# Carbon Markets for US Row Crop Producers: Opportunities and Challenges

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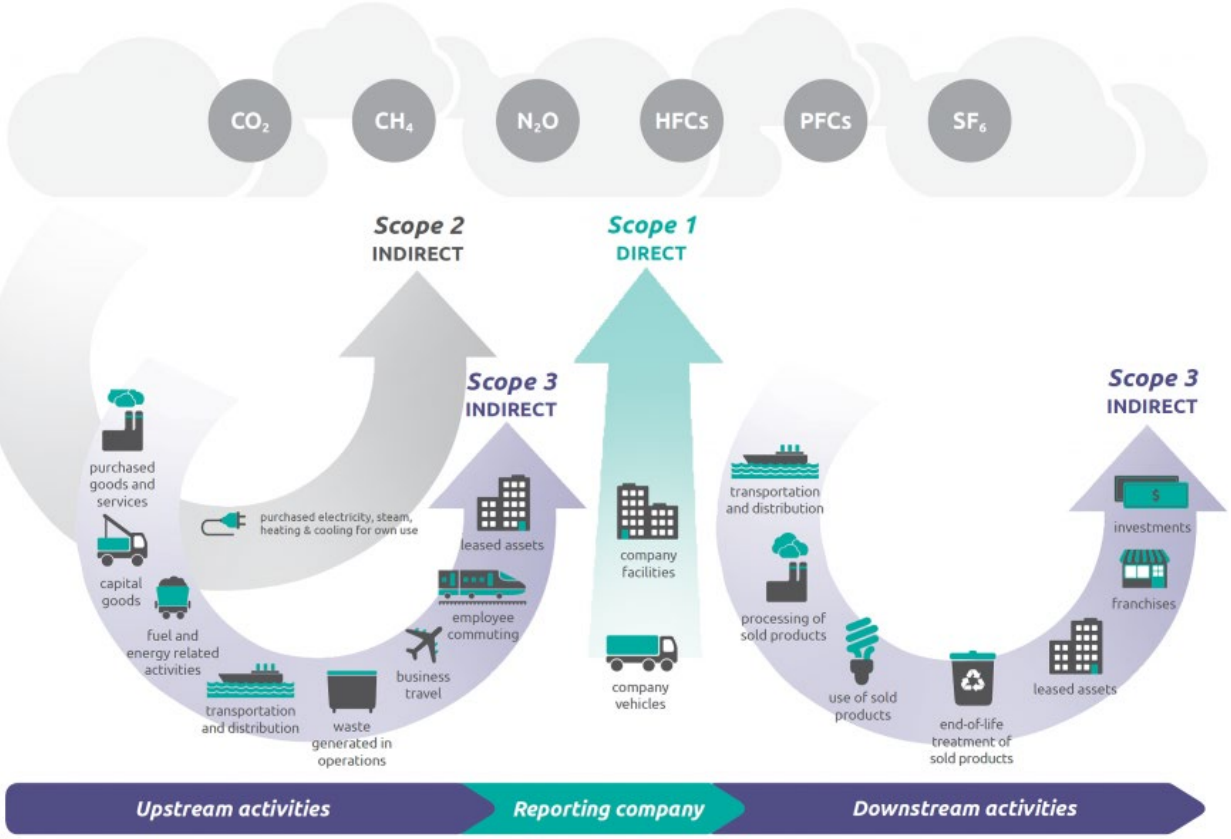
# Typology of carbon emissions

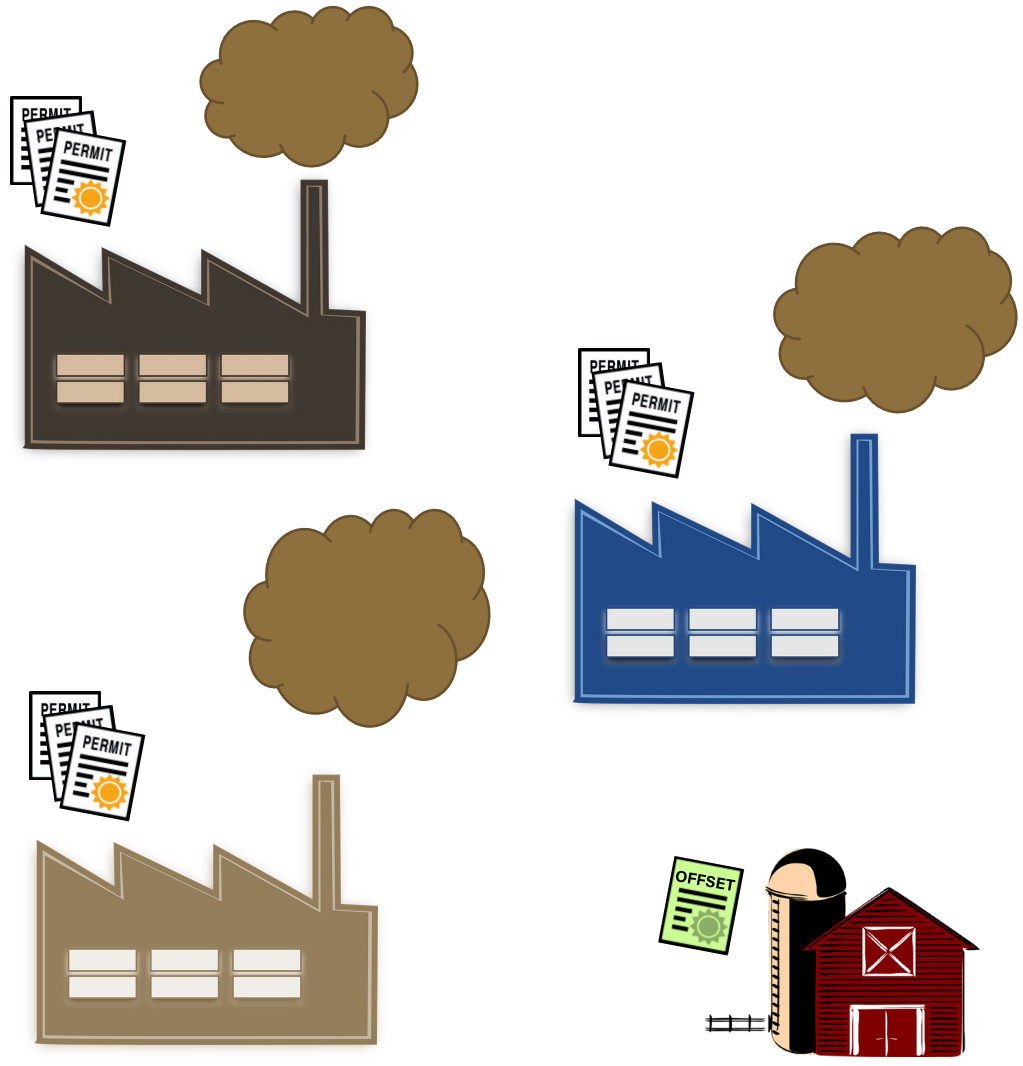
- Emissions are divided into 3 “scopes”
  - *Scope 1:* Direct emissions from company-owned assets (facilities, vehicles)
  - *Scope 2:* Indirect emissions from purchased energy
  - *Scope 3:* Indirect emissions from upstream suppliers, employee commuting, etc.
    - These are mostly the emissions covered in the offset markets we’ll discuss later




Source: https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance

# Carbon markets: principle and practice

- A basic regulatory market
  - Regulatory authority caps emissions from some industry
  - Regulator issues permits, 1 permit = 1 unit of emissions
  - Regulated polluters meet emissions cap by either
    1. Abating pollution to match permit stock
    2. Buying permits from others
    3. Buying “offsets” from unregulated sources outside market

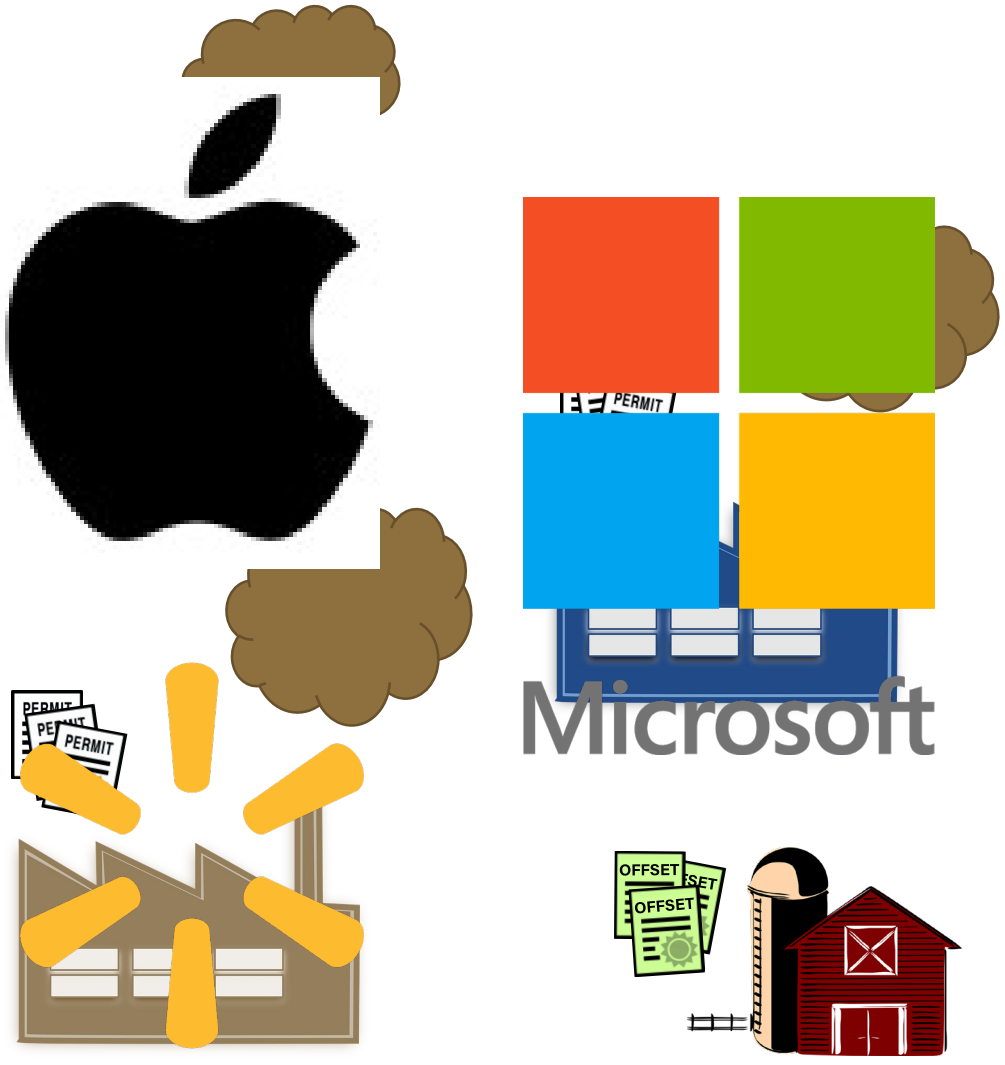


# Carbon markets: principle and practice

- Regulatory markets
  - Chicago Climate Exchange (defunct 2010)
    - Voluntary, legally-binding market
  - Regional Greenhouse Gas Initiative (2009-present)
    - Mandatory market for power plants in NE and Mid-Atlantic
  - California Cap-and-Trade Program (2013-present)
    - Mandatory for electricity producers, large industrial sources, and fuel distributors

# Carbon markets: principle and practice

- A basic nonregulatory offset market
  - Unregulated firms want to voluntarily mitigate emissions
  - Firms pay for offset projects or buy offsets from third party aggregators



# Carbon markets: principle and practice

- Nonregulatory/offset markets
  - Indigo Ag
  - Nori, Inc.
  - Bayer Crop Sciences

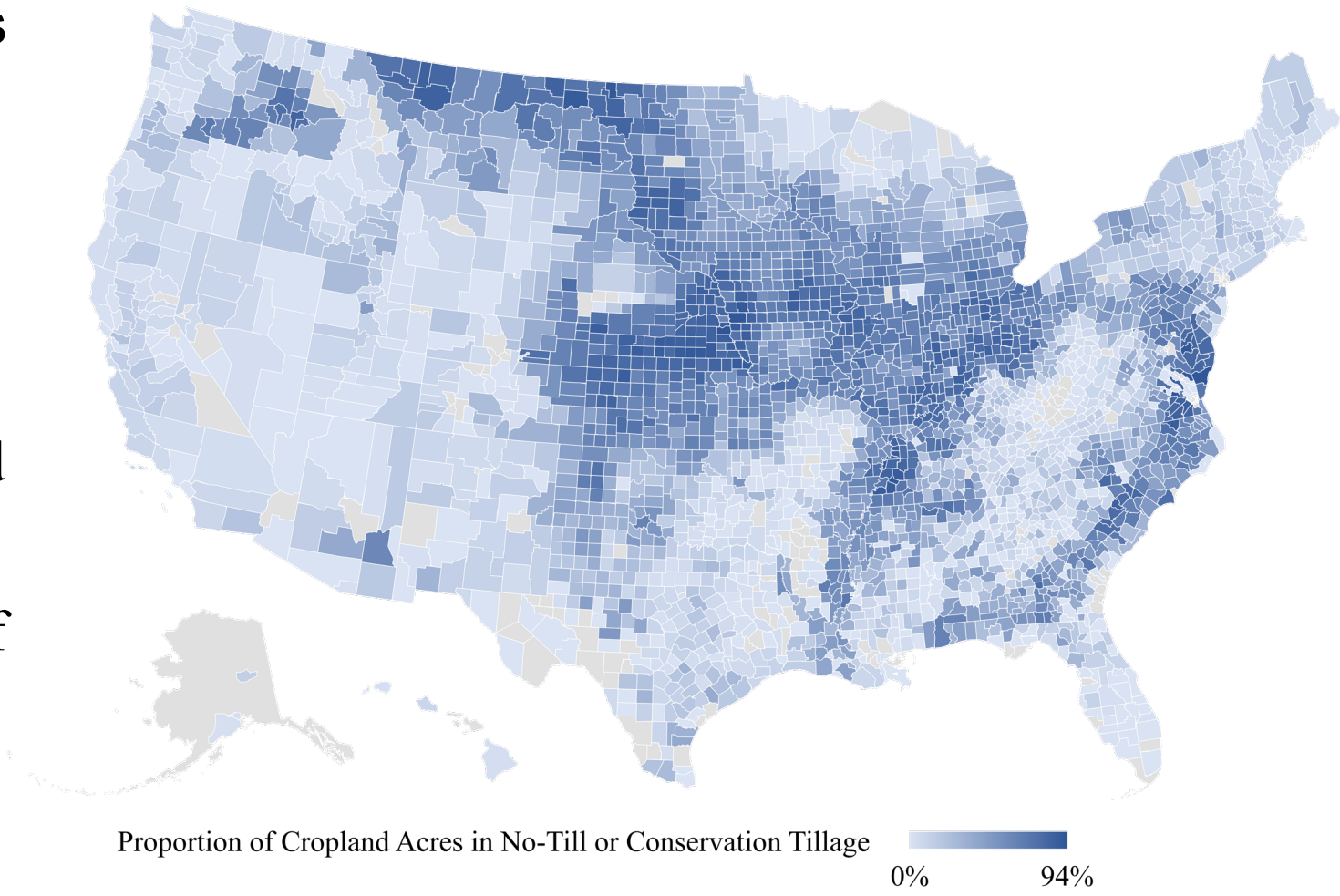
  Only markets to date that deal with row crop ag

  ✓This is an "inset" market – like an "offset" market, but scope of offset sales restricted to firm's own supply chain
  - Climate Trust



# Proportion of US cropland acres in conservation tillage

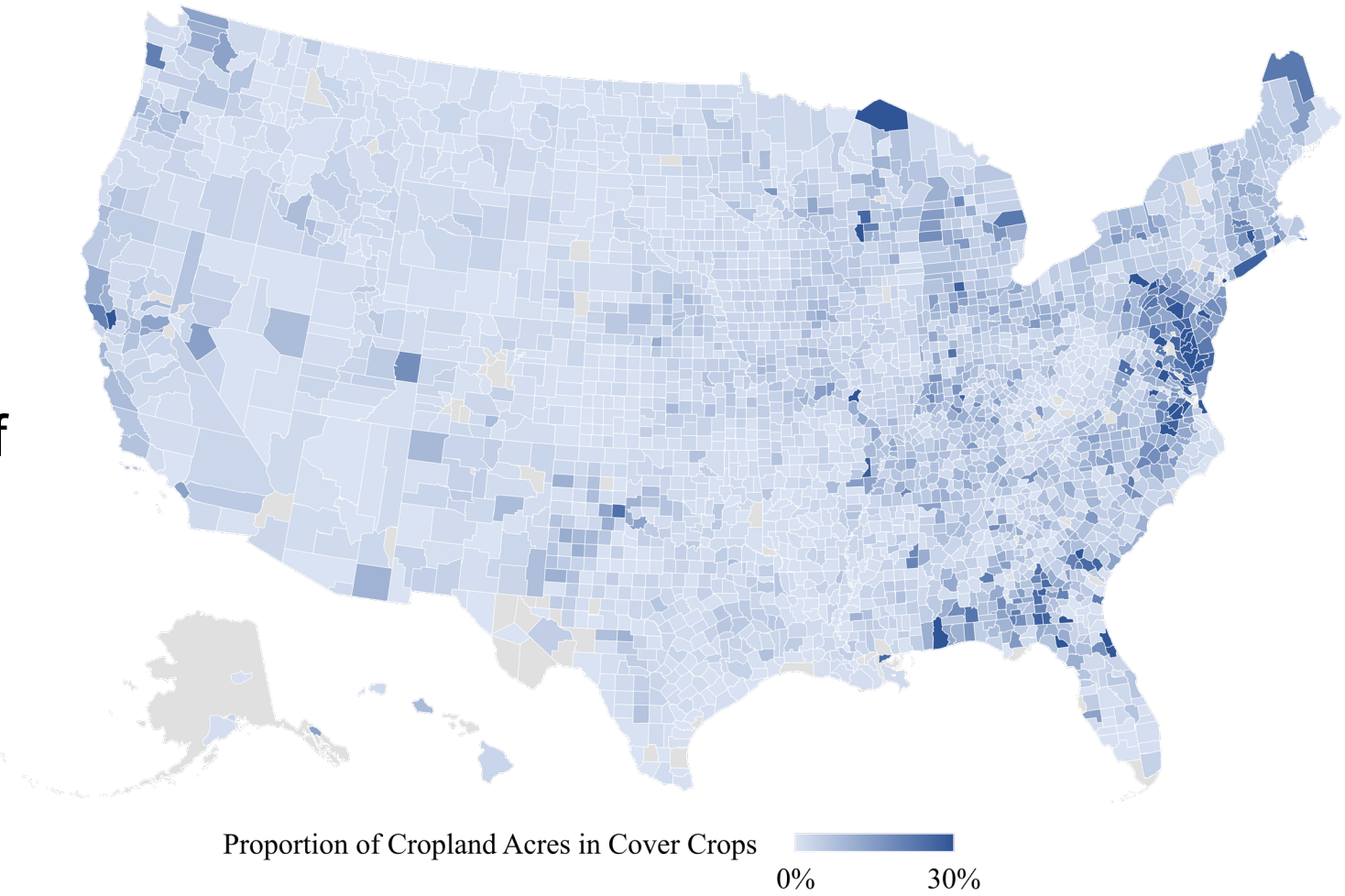
- Over half of US cropland acres are already in
  - No-till (104 mil. acres, 26%)
  - Other conservation tillage (98 mil. acres, 25%)
- If all US cropland acres planted in no-till
  - Sequester 123 million MT of carbon/year
  - 2% of all US $CO_2$ emissions




Source: 2017 US Census of Agriculture

# Proportion of US cropland acres in cover crops

- Only 4% of US cropland acres are planted in cover crops
- If all US cropland acres planted in cover crops
  - Sequester 147 million MT of carbon/year
  - 3% of all US $CO_2$ emissions

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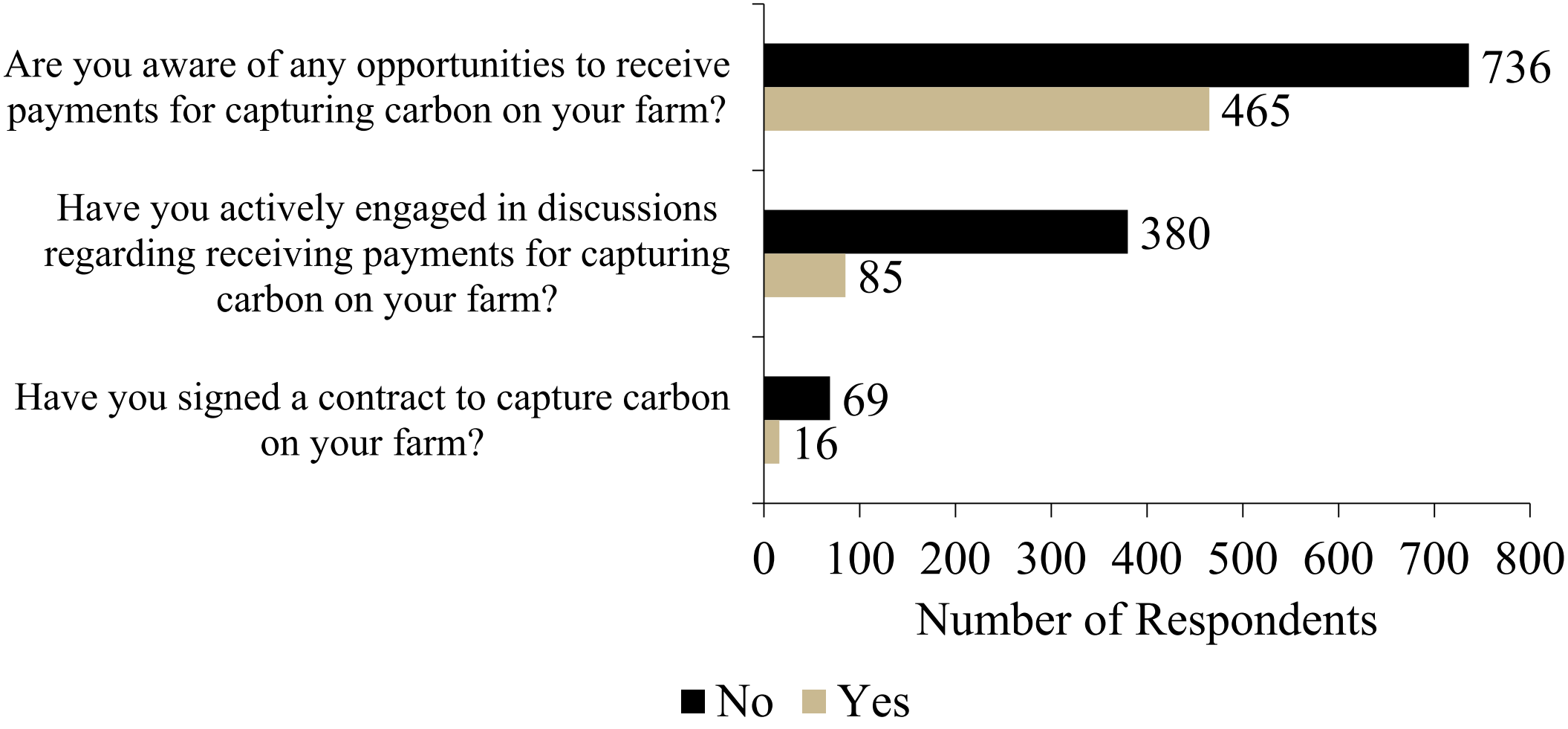
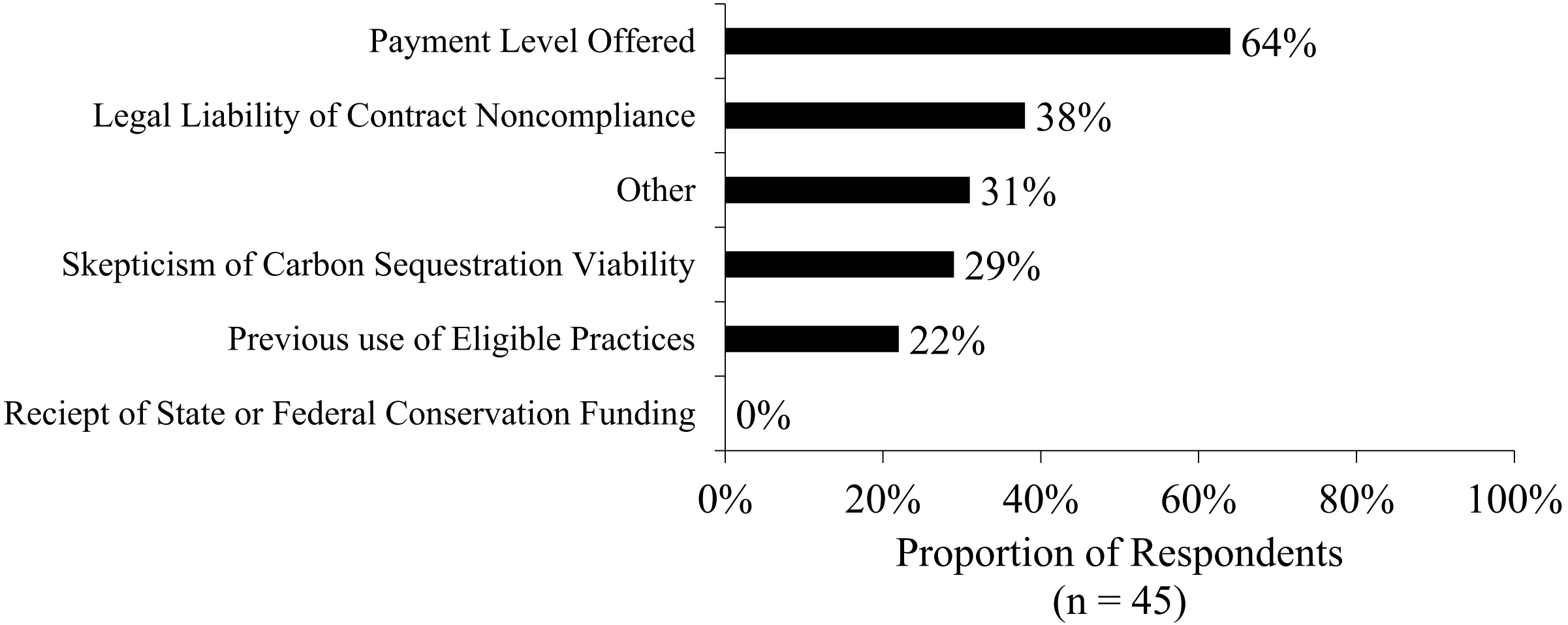
Source: 2017 US Census of Agriculture

# Farmer awareness, engagement, and participation in c




Source: Purdue University-CME Group Ag Economy Barometer, February, March, and April 2021 Surveys

# Why are farmers choosing not to participate in carbon m

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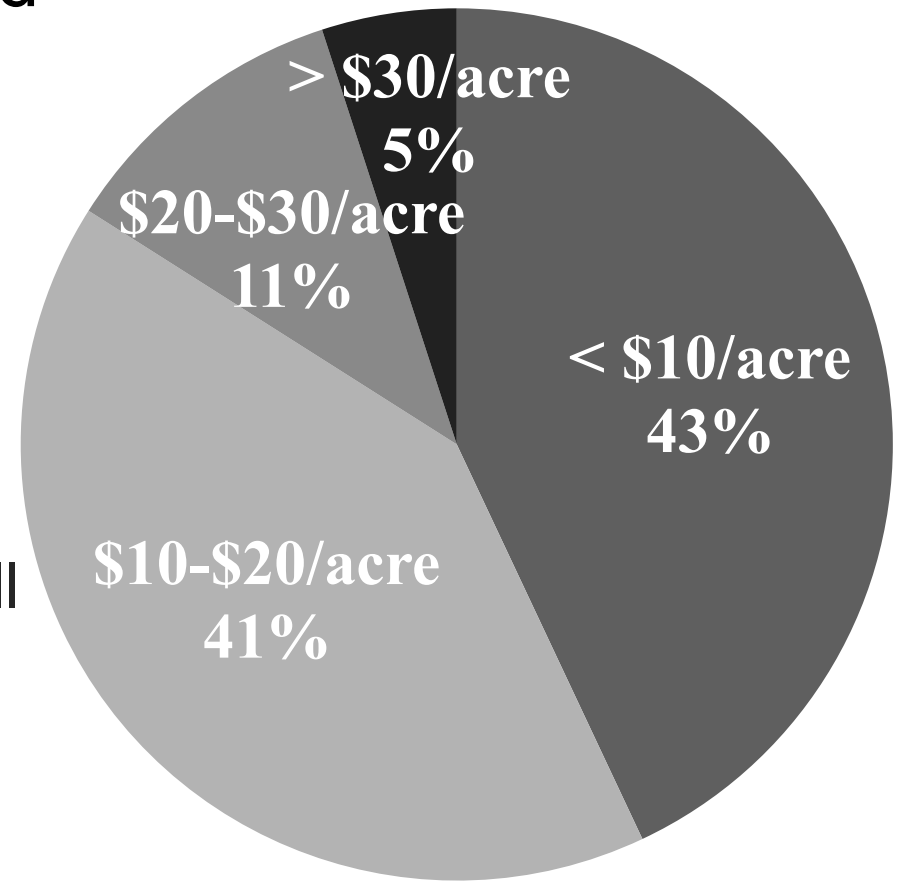
Source: Purdue University-CME Group Ag Economy Barometer, March and April 2021 Surveys

# How much will I get paid?

- Price is determined by supply and demand
  - Supply is lagging demand
  - Is demand sustainable?
- Current prices seem to be in the range of $10-$20/MT of carbon
  - $40/acre est'd. cost to switch from conv. till to no-till
  - If 0.5 MT/acre sequestered, then $80/MT carbon would be needed to offset costs

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Source: Purdue University-CME Group Ag Economy Barometer, March and April 2021 Surveys

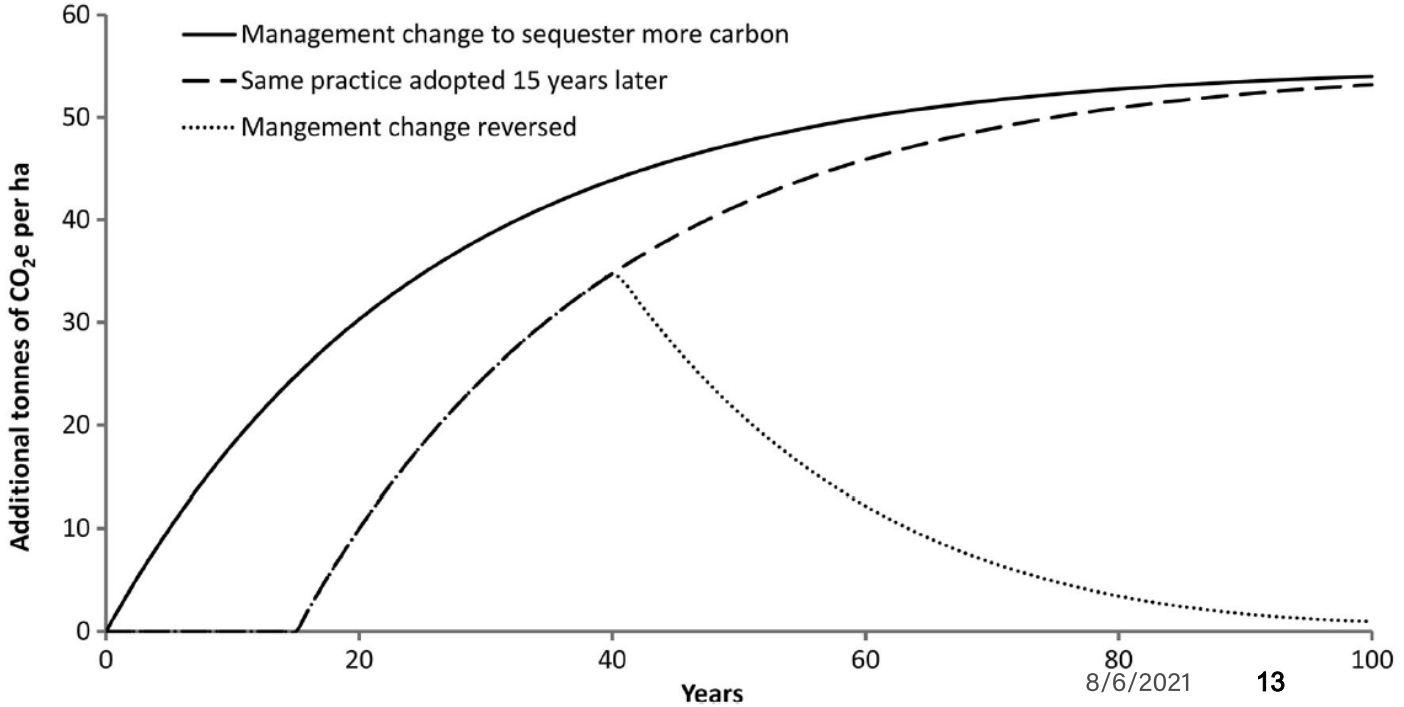
# What are my contractual obligations to continue the pra

- Soil carbon sequestration is reversible
  - ✓Example – tillage to eliminate field ruts, weeds, etc.
  - ✓How would carbon contracts handle these situations?

- How long are contracts?
  - ✓1-20 years
  - ✓Australia's Emissions Reduction Fund – 100-year contracts
    - ✓25-year contracts available, but at reduced rate

# Do I qualify if I am already using eligible production pra

- Generally, no.
  - Some opportunities for short “lookback” payments from some firms
  - Typically, less than 5-year “lookback”
- Soil carbon sequestration potential
  - Increasing at a decreasing rate
  - But ultimately, it is finite




Source: Thamo and Pannell (2016)

# *Who pays for verification and am I actually paid for carbo*

- Companies generally pay for verification
- But they do not sample every acre
  - ✓Heavy reliance on biogeochemical modeling, based on a combination of sampling and production practices

# *Can I store carbon on leased acres?*

- Generally, yes.
  - Need to show management control
  - Need landowner approval to sell carbon credits
- Questions remaining
  - How is continuity of carbon sequestration ensured?
  - Current contracts are with farm operator, what happens when cropland changes hands either via change in ownership or lease?
  - Contract enforcement issues

# *Alternatives and consequences*

1. Private carbon markets continue to dominate
   - Reliant on investors and/or consumers demanding a reduction in firms' carbon footprint
   - Existence of private markets is driving opportunity for row-crop agriculture to benefit from carbon sequestration
   - But, questions regarding quality of soil carbon credits likely remain

# *Alternatives and consequences*

## 2. Government gets involved

- Standardize measurement and verification
  - Could set the stage for carbon offsets from row-crop agriculture to be used in regulated carbon market
  - Make information publicly available, similar to role of USDA-AMS
- Tax or cap on carbon emissions
  - Ensures that there would be a demand for carbon offset

# *Thank you!*

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Visit www.purdue.edu/commercialag for a white paper and webinar on carbon markets.