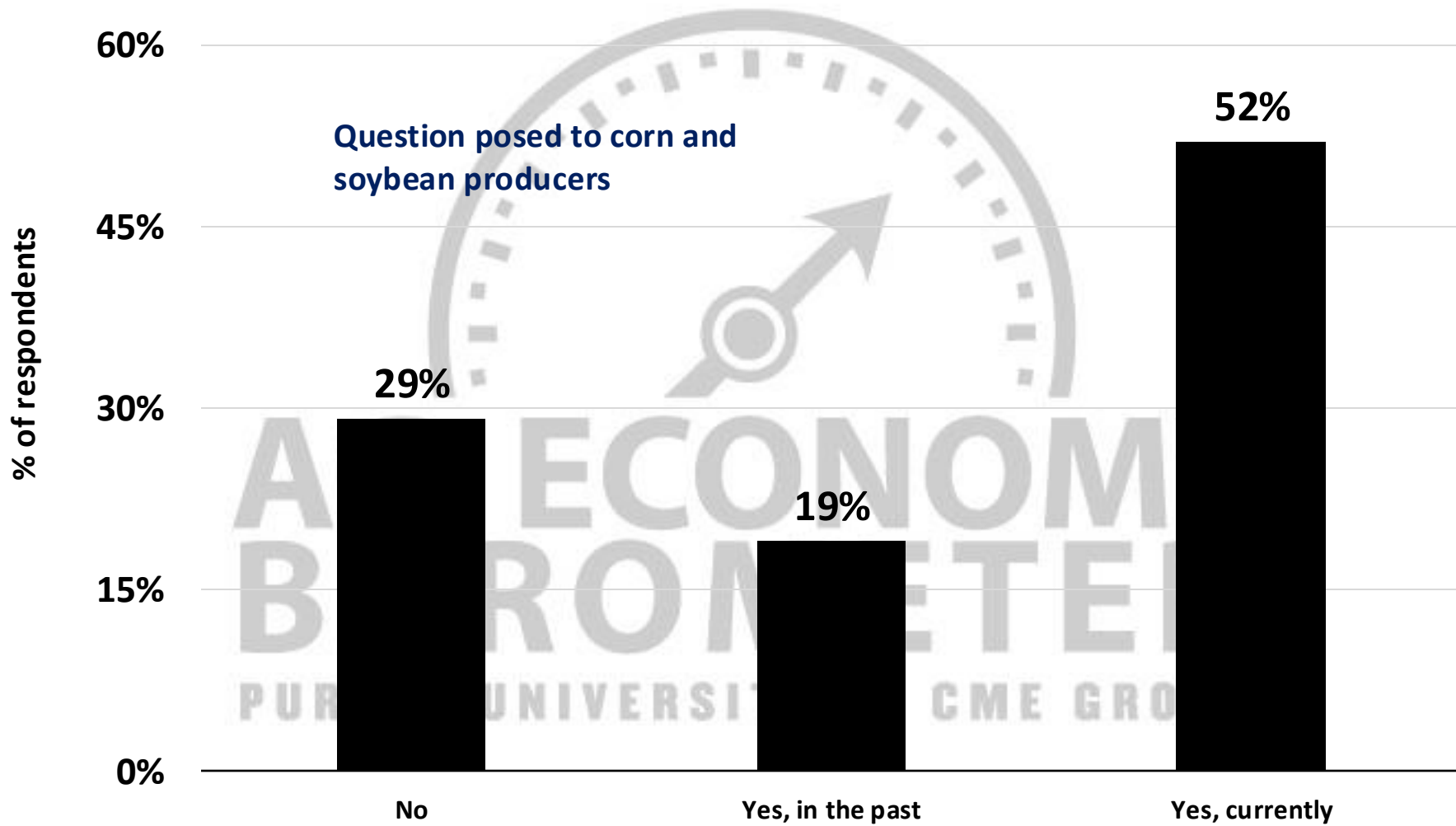
- Corn
 - 21% no-till
 - 10% 2-pass light
 - Maximize efficiency by producing high yields with lower rates of nitrogen fertilizer (< 0.85 lb N/bu)
- Soybean
 - 43% no-till
 - 24% 2-pass moderate

Cover Crops

Agricultural Economy Barometer

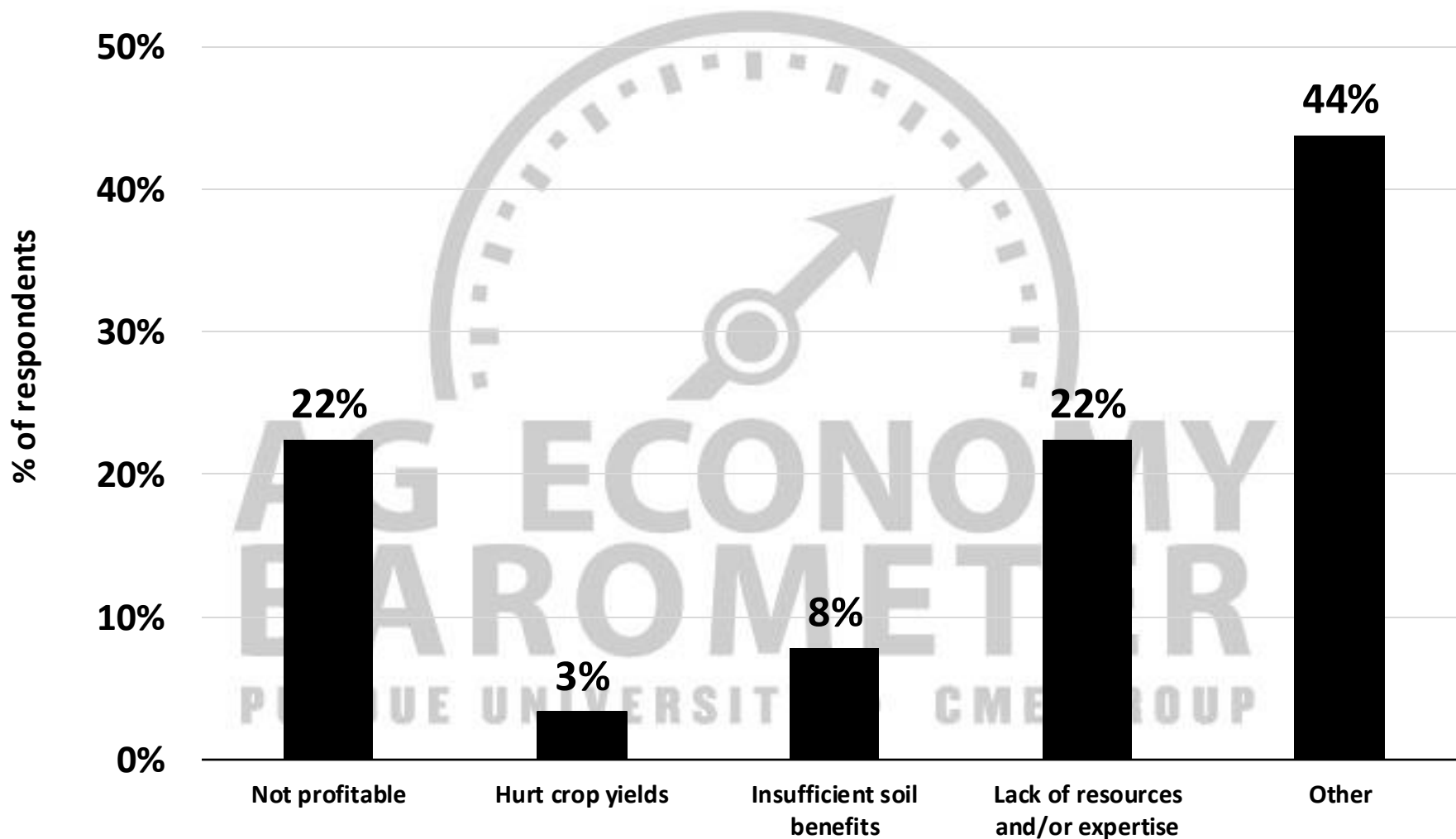
Survey Results

Have you ever planted a cover crop on your operation?



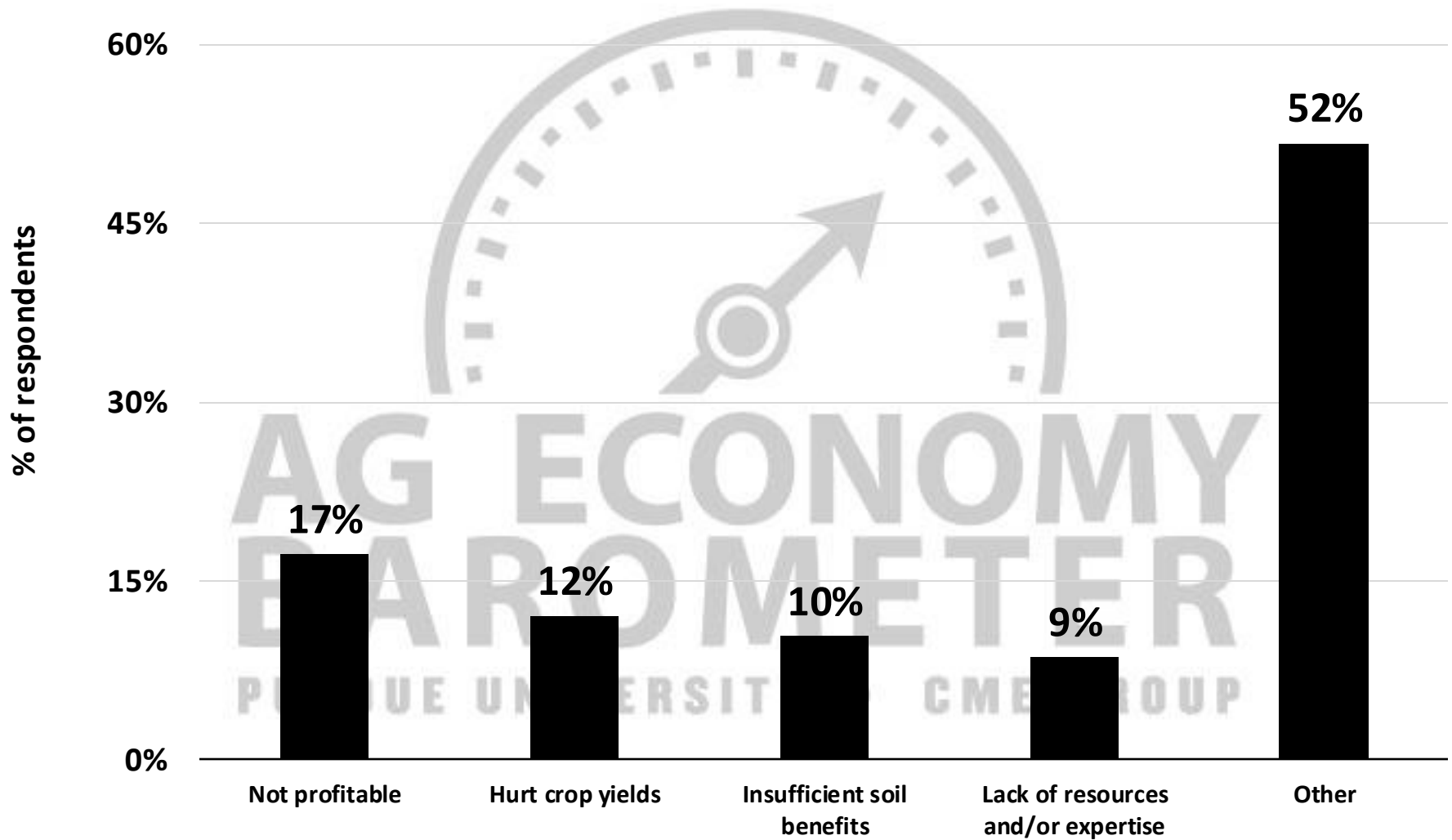
Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

What is your primary reason for not using cover crops?



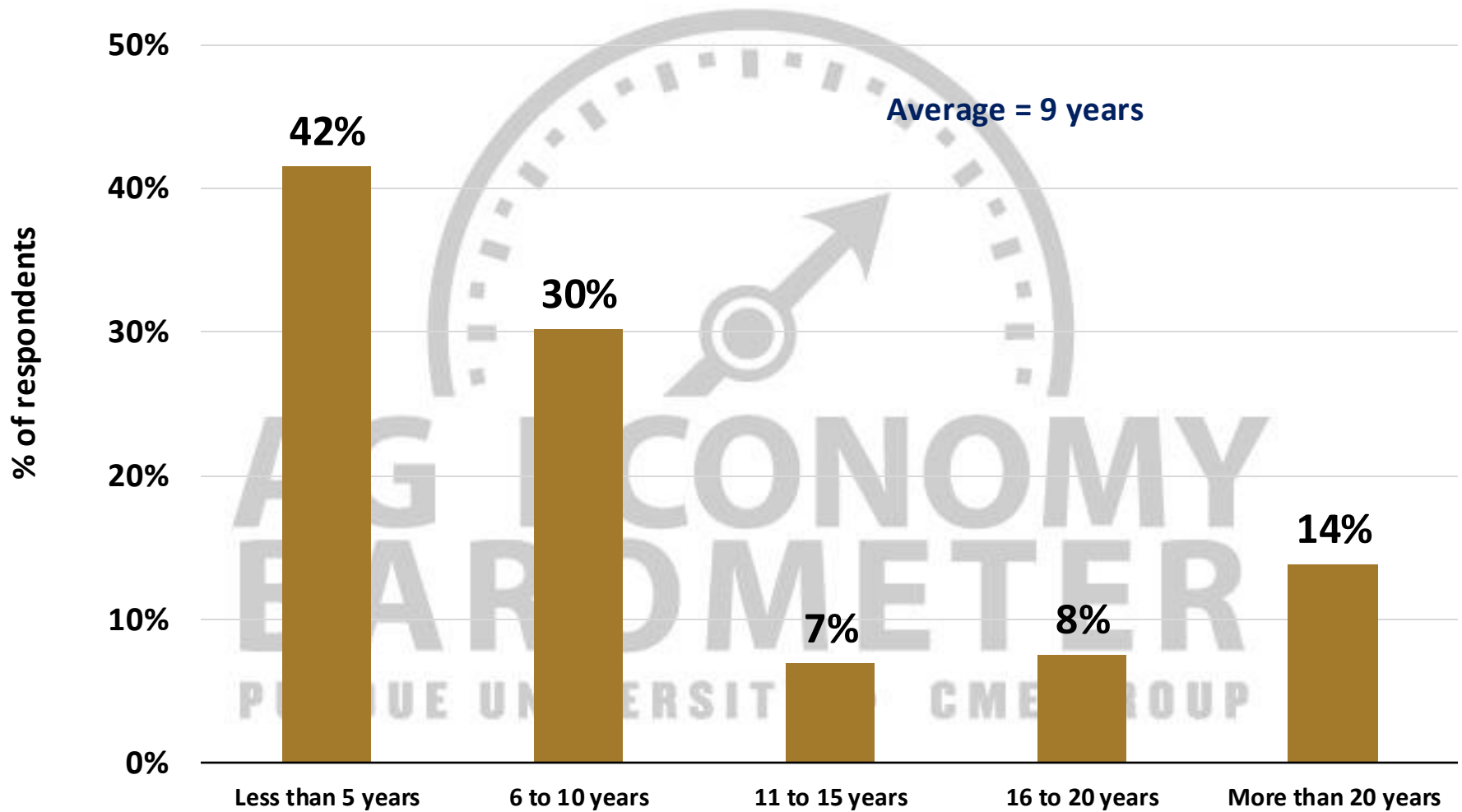
Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

What was the primary reason for discontinuing cover crops?



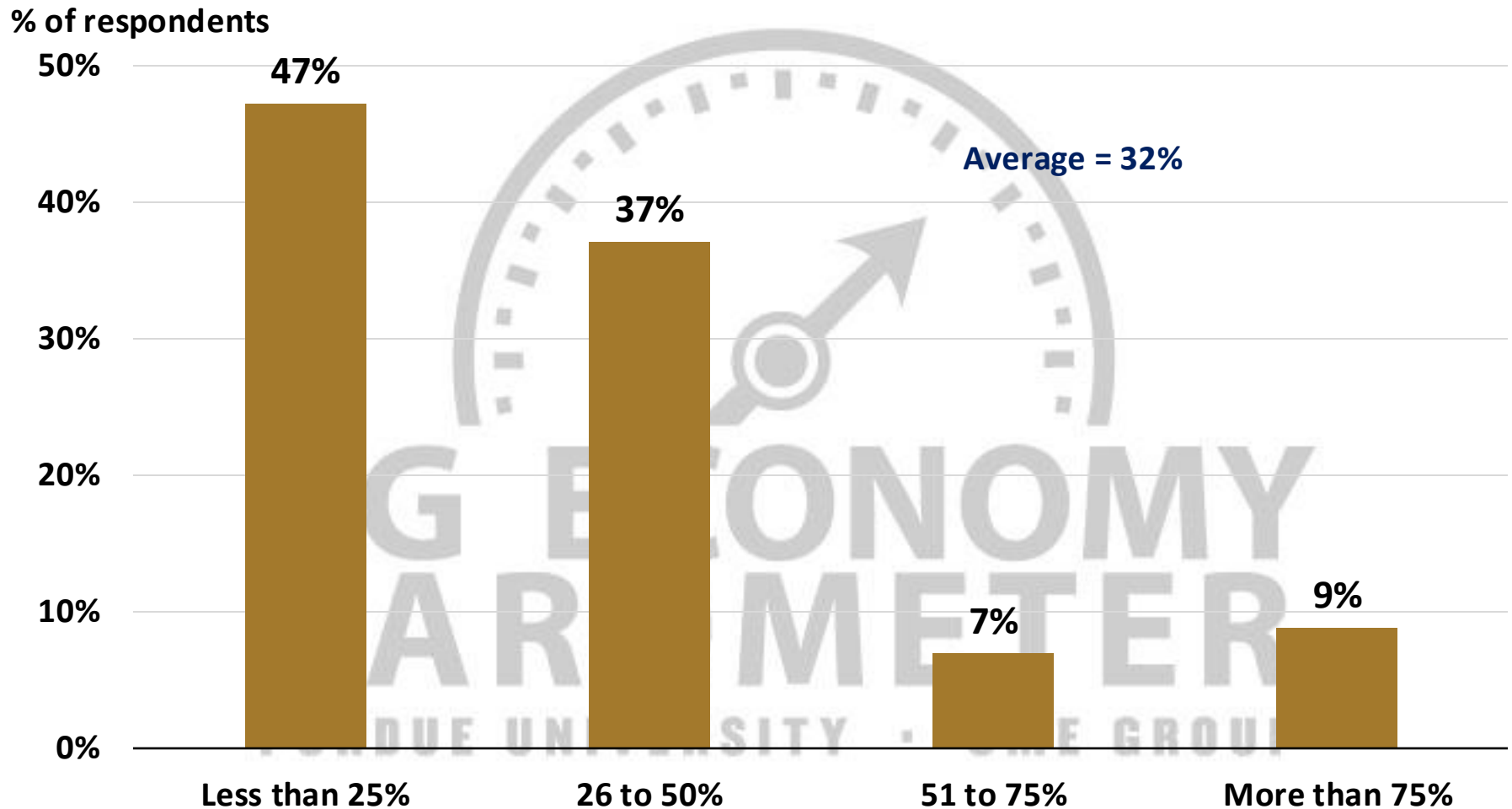
Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

How many years have you planted cover crops?



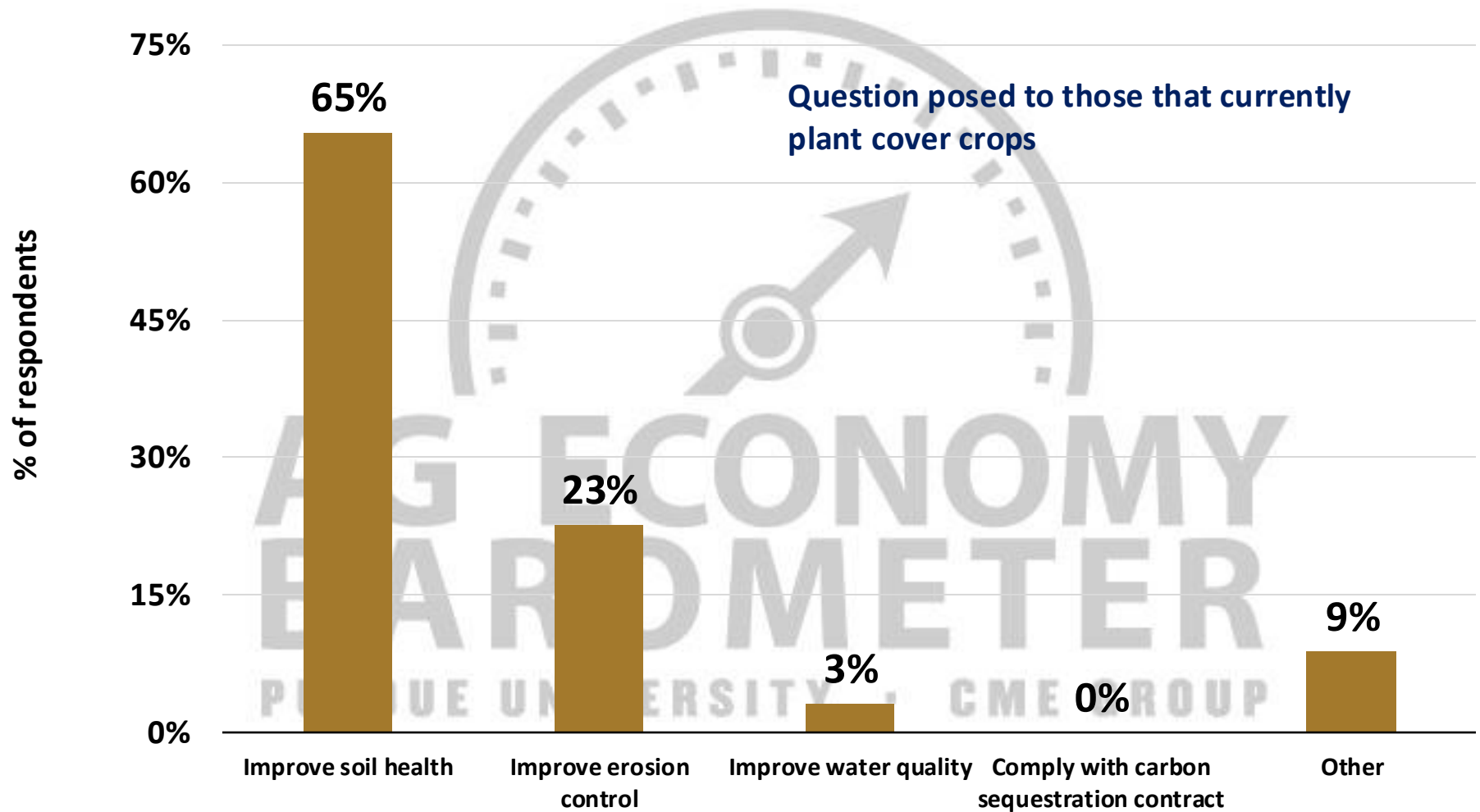
Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

Annually, on what proportion (percentage) of your farm did you plant cover crops?



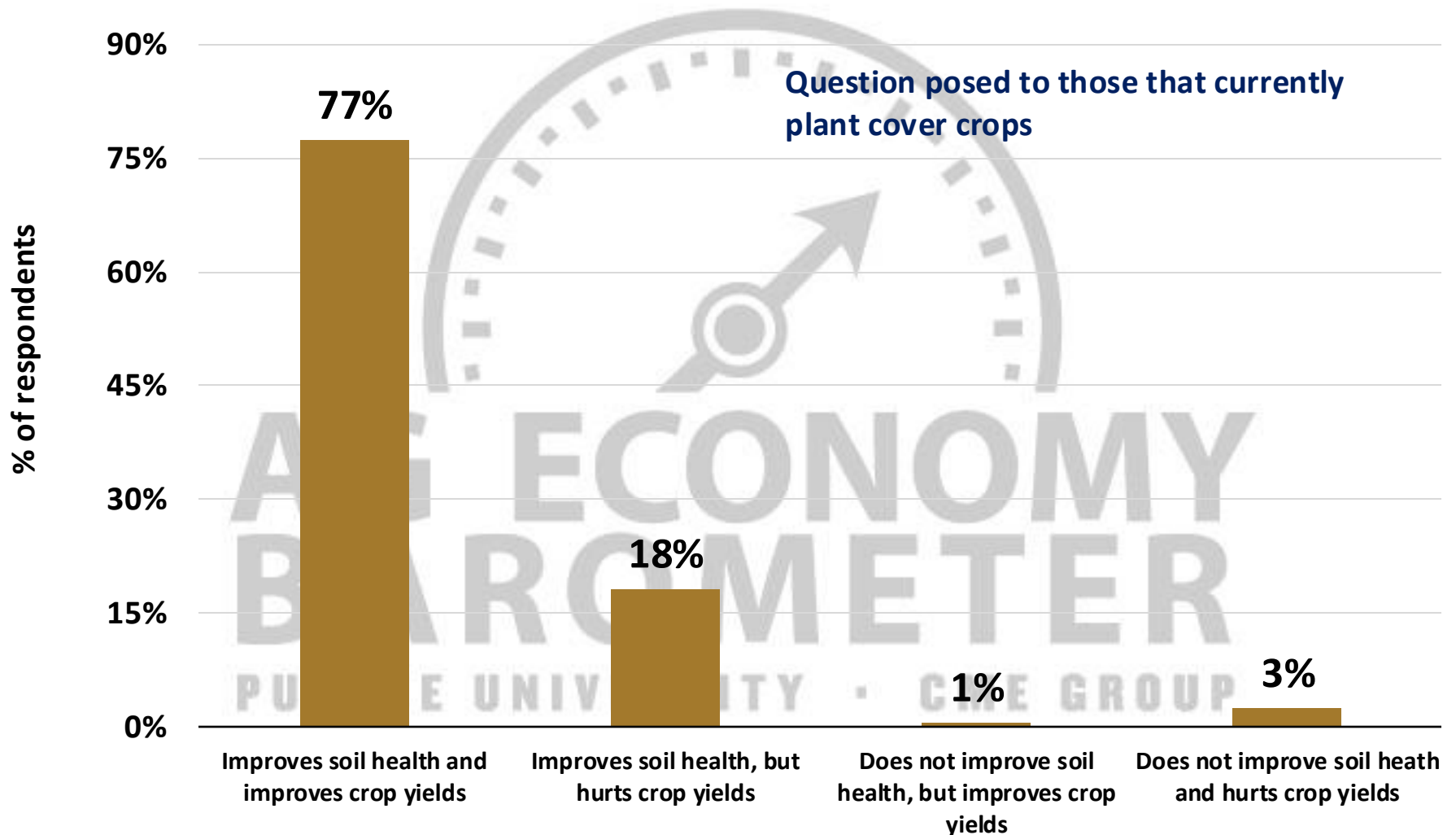
Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

What are your motivations for planting cover crops?



Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

Which statement best describes your experience with cover crops?



Source: Purdue Center for Commercial Agriculture, Producer Survey, September 2023

Cover Crops
FINBIN
2019 to 2023 Data

Cover Crop Analysis

Cash Rent Ground

| | No Cover Crop | Combined with Cover Crop | Difference |
|------------------------------------|-------------------|--------------------------|-------------------|
| Corn | | | |
| Net Return to Labor and Management | \$123/acre | \$57/acre | -\$66/acre |
| Soybeans | | | |
| Net Return to Labor and Management | \$90/acre | \$44/acre | -\$46/acre |

Cover Crops

Precision Conservation Management Results

Precision Conservation Management

precisionconservation.org

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- Results below are for Illinois (2015 to 2023 data).

Cover Crop Data for Corn

- Overwintering
 - 9% of fields
 - 216 bushels per acre
 - \$309; operator and land return
 - 0.81; estimated soil loss (tons per acre)
 - 0.36; GHG emissions (metric tons per acre)
- No Cover Crop
 - 87% of fields
 - 224 bushels per acre
 - \$361; operator and land return
 - 1.45; estimated soil loss (tons per acre)
 - 0.78; GHG emissions (metric tons per acre)

Cover Crop Data for Soybeans

- Overwintering
 - 23% of fields
 - 68 bushels per acre
 - \$400; operator and land return
 - 1.24; estimated soil loss (tons per acre)
 - -0.42; GHG emissions (metric tons per acre)
- No Cover Crop
 - 77% of fields
 - 70 bushels per acre
 - \$452; operator and land return
 - 2.03; estimated soil loss (tons per acre)
 - -0.02; GHG emissions (metric tons per acre)

Future Work

Future Work

- Conceptual Framework
 - Evaluate the effects of different tillage systems and cover crop options on net returns, downside risk, soil loss, greenhouse gas (GHG) emissions.
 - Both reduced tillage (e.g., no-till) and cover crops can be used to reduce erosion and GHG emissions. The net short-term cost of using cover crops is higher than the net short-term cost associated with reducing tillage.

Future Work (continued)

- Carbon payments can be used to offset the cost of adopting reduced tillage and cover crop practices. The carbon market is evolving. Future carbon payments are likely to be higher than historical payments.
- Also, there is a need to examine long-term farm goals and benefits. The long-run costs of adopting practices are likely lower than the short-run costs.

Questions, Comments

www.ag.purdue.edu/commercialag

