

Farmland Ownership and Environmental Impacts

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Improving Midwest Agriculture and the Environment

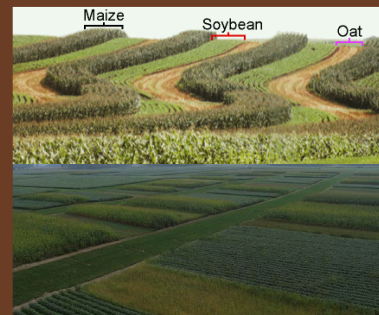
Federal Reserve Bank of Chicago - November 20, 2019

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5 Principles of Soil Health

USDA Natural Resource Conservation Service

Soil Armor Minimize Disturbance Plant Diversity (Perenniality) Continual Live Plant/Root Livestock Integration



- Cover crops
- Residue

- Reduced tillage
- Lower compaction (controlled traffic)

- Cover crop mixtures
- Crop rotations
- Intercropping
- Prairie strips

- Cover crops
- Perennial crops
- Prairie strips
- Relay cropping

- Grazing cover crops
- Seed pastures in rotation
- Adding manure

Credits: Dr. Marshall McDaniel, ISU

...to reduce soil erosion, water runoff and nitrate leaching



Credits: Sarah Carlson, PFI

Nutrient Loss & Water Quality

- Increases costs for drinking-water treatment facilities
- Algal blooms negatively affect water recreation
- Contributes to hypoxic zone in Gulf of Mexico



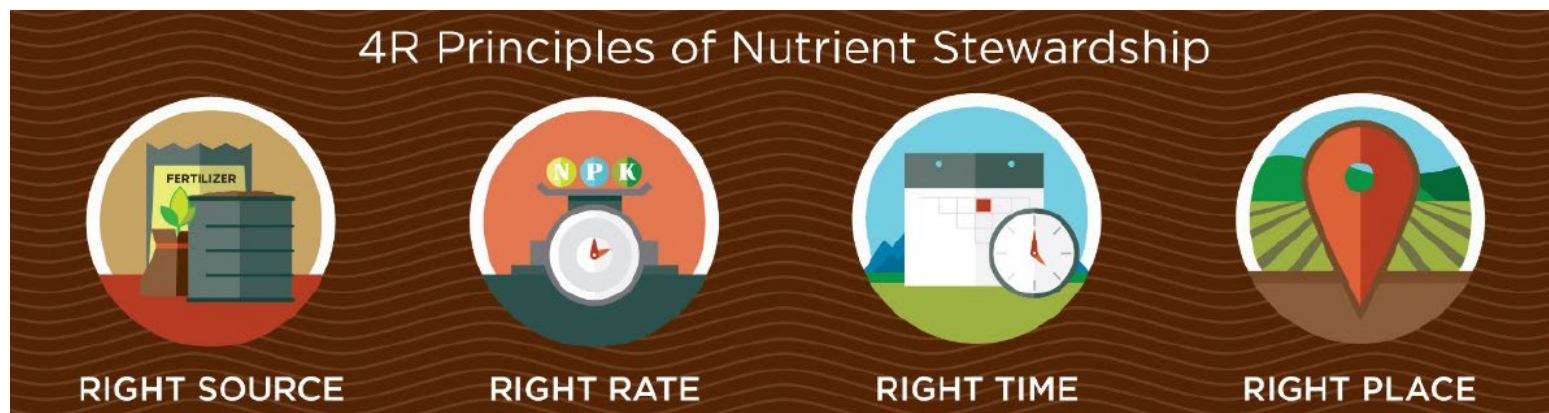
Source: <http://www.umces.edu/people/boesch-gulf-mexico-hypoxia>

Iowa Nutrient Reduction Strategy: Nitrogen (N), Phosphorous (P)

- Goal for non-point sources
 - ↓N loads 41%; ↓P loads 29%
- Government-sponsored research, education, and subsidized adoption of Conservation Practices:
 - 2018 Iowa Water Quality Bill: \$156M over 12 years
 - 2018 Farm Bill: \$66B over 10 years

How to reduce N Loads?

- Management or 4 R's of soil fertilizer application
 - 1) **Right Source** – or fertilizer type (form of N or slow release products)
 - 2) **Right Rate** – based on soil fertility tests
 - 3) **Right Time** – when to apply for maximum plant uptake
 - 4) **Right Place** – or fertilizer placement (surface or in soil)



Credits: Dr. Marshall McDaniel, ISU

Iowa Nutrient Reduction Strategy: Nitrogen reduction practices

Average nitrate-nitrogen concentration or load reduction as a percentage. Error bars represent one standard deviation above and below the mean.

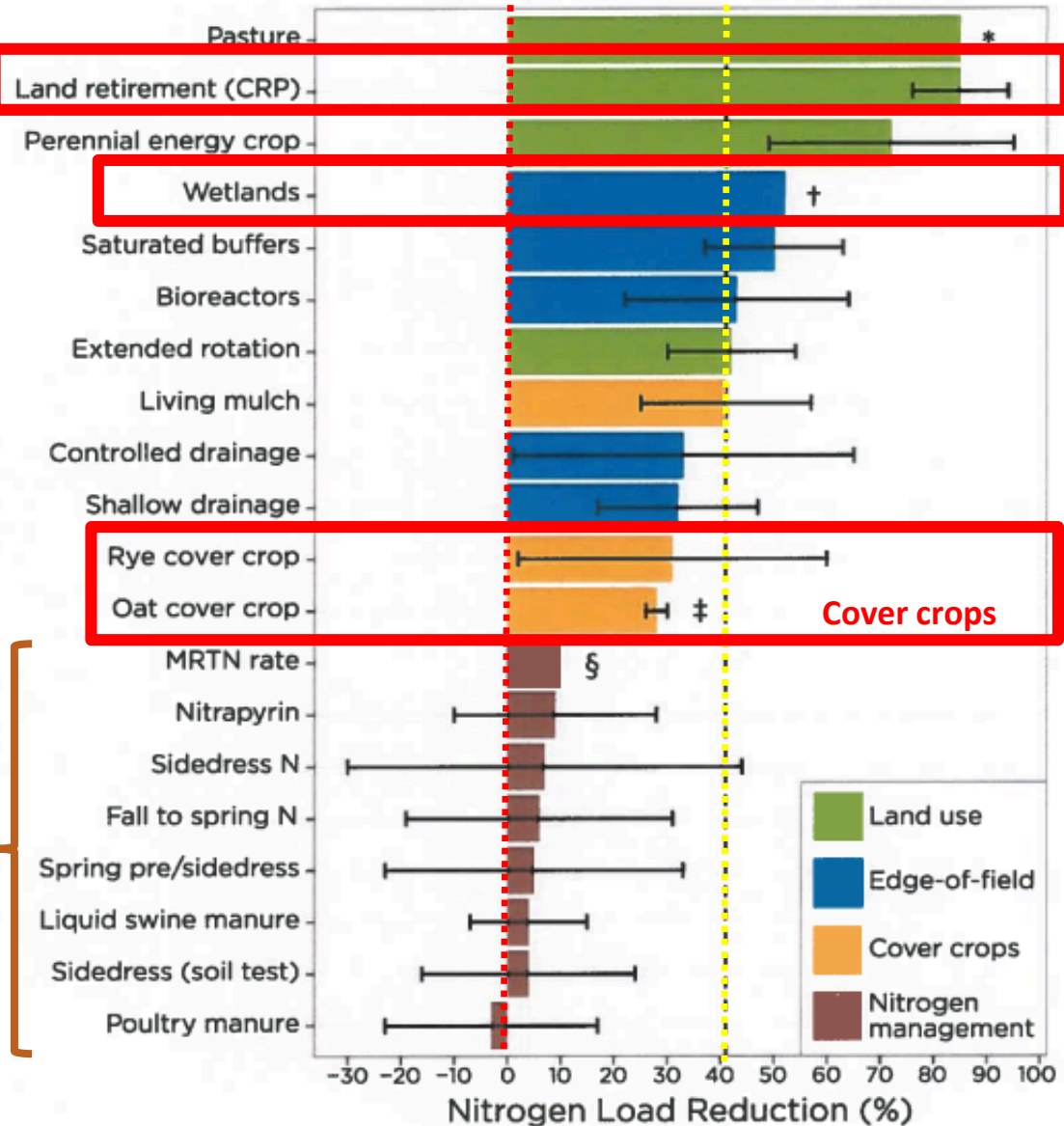
* Based on the land retirement (CRP) value. There were no observations to develop a standard deviation.

† Based on one report looking at multiple wetlands in Iowa (Helmers et al., 2008).

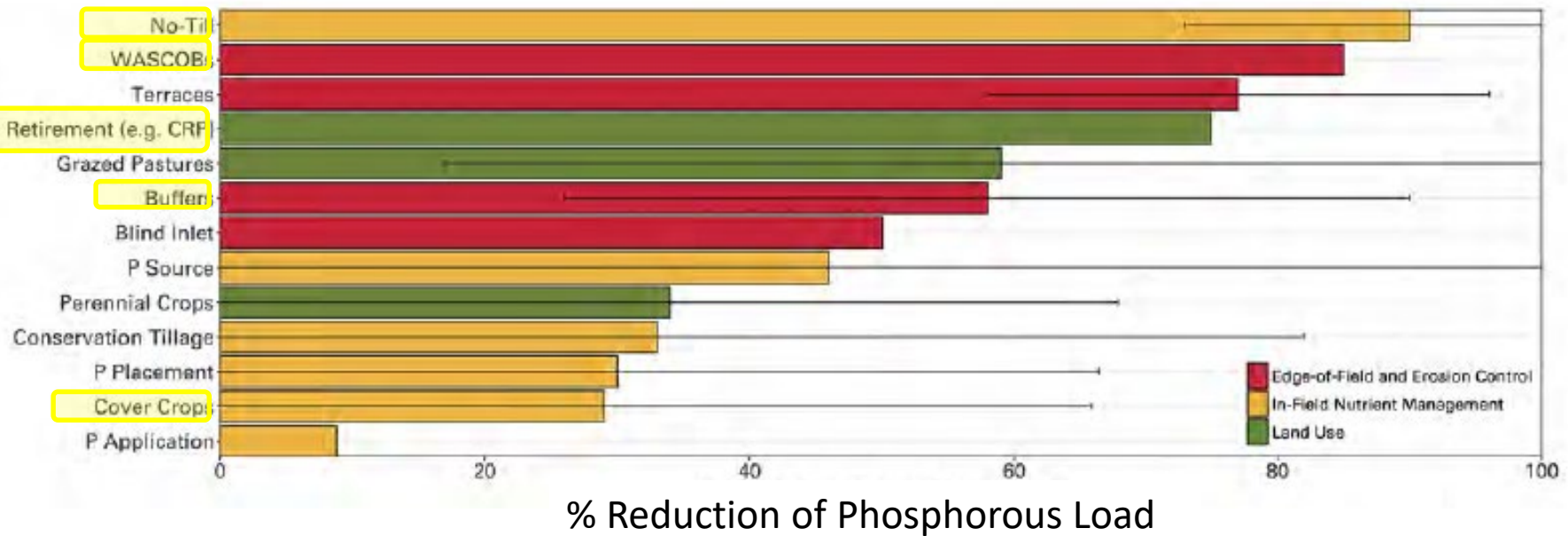
‡ Based on one study with three years of corn and two years of soybeans.

§ Reduction calculated based on initial estimated application rate for each Major Land Resource Area in Iowa.

4 R's

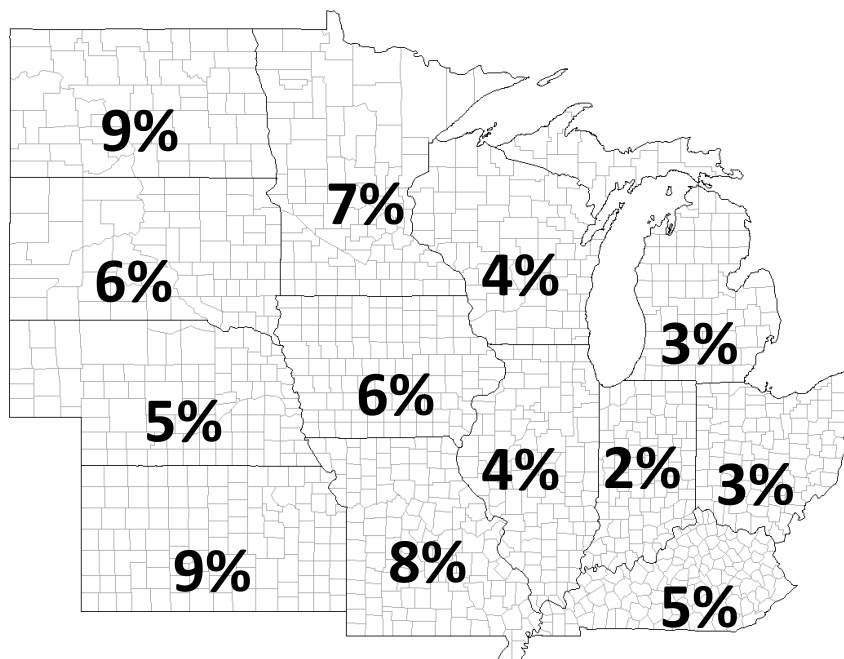


Iowa Nutrient Reduction Strategy: %Reduction of Phosphorous Load

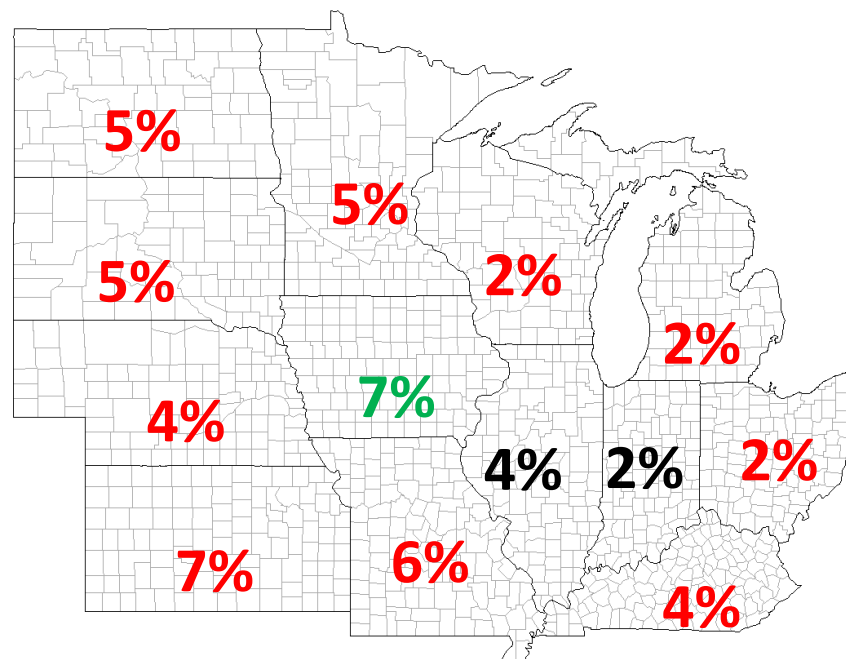


% of Cropland in CRP

2012



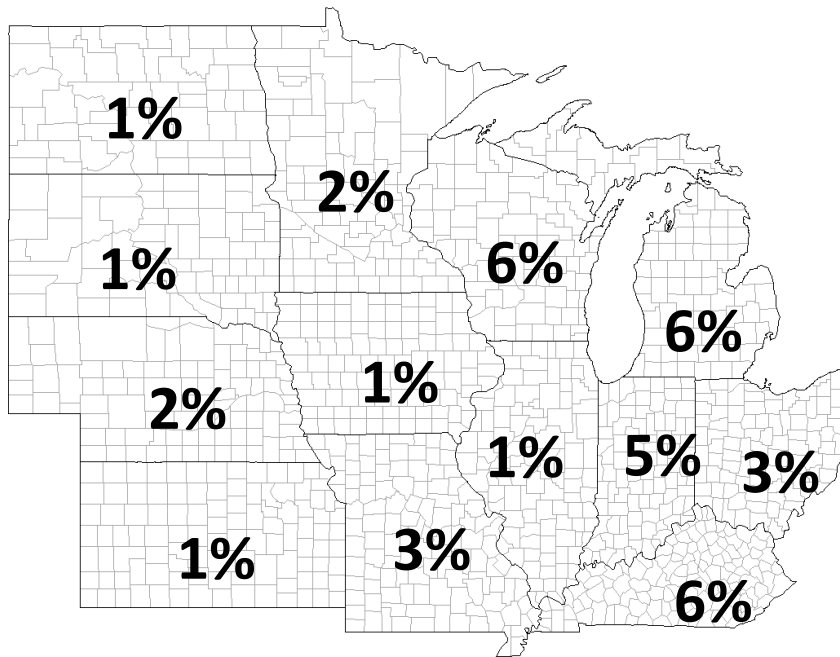
2017



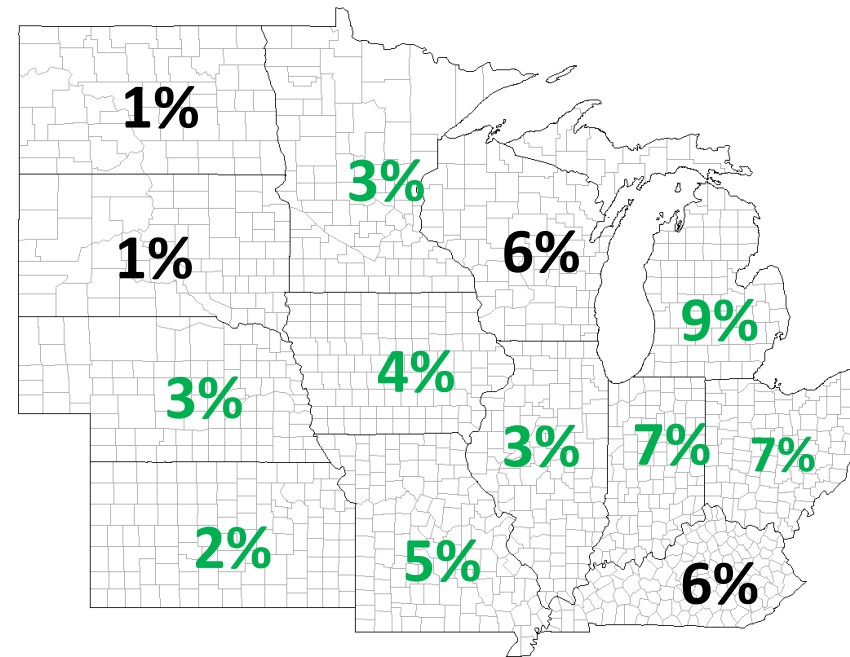
Data Source: USDA-FSA & USDA-NASS

% of Cropland in Cover Crops

2012



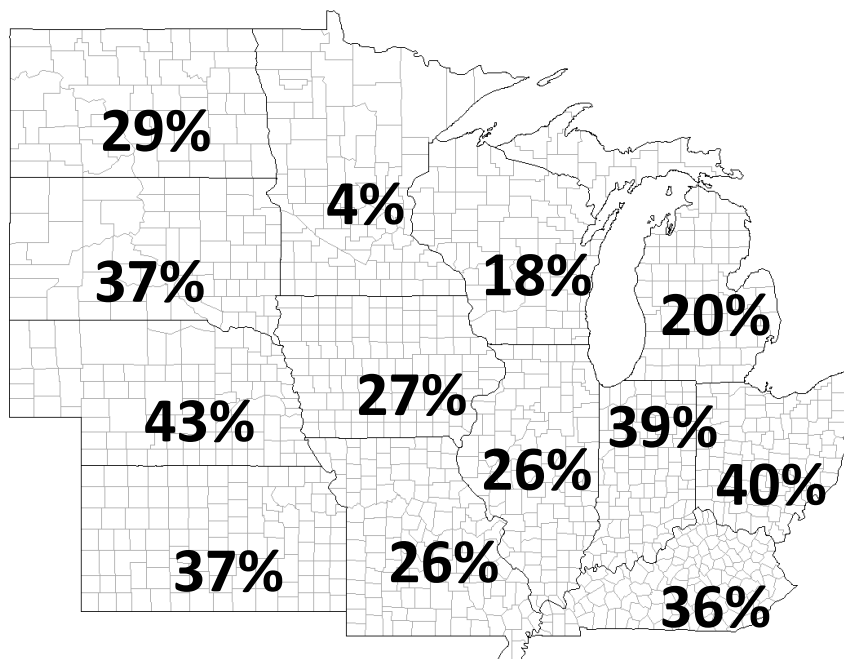
2017



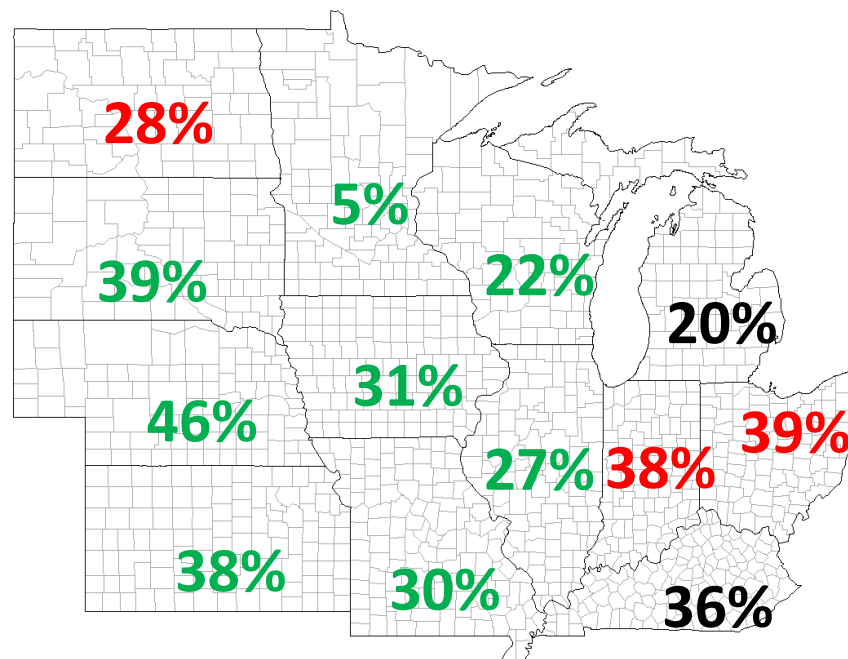
Data Source: USDA-NASS

% of Cropland in No-Till

2012



2017



Data Source: USDA-NASS

Role of Land Tenure on Conservation Practice Adoption?

- Farmland ownership dynamics could hinder growth in conservation-practice use
 - Leased farmland (mostly short-term leases)
 - Reluctance to invest medium-/long-term on rented land
 - Non-operator landowners (landowners who are not current farmers)
 - Absentee landowners (landowners who do not live in Iowa at all)

Objectives

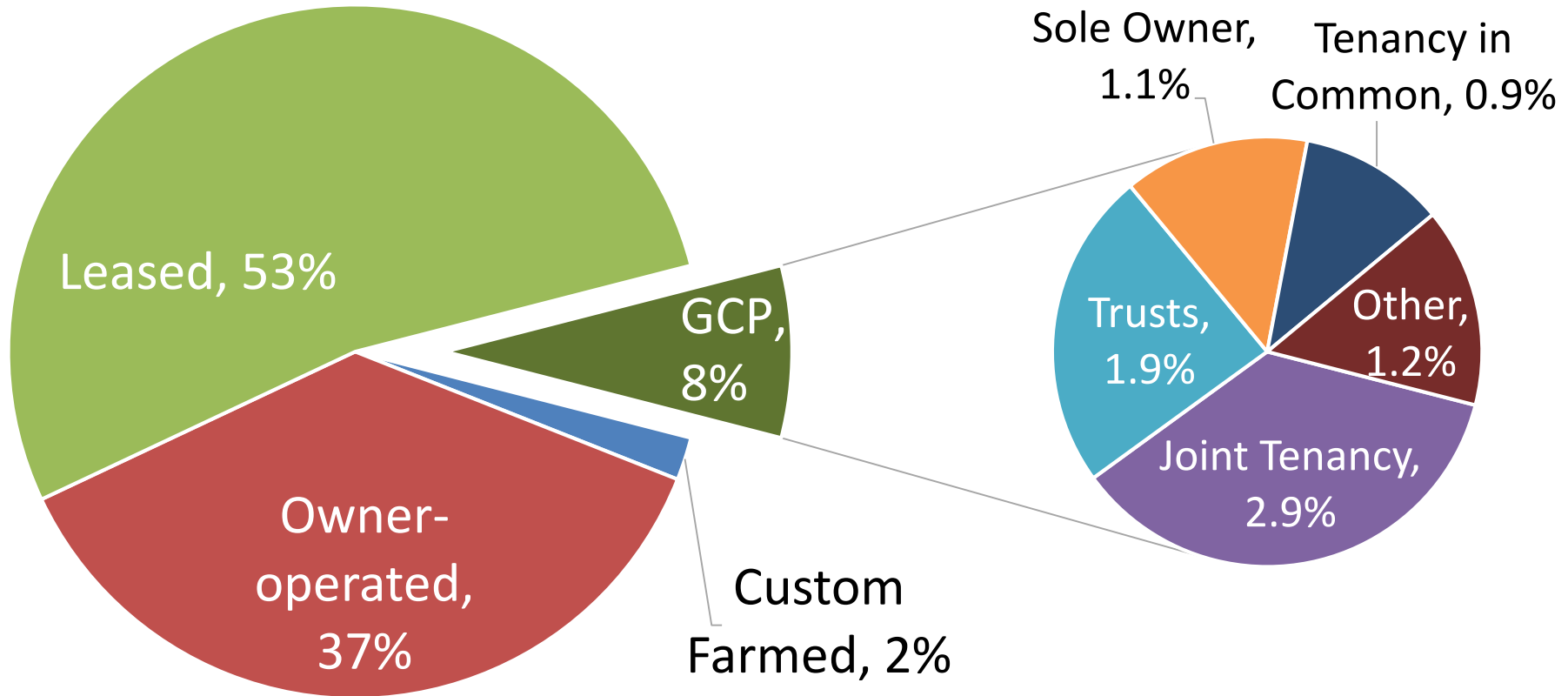
1. Analyze determinants of landowners' use of conservation practices in Iowa
 - **Land tenure**
 - Landowner characteristics (farming experience, absenteeism, etc.)
2. Reasons for not adopting?
3. Explore future conservation use

Data

- 2017 Iowa Farmland Ownership & Tenure Survey
 - Representative of all landowners and farmland in Iowa
 - Every five years since 1989
 - New conservation section
 - Practices: no-till, cover crops, buffer strips, and ponds/ sediment basins



IA Farmland in Gov. Conservation Programs (GCP) by Ownership Type

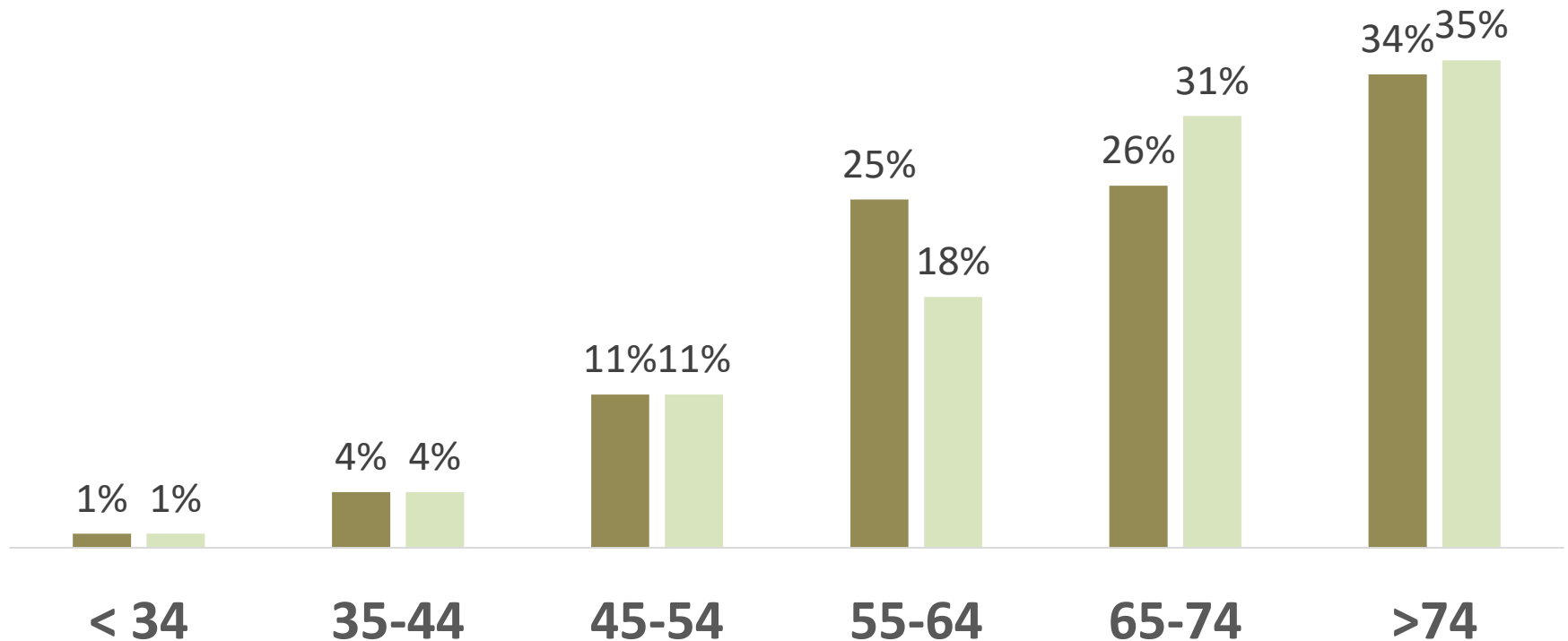


GCP: Government Conservation Programs, CRP and CSP.

CRP: Conservation Reserve Program; CSP: Conservation Stewardship Program

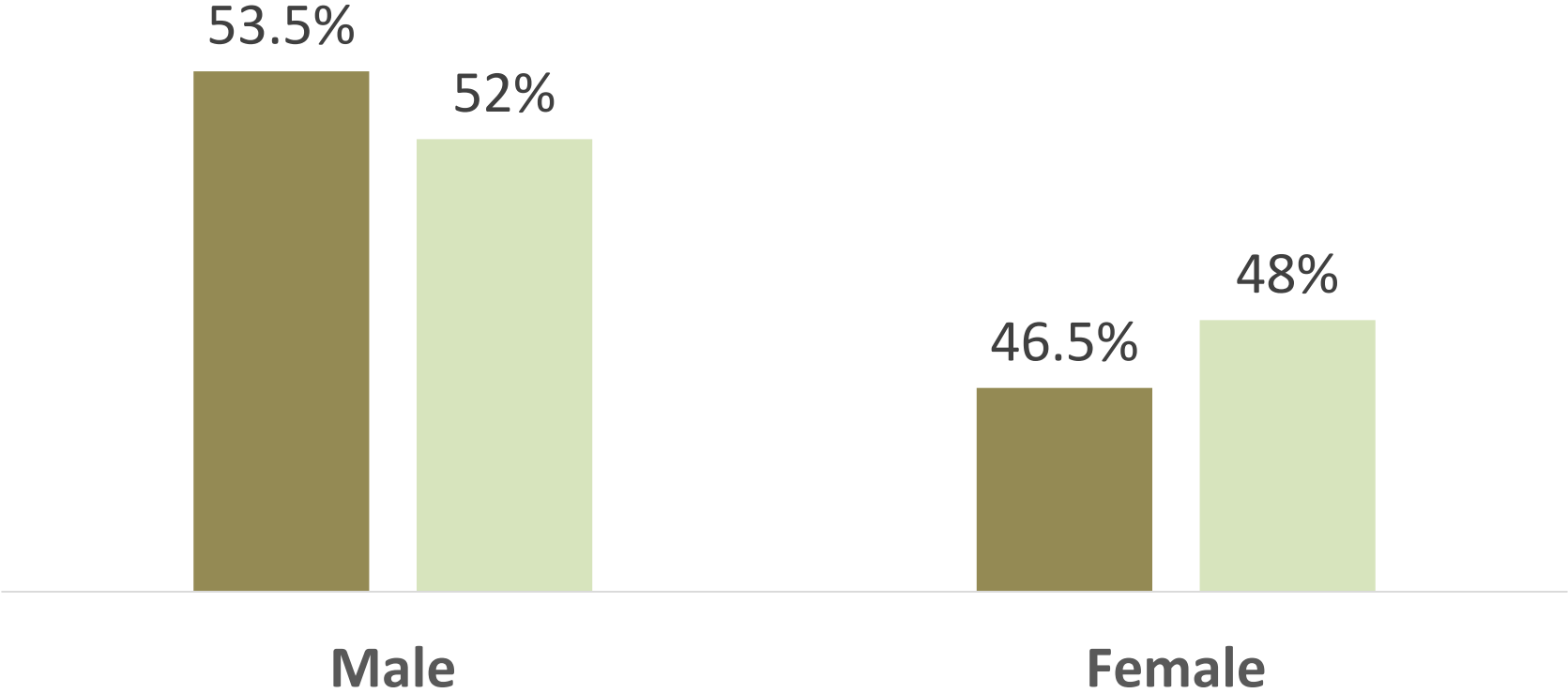
% of IA Farmland and % in Gov. Cons. Programs (GCP) by Age

■ All Farmland ■ Farmland in GCP



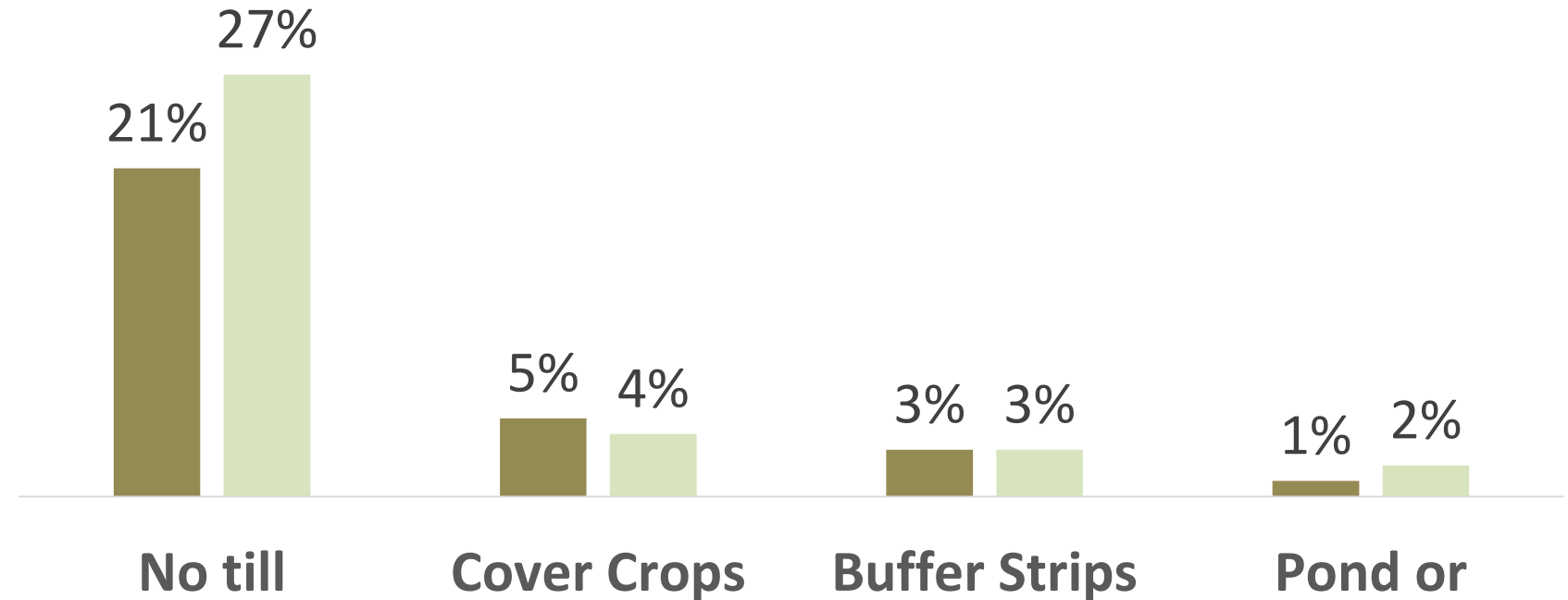
% of IA Farmland and % in Gov. Cons. Programs by Gender

■ All Farmland ■ Farmland in GCP



% of IA Farmers and Land that Use Conservation Practices

■ Landowners ■ Farmland

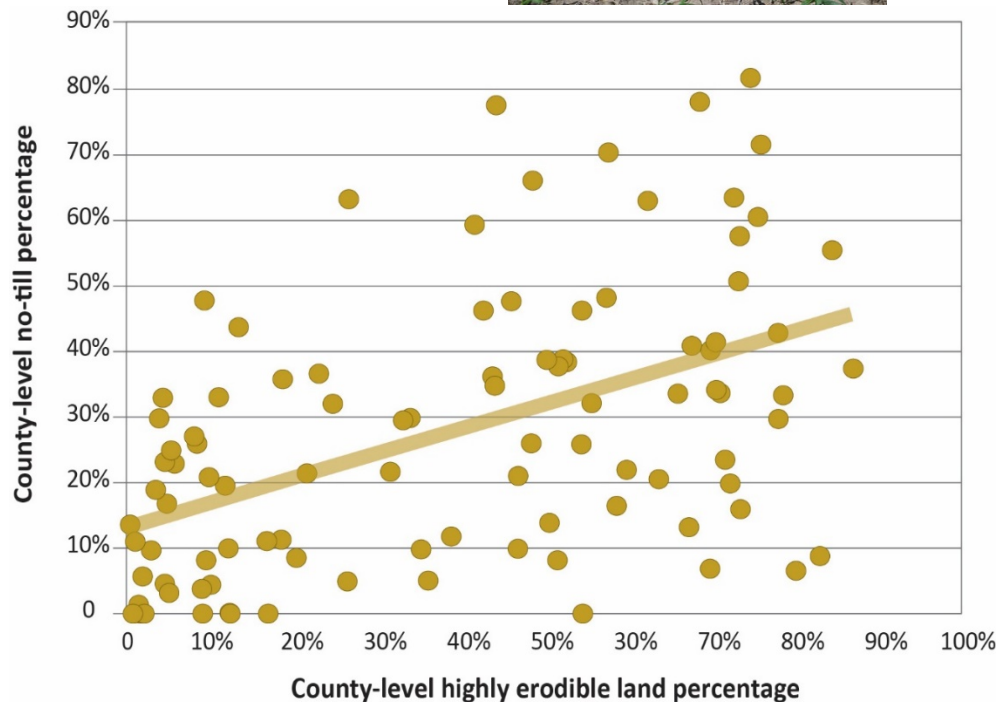
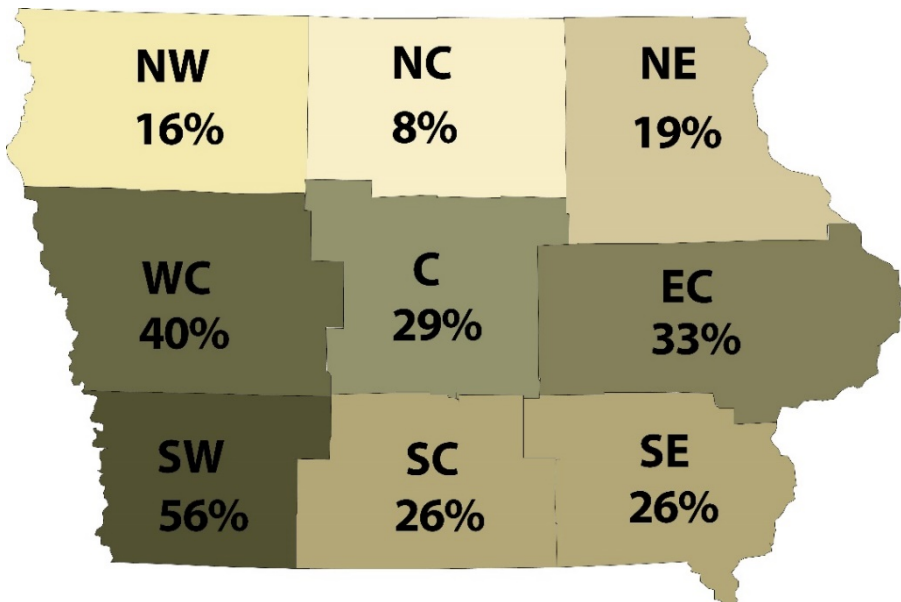


**Pond or
Sedimentation
Basin**



No-Till Use by Crop Reporting District

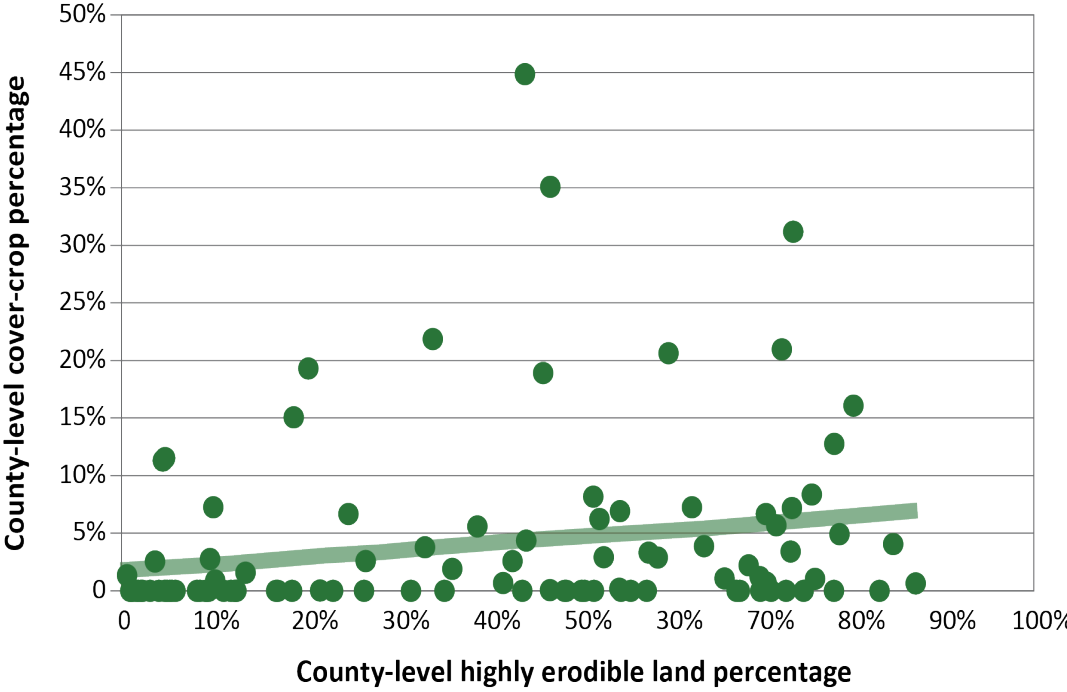
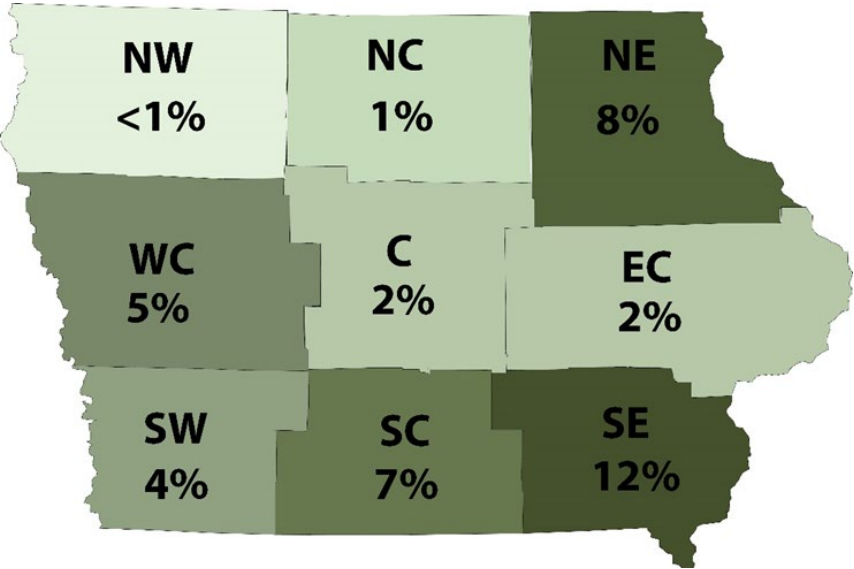
State Average 27%



Cover Crop Use by Crop Reporting District



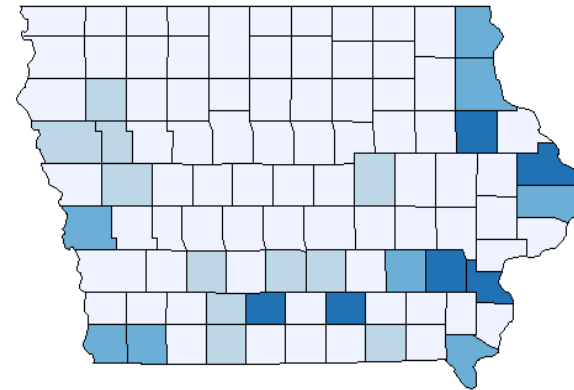
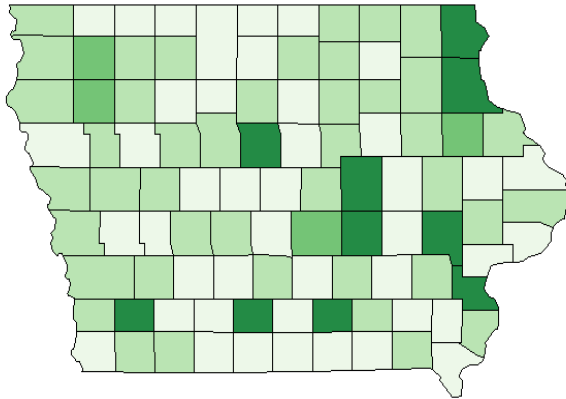
State Average 4%



Buffer Strip & Sedimentation Ponds Use by County



State Average 3%



State Average 2%



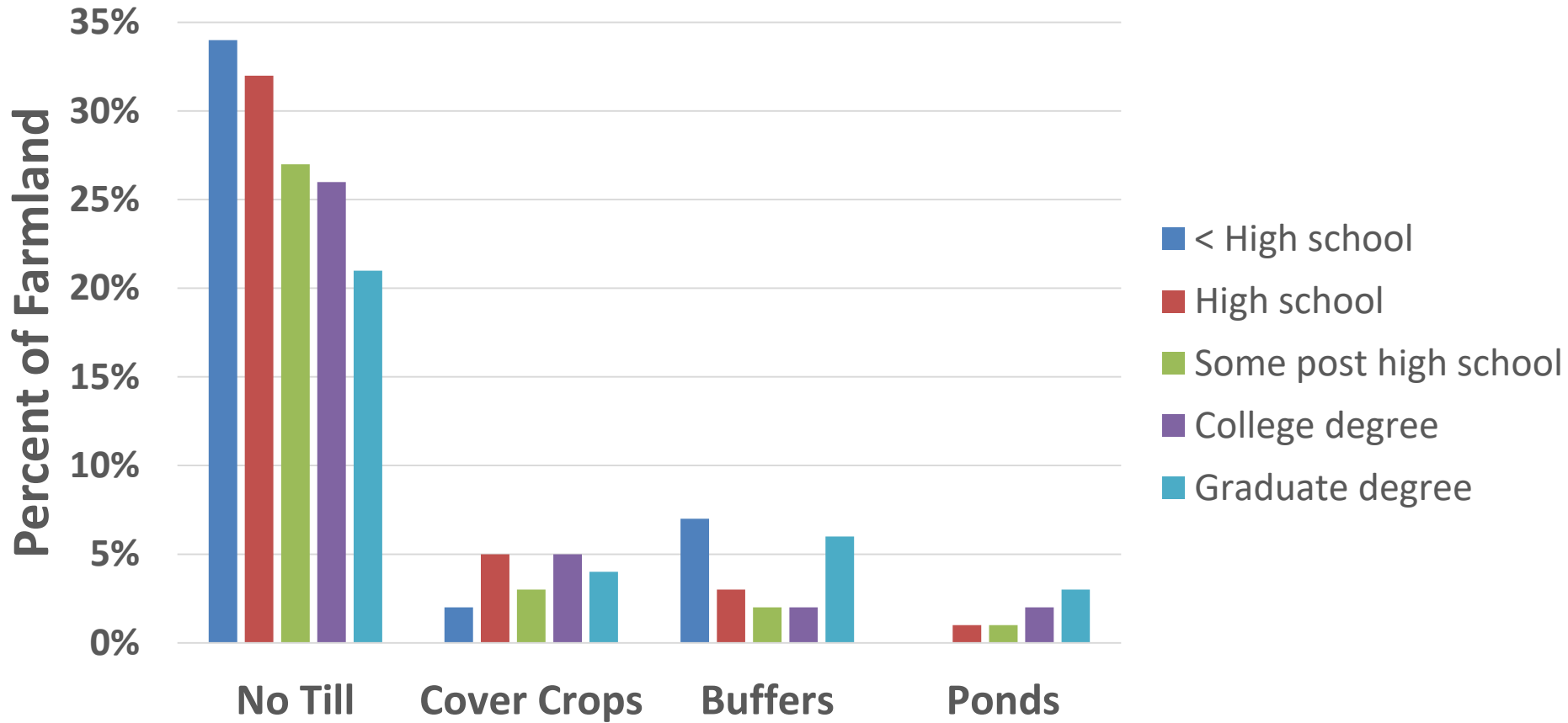
% Farmland in Conservation Practices, by Owner Farming Type

	No-till	Cover crops	Buffer strips	Ponds
Farms full time	33%	6%	4%	2%
Farms part time	24%	3%	4%	2%
Retired from farming	31%	4%	1%	1%
Never farmed	23%	4%	2%	1%

% Farmland in Conservation Practices, by Owner Residency

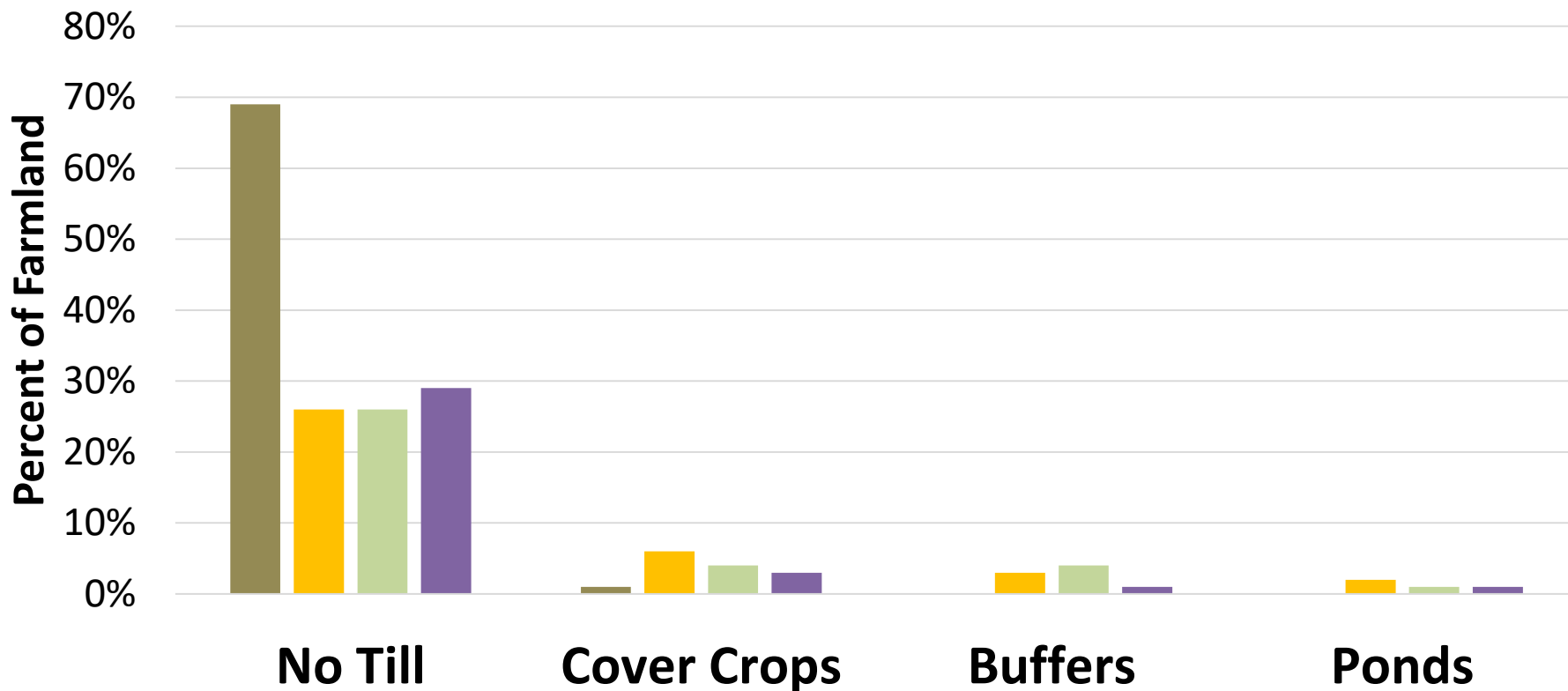
	No-till	Cover crops	Buffer strips	Ponds
All year in IA	28%	5%	3%	1%
Part of year in IA	32%	5%	3%	4%
All year outside IA	23%	3%	2%	<1%

% Farmland in Conservation Practices by Education of Owner



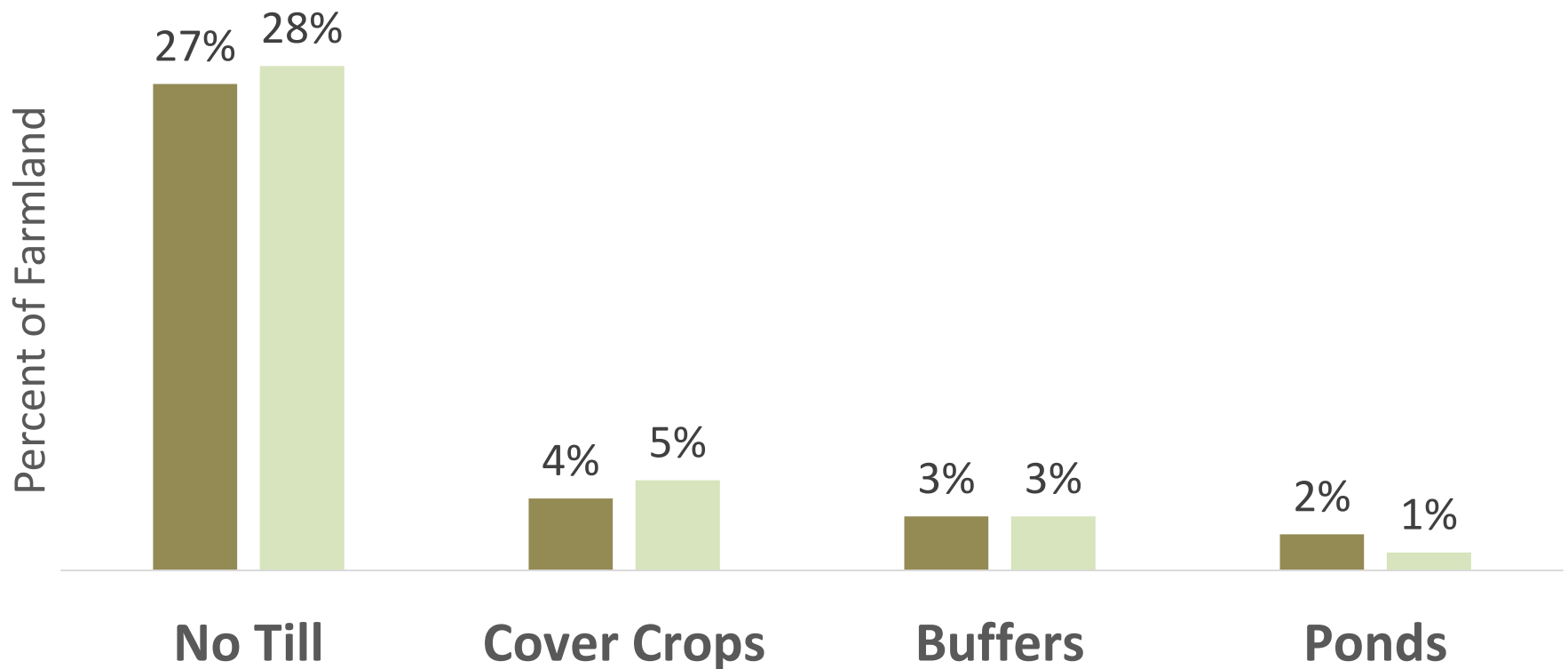
% Farmland in Conservation Practices by Age of Owner

■ < 35 ■ 35-65 ■ 65-80 ■ > 80

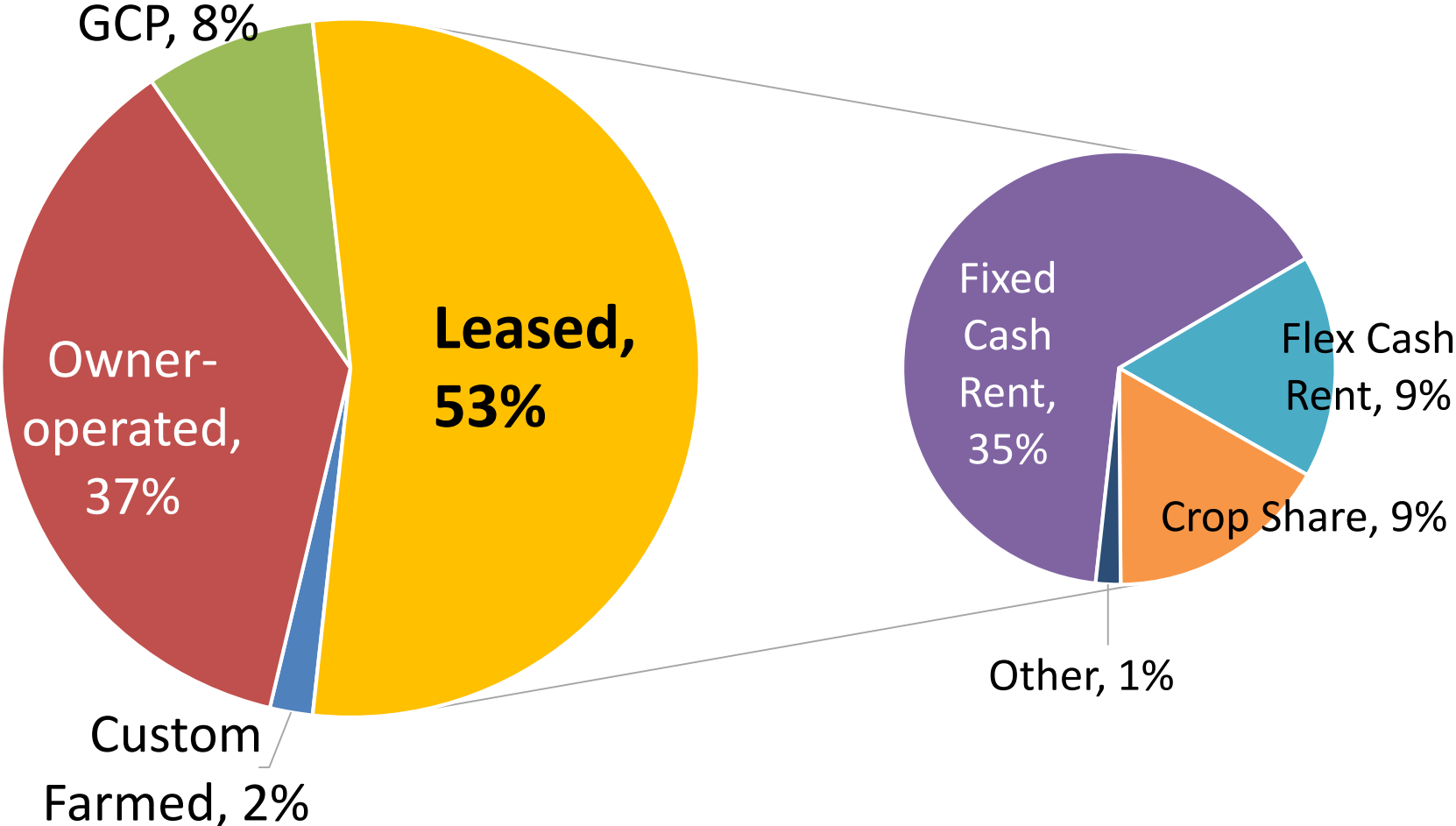


% Farmland in Conservation Practices by Gender of Owner

■ Male ■ Female



IA Farmland by Leasing Type, 2017





Iowa Farmland

100%

**Custom
Farmed**
2%

**Operated by
landowner**
37%

**Rented out by
landowner**
53%

**In government
programs**
8%

**Co-owner of
non-operator
landowner
operates land**
11%

**Owner farms
full time**
18%

**Owner
farms
part time**
8%

**Rented out by operator
landowner**
8%

**Rented out by non-
operator landowner**
45%

**Owner
farms
full time**
3%

**Owner
farms
part time**
5%

**Owner retired
from farming**
20%

**Owner never
farmed**
25%

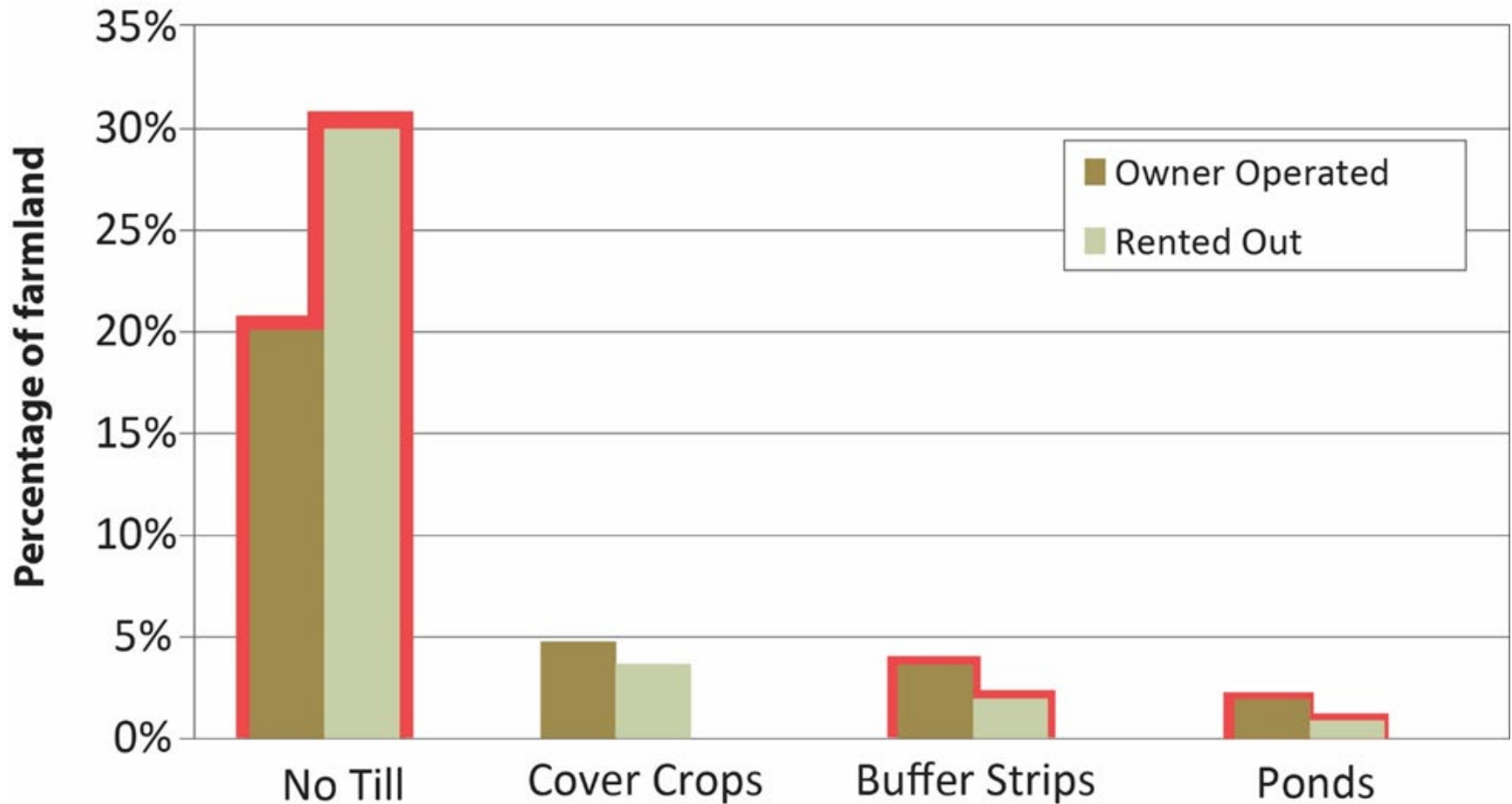
Local
19%

Absentee
1%

Local
17%

Absentee
8%

Conservation by Land Tenure



Note: Red outlines denote statistically significant difference (95% level)



Iowa Farmland

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**Custom
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Absentee

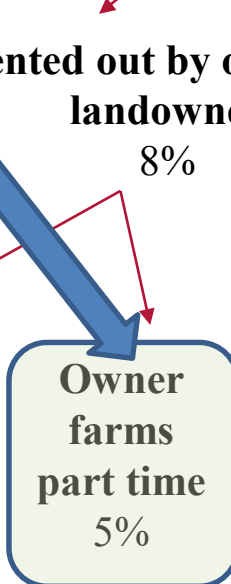
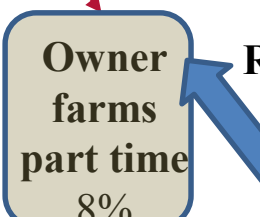
1%

Local

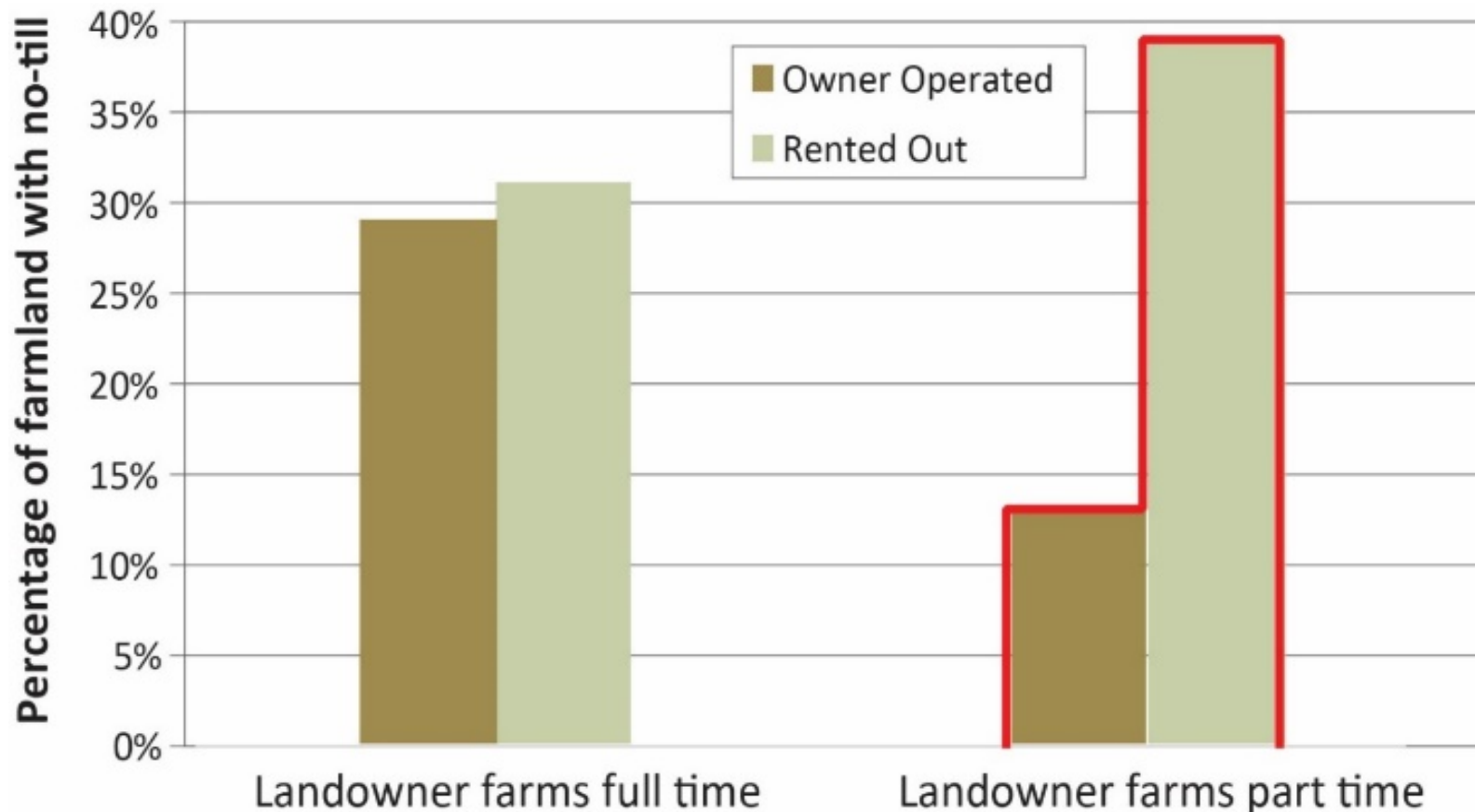
17%

Absentee

8%

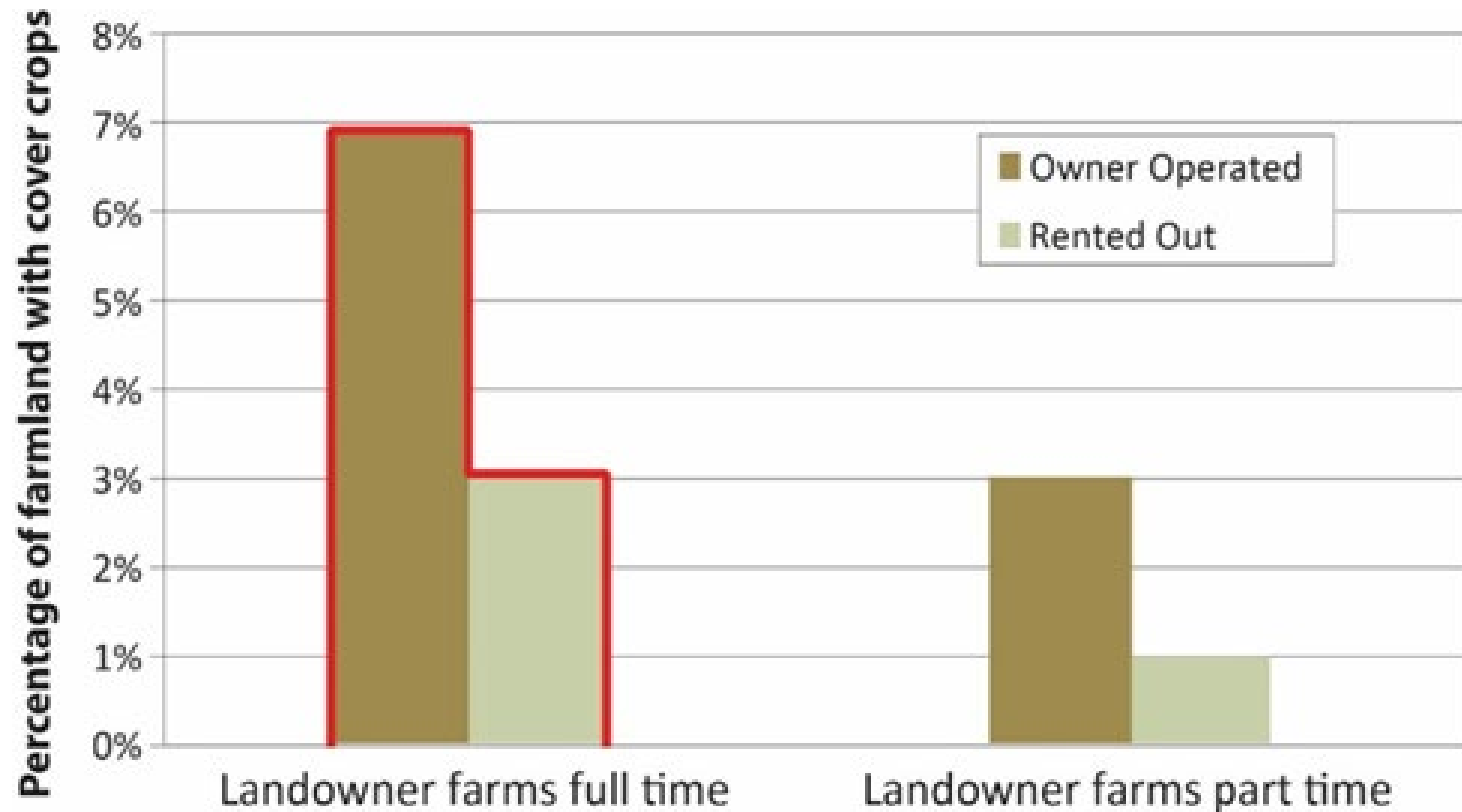


% Farmland with No-till, by Owner Type & Land Tenure



Note: Red outlines denote statistically significant difference (95% level)

% Farmland with Cover Crops, by Owner Type & Land Tenure



Note: Red outlines denote statistically significant difference (95% level)

Empirical Model

$$Y_{ijp} = \beta Rented_{ip} + \gamma X_{ijtp} + u_{ijp}$$

- Let Y_{ijp} be whether landowner i has conservation practice j on land type p , where

$p \in \{\text{owner-operated, rented}\}$

$j \in \{\text{no-till, cover crops}\}$

Summary Statistics

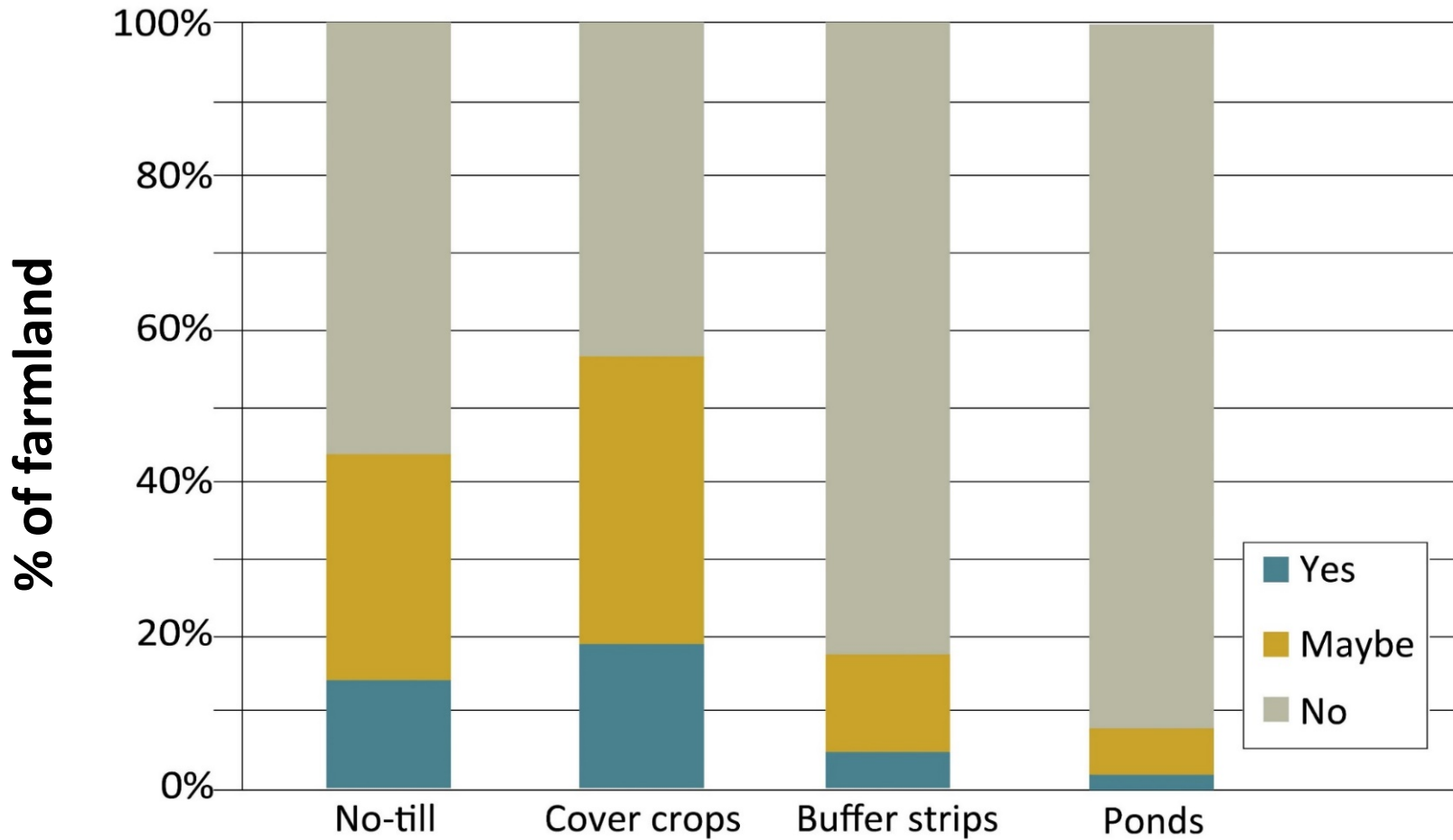
Variable name	Variable description	Mean	Standard deviation	Minimum	Maximum
Rented	=1 if the land is rented out by landowner	0.53	0.50	0	1
Cash-rent lease	=1 if the land is rented out by cash-rent lease	0.44	0.50	0	1
Full-time farmer	=1 if landowner is a full-time farmer	0.30	0.46	0	1
Part-time farmer	=1 if landowner is a part-time farmer	0.21	0.41	0	1
Retired farmer	=1 if landowner retired from farming	0.20	0.40	0	1
Never farmed	=1 if landowner has never farmed	0.29	0.46	0	1
Age	Landowner's age	66.58	13.18	18	97
Gender	=1 if landowner is male	0.57	0.50	0	1
College graduate	=1 if landowner is a college graduate	0.24	0.43	0	1
Landholdings	Total acres owned by the landowner	516.20	629.98	5	8200
% Paid for	Percent of the landowner's acres that have been paid for	75	39	0	100

Results: Dependent variable is whether the practice is present

	No-till	Cover crops
Rented	0.2353 ***	-0.0809 *
Cash-rent lease	-0.0461	0.0740 *
Part-time farmer	-0.1647 ***	-0.0729 *
Retired farmer	-0.1912 ***	-0.0831 *
Never farmed	-0.2230 ***	-0.1034 **
Age	0.0013	-0.0020 *
Gender	-0.0262	-0.0367
College graduate	-0.0550	0.0494
Landholdings	0.0001 ***	0.0001 **
% Paid for	0.0028	-0.0445
Intercept	0.1930 *	0.2646 ***

Note: Controls for crop-reporting district

Likely to Use Practices in Next Five Years?

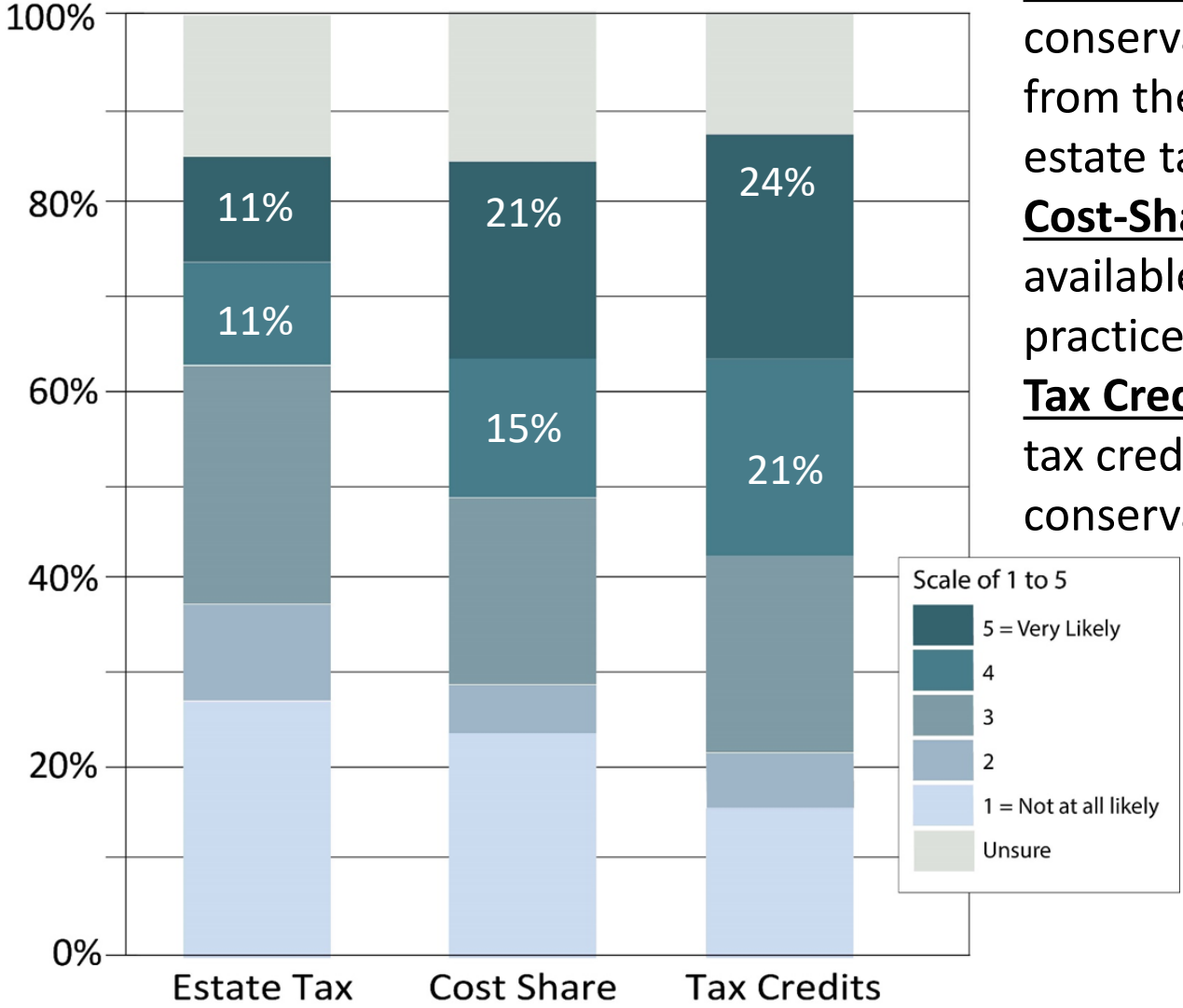


Reasons for Not Using:

No-till				Cover crops			
	Operator	Non-operator	All		Operator	Non-operator	All
Not suitable for the land	12%	46%	21%	Tenant's decision	19%	36%	25%
Hurts crop yield	17%	22%	18%	Too costly to terminate	19%	27%	22%
Tenant's decision	15%	6%	13%	Requires too much labor/time or season is too short	16%	9%	14%

Top reason for not using buffer strips (84%) and ponds (88%) is that they were not needed on the land.

Likelihood of Increasing Conservation Practices Under Alternative Policies

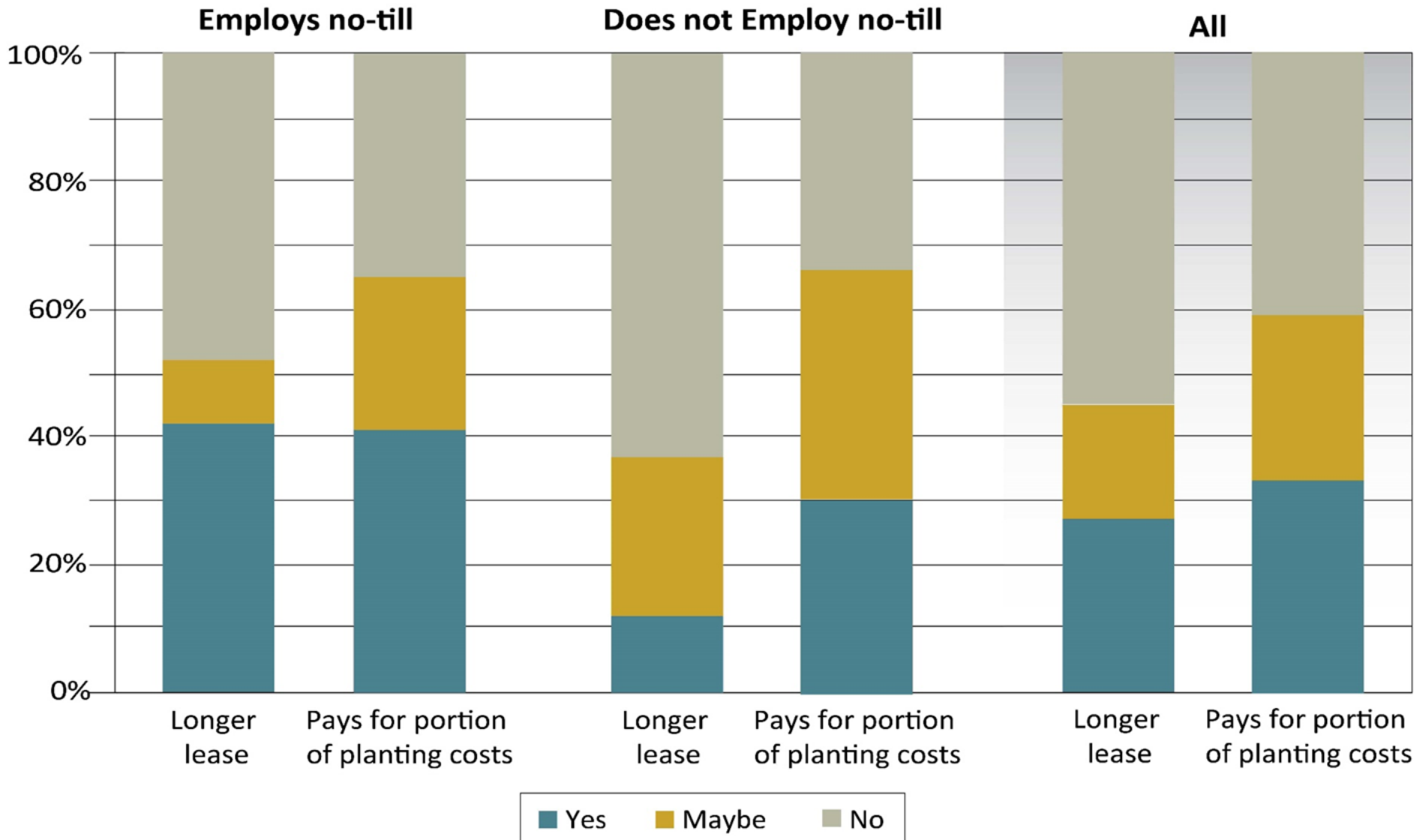


Estate Tax: land enrolled in conservation practices excluded from the value of the estate for estate tax purposes.

Cost-Share: tax-free cost sharing available for conservation practices.

Tax Credits: landowners to receive tax credits for implementation of conservation practices.

% Farmland by Owners' Willingness to Help Tenant Use Cover Crops



Conclusions

- Leasing may be a barrier to adoption of buffer strips, ponds, and cover crops.
- No-till use is higher on rented than owner-operated farmland, due to low use on operated land by part-time farmer landowners.
- Conservation use is lower on farmland owned by non-operator landowners...
- ...Also lower among absentee landowners
- Landowners seem open to increasing cover-crop acreage in the future...
- ...Willing to help tenants pay for portion of planting cost
- Landowners would increase conservation in exchange for tax credits/deductions

Thank you for your attention

Questions? Comments?

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