Crop Insurance and Soil Health

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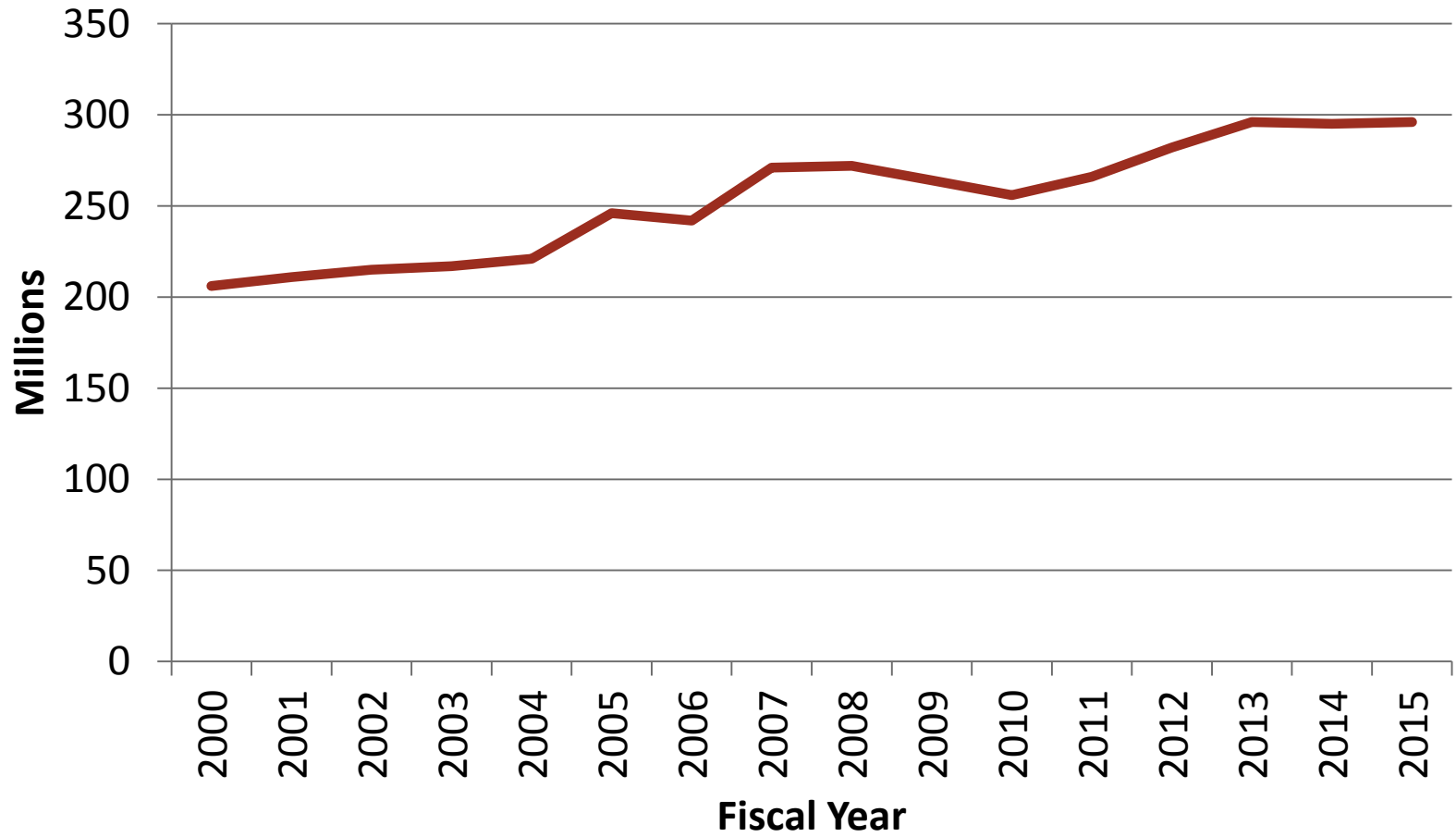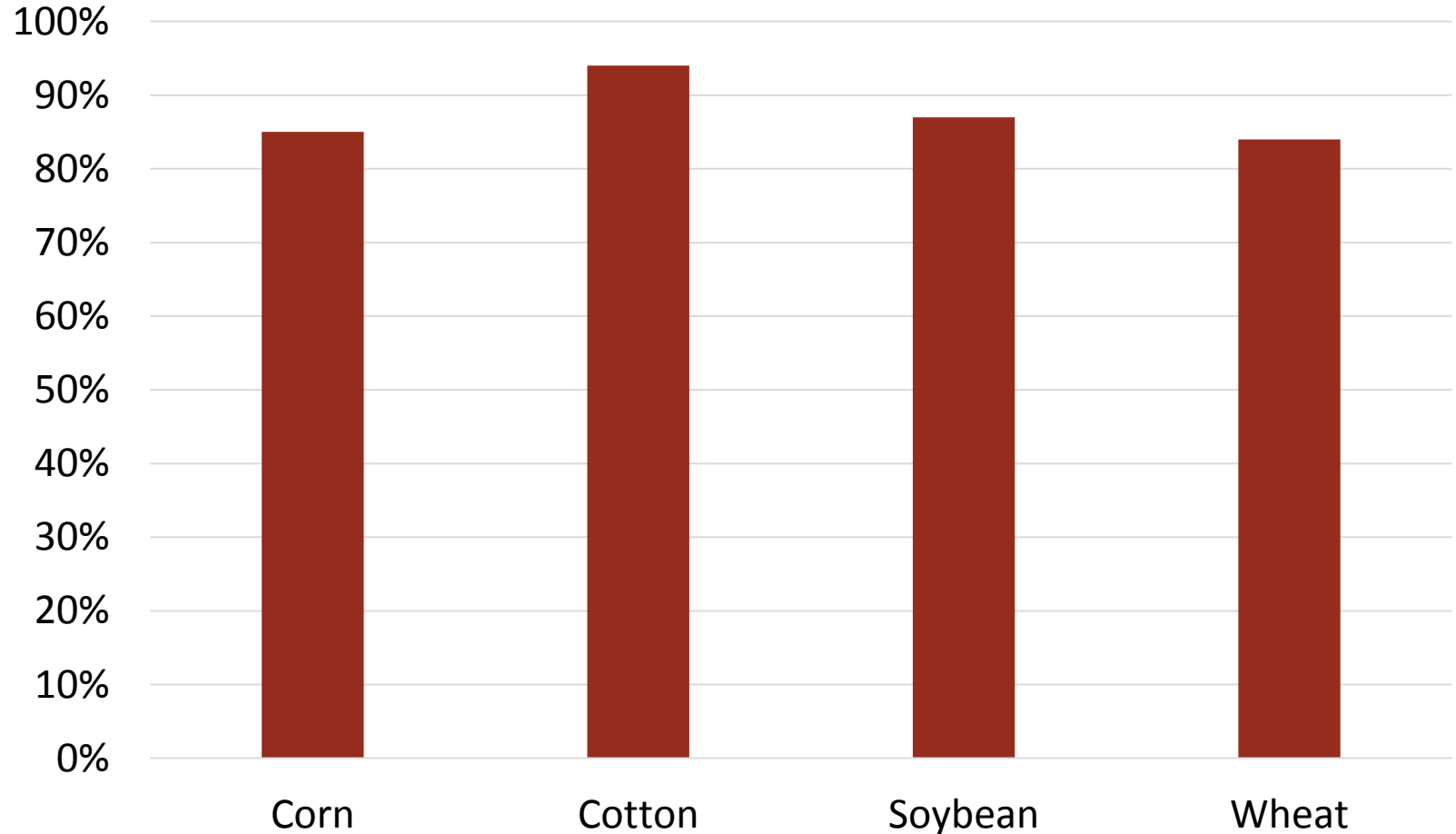
Federal Crop Insurance

- Partnership between the federal government and private insurance companies.
- Private insurance companies:
  - Sell and service insurance policies (required to sell to all eligible farmers).
  - Conduct loss adjustment.
  - Retain some premium and loss risk.
- Federal government:
  - Provides reinsurance to private insurance companies.
  - Reimburses administrative and operating costs (as a percentage of premium).
  - Establishes policy language and premium rates.
  - Provides premium subsidies.

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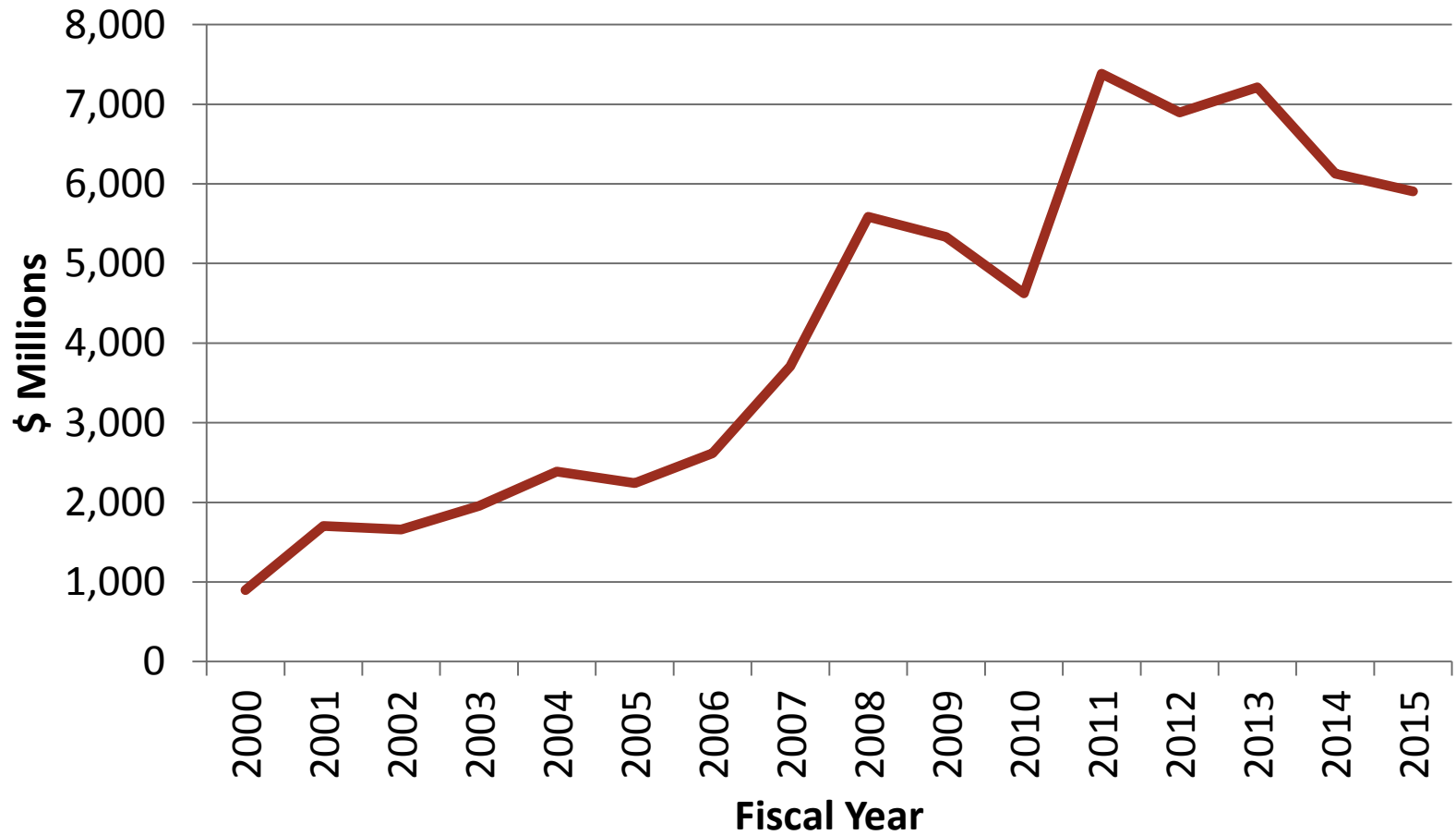
Federal Crop Insurance Insured Acres

2014 Percentage of Planted Acres Insured

These 4 crops account for more than 70% of insured acres.

Federal Crop Insurance Premium Subsidies

How Did the 2014 Farm Bill Impact U.S. Crop Insurance?

- New "shallow loss" crop insurance products (SCO/STAX).

- Almost all federal support for cotton producers will be via crop insurance.

- Even for commodities other than cotton, crop insurance will be the primary mechanism for federal support of crop agriculture in the United States.

- Farmers must now be in compliance with federal soil conservation guidelines to be eligible to purchase federal crop insurance.

Calculating a Crop Insurance Indemnity

- $Trigger\ Yield = Approved\ Yield \times Coverage$
  where $50 \leq Coverage \leq 85\%$

- $Indemnity = max\big(0, (Trigger\ Yield -$

APH Yield

- Actual Production History (APH) Yield: simple rolling average of most recent 10 years of yields on the insured unit.

Example of APH Calculation

Year	Actual Yield (bu/ac)	2014 APH	2015 APH
2004	172	172	
2005	181	181	181
2006	176	176	176
2007	203	203	203
2008	210	210	210
2009	200	200	200
2010	213	213	213
2011	204	204	204
2012	160	160	160
2013	221	221	221
2014	232		232
Simple Average APH Yield		194	200

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APH Yield

- Actual Production History (APH) Yield: simple rolling average of most recent 4-10 years of yields on the insured unit.

- If crops are grown in rotation, it takes more than 10 years to get 10 years of yield history.

- Can begin with as few as 4 years of yield history and build up to 10.

- If fewer than 4 years of yield history, RMA-determined T-yields are used to replace the missing years. These are generally significantly lower than expected yields.

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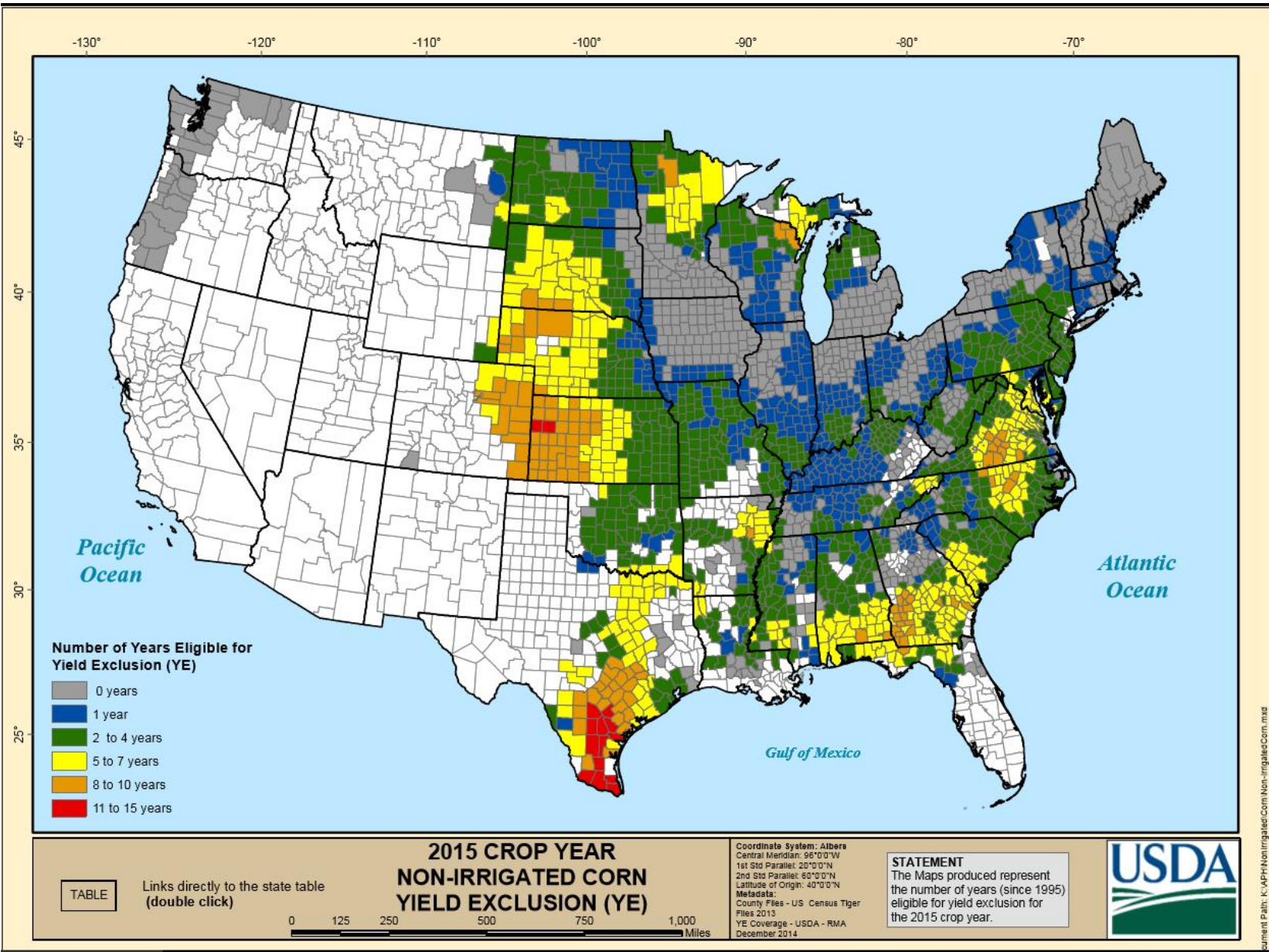
From APH Yield to Approved Yield

- May elect to substitute 60% of T-yield for any actual yields that are less than 60% of T-yield.
- Approved yield not be less than a specified percentage (generally 80%) of the T-yield.
- Approved yield may not decrease by more than 10% in successive years.
- If the county yield is at least 50% below the simple average yield for the previous 10 years, all policyholders in that county (and contiguous counties) may elect to exclude that year from APH calculations.
- For some crops and areas, APH yields can be trend-adjusted.
- Other favorable adjustments for new farmers, added land, and prevented planting.

Potential Soil Health Implications

- APH yield modifications disproportionately benefit growers in high risk areas.
  - Are soils in these areas more fragile?

Number of Years Eligible for Yield Exclusion (YE)

- 0 years
- 1 year
- 2 to 4 years
- 5 to 7 years
- 8 to 10 years
- 11 to 15 years

2015 CROP YEAR NON-IRRIGATED CORN YIELD EXCLUSION (YE)

TABLE — Links directly to the state table (double click)

0   125   250   500   750   1,000 Miles

Coordinate System: Albers
Central Meridian: 96°0'0"W
1st Std Parallel: 20°0'0"N
2nd Std Parallel: 60°0'0"N
Latitude of Origin: 40°0'0"N
Metadata:
County Files - US Census Tiger Files 2013
YE Coverage - USDA - RMA
December 2014

STATEMENT
The Maps produced represent the number of years (since 1995) eligible for yield exclusion for the 2015 crop year.

USDA

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Potential Soil Health Implications

- APH yield modifications disproportionately benefit growers in high risk areas.
  - Are soils in these areas more fragile?
- APH yield modifications disproportionately benefit growers who use higher risk production practices.
  - Disincentive to use conservation practices (e.g., reduced- or no-tillage) if those practices reduce yield losses in drought conditions.

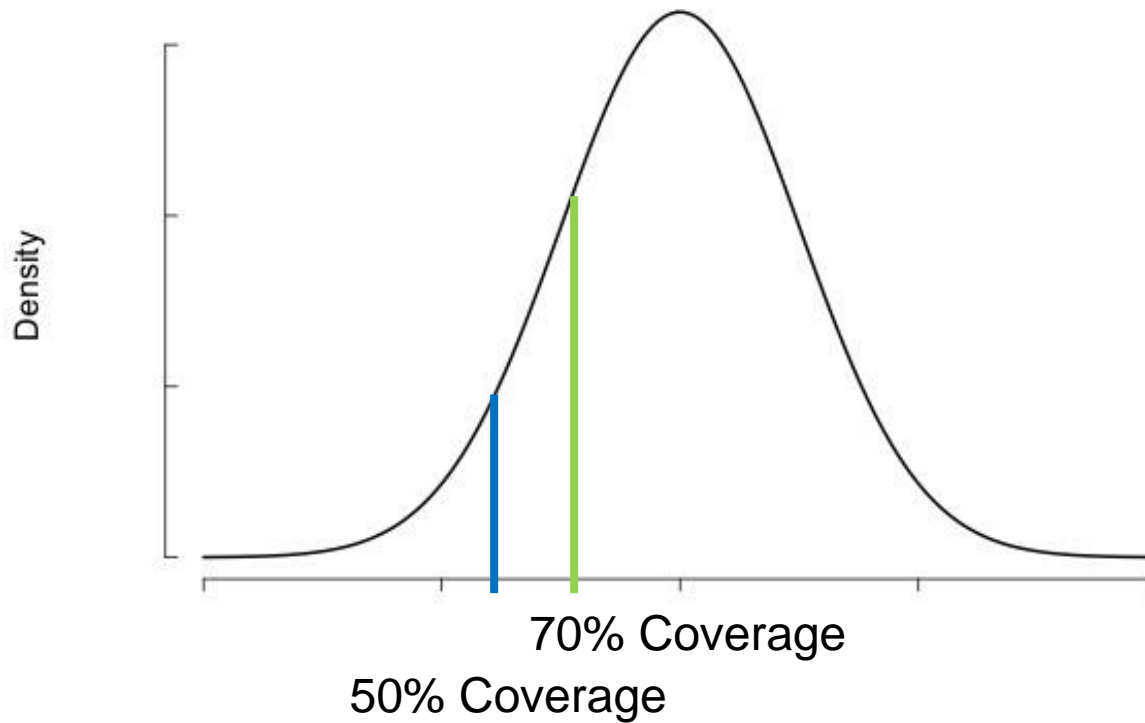**MISSISSIPPI STATE**
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What is a Premium Rate?

- Premium rate = premium / liability (or premium per dollar of liability).

- Insured's total premium = premium rate × insured's liability (liability = dollar amount of protection).

- Crop insurance producer premium = total premium × (100% - % subsidy).

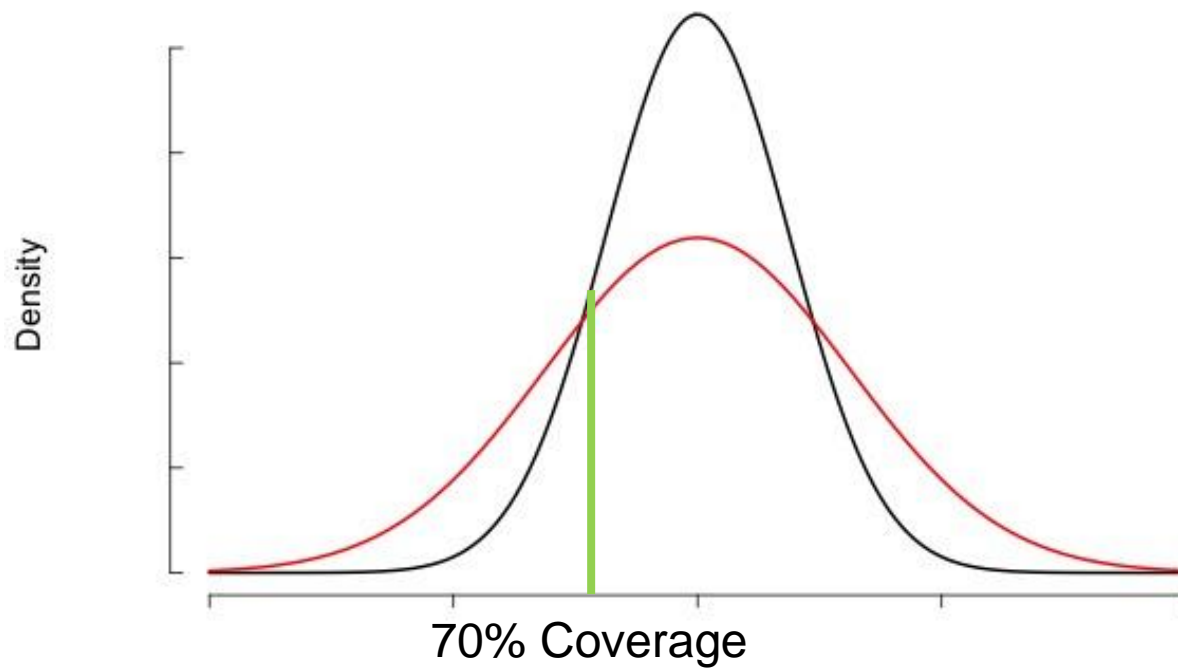- How does one calculate a premium rate?

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Premium Rate for 70% Coverage

Yield or revenue distribution

Density
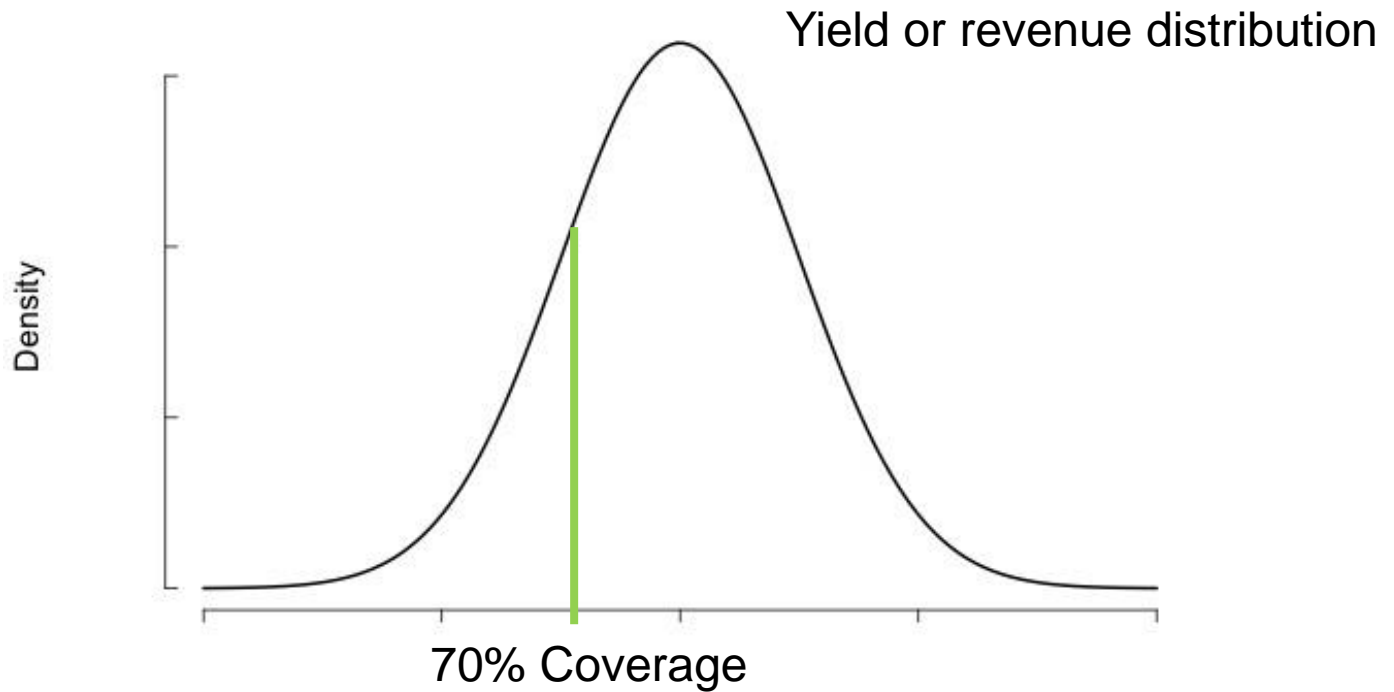
70% Coverage

Premium Rate Varies with Coverage Level

Density

70% Coverage

50% Coverage

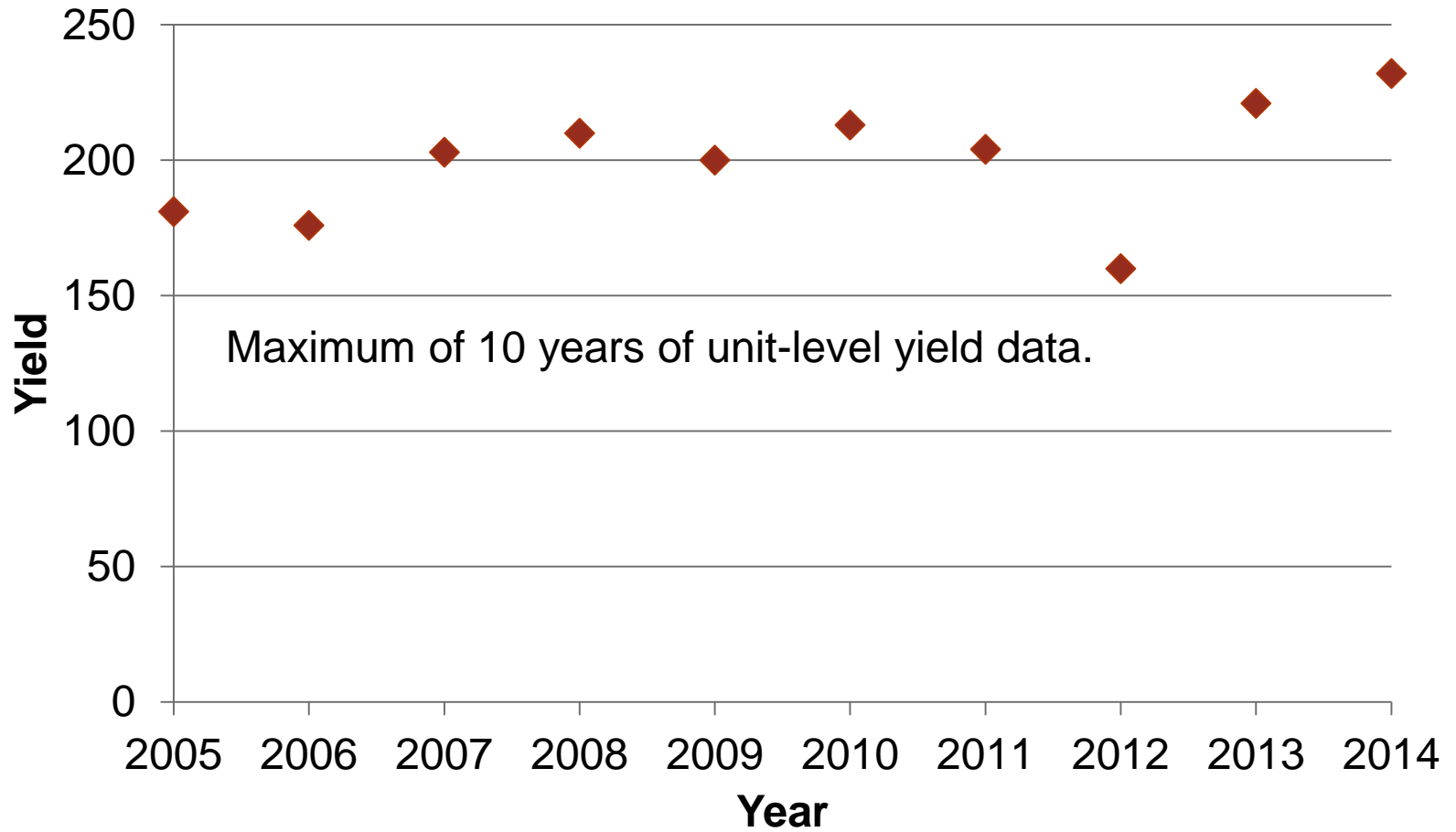# Higher Risk Implies Higher Premium Rate

70% Coverage

Density

Yeah but . . .

- We never actually observe unit-level yield or revenue distributions.

What we Actually Observe (unit-level products)

Maximum of 10 years of unit-level yield data.

So Now What?

- Obviously 10 observations is insufficient to fit a probability distribution.

- Instead, these observations are used to estimate the central tendency of the yield distribution for the insured unit.
  - Can be large errors in estimating the central tendency with only 10 observations – especially for riskier crops/regions.

Loss Cost

- Loss cost = indemnity/ liability.
  - Impossible to predict loss cost for a given year.

- Actuarially-fair premium rate = E(Loss Cost).

- Rather than trying to fit a distribution for each insured unit, actuaries attempt to estimate the E(Loss Cost) for various classifications of insured units.

So How is E(Loss Cost) Estimated?

- For yield insurance products:
  - E(Loss Cost) varies by crop.
  - E(Loss Cost) varies by county.
  - E(Loss Cost) varies by production practices.
  - E(Loss Cost) varies by types/varieties.
- For revenue insurance products, there are also:
  - Differences in price risk for different crops and differences in price-yield correlation for different crops and regions – all of which impact E(Loss Cost).

Risk Differences Across Insured Units for a Crop/County/Type/Practice

- May be due to differences in soil quality, drainage, practices not recognized by RMA, producer ability, etc.

- In some cases (e.g., high risk land in a flood plain) explicit premium rate loads are applied.

- In other cases (where differences are not easily attributable to a specific factor):

  - For a given county/crop/type/practice combination, E(Loss Cost) for insured units is assumed to be lower (higher) the higher (lower) the estimate of yield central tendency (APH yield).

Premium Rate Adjustments for Soil Conserving Practices

- Any resulting increase in expected yield is already being captured by the APH yield (which, in turn, reduces premium rates).

- Must be able to demonstrate that the practice reduces yield variability.

  - Much more data are required to demonstrate variance reduction than are required to demonstrate mean impacts.

  - Marginal impact on variance reduction likely depends on geographic region, management ability, interactions with other practices.

Subsidy Impacts

- Even if premium rate adjustments could be obtained for practices that improve soil health, the incentive impacts would be greatly reduced by the premium subsidy.
  - On average, growers pay only about 40% of the total premium cost.

Subsidy Impacts

- A more important incentive issue may be that premium subsidies are a percentage of the total premium.
  - Total premium is higher in higher risk areas, so dollars of subsidies per acre are higher for higher risk regions
- Example:
  - Non-irrigated corn, 65% coverage (59% premium subsidy), APH yield is typical, $500,000 policy.
  - DeKalb County, IL, premium rate is 0.8%, subsidy is $2,360.
  - Fort Bend County, TX, premium rate is 8.0%, subsidy is $23,600.
- Are soils in higher risk regions more fragile?

Thank you!