Crop Insurance and Marketing: Together the Most Successful Tool

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Kentucky Producer

Farmers are the biggest gamblers there ever were

Farmers are paid to take risks.

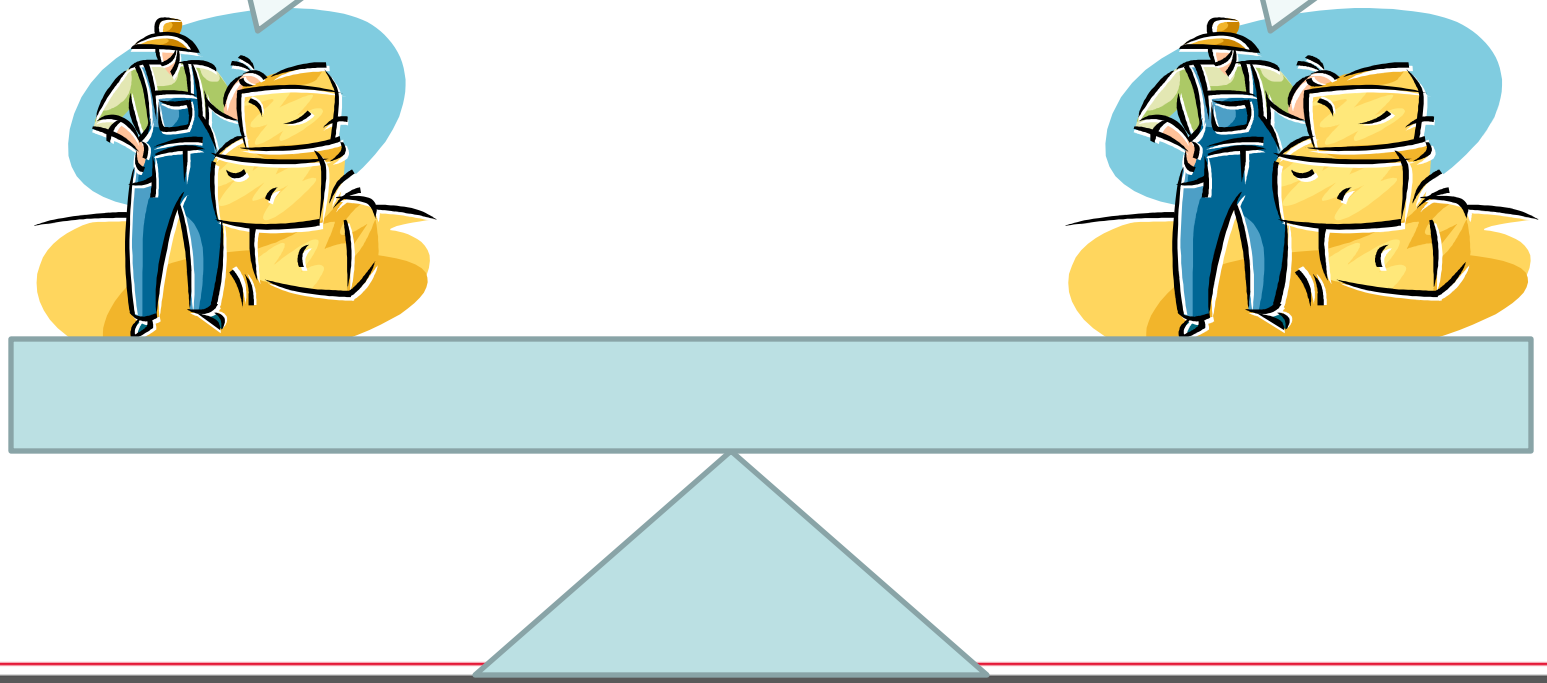
-They face weather, price and input uncertainty

-They face physical risks and financial risks.

We cannot eliminate risk only manage it!

You never go broke taking a profit

Don’t sell something you don’t have



Background

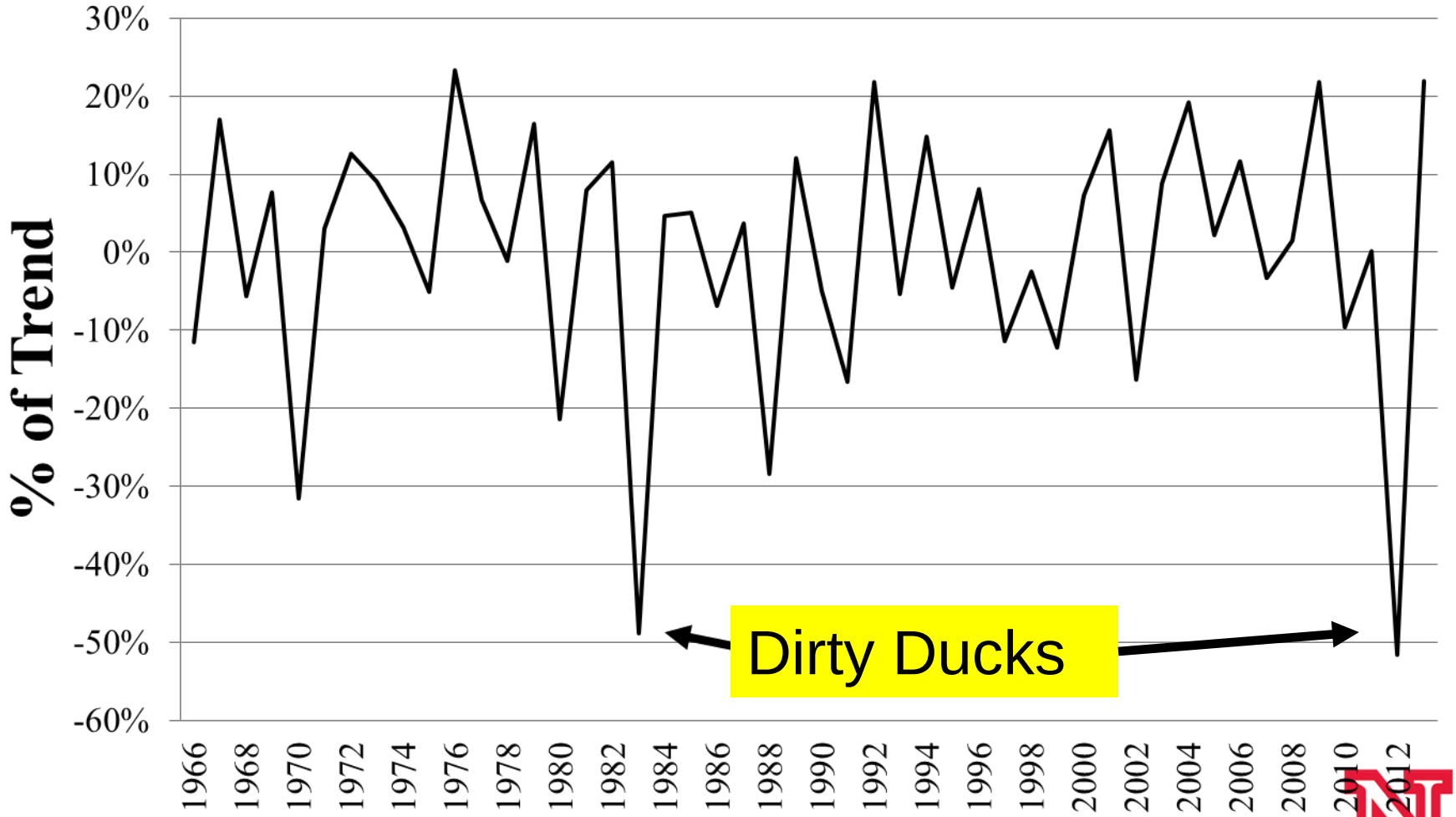
- Often you will hear ‘ you should hedge up to your guaranteed bushels’
  - Or
- Grain marketing specialists will tell you to use forward contracting to reduce risk
  - But how much of each tools should a producer use?

Background

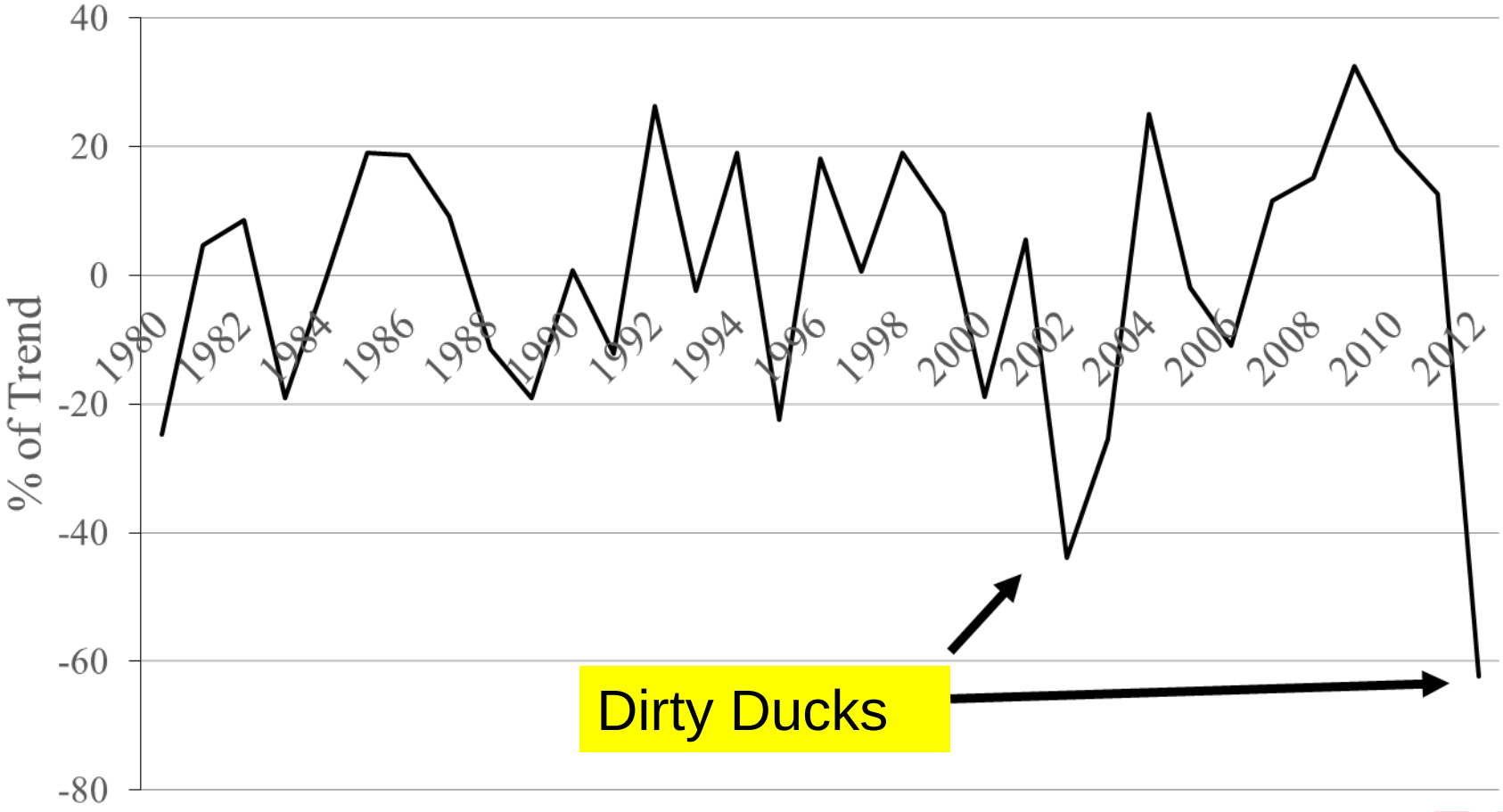
- Crop insurance program has evolved into the largest government supported risk program for producers
  - Acres increased from 100 in 1994 to 279 million in 2012
    - 175 of the 279 million are under revenue protection policy
      - Revenue protection (RP) insures both prices and yields

Nebraska	2012	2013
Liability	$5.9 Billion	$6.2 billion
Acres insured	9.0 million	9.0 million
Premiums	429 million	456 million
Indemnities	1.2 billion	306 million
Corn loss ratio	6.91	1.5

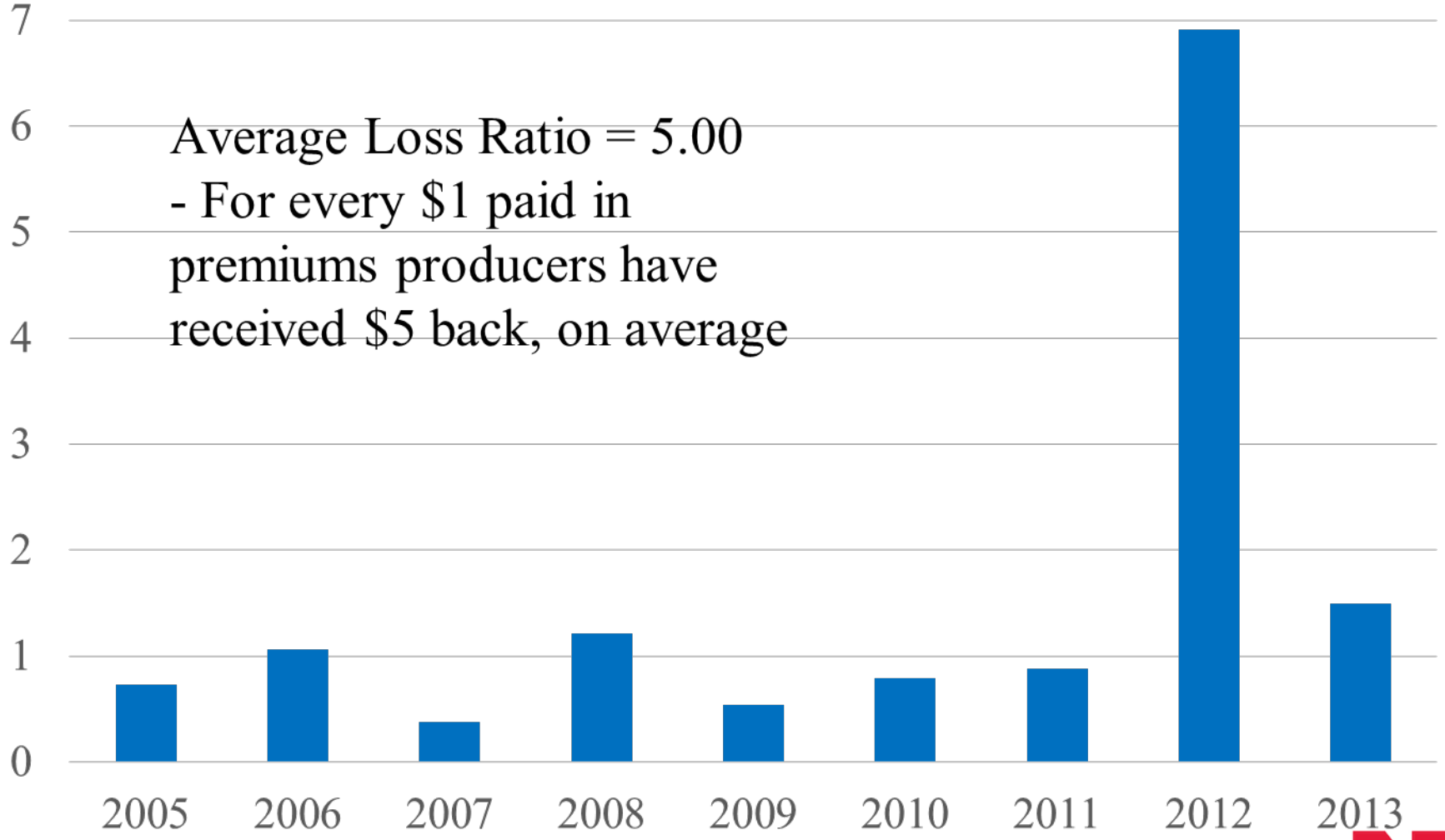
Kentucky Corn Yield Deviation from Trend, 1966 to 2013



Nebraska Non-Irrigated Corn Yield Deviation from Trend, 1980 to 2013



Nebraska Corn Loss Ratio



Average Loss Ratio = 5.00
- For every $1 paid in premiums producers have received $5 back, on average

Producer Motivation

- At the beginning of each year the farm is concerned with two things
  - Positive expected income
  - Farm survival (surviving a rare event (we assume this to be 1 in 100 year event or 18% chance of occurring in 20 years))

Motivation

- How can forward contracting (private tool) and crop insurance (public tool) interact to reduce revenue risk
  - Answer depends upon farm specific characteristics
    - Farm yields (determines guarantee)
    - Farm yield-price relationship
  - Crop insurance contract
    - About 200 different contract combinations exist

- Misunderstanding of these interactions could lead to an ***inefficient*** combination of risk and expected income

Crop Insurance

- First requirement – Actual Production History (APH) needs to be as close to expected production as possible
  - This drives how ‘useful’ (i.e., impacts probability of receiving an indemnity) crop insurance will be
    - Two producers both expect 150 bpa. Producer ‘a’ has an APH of 140 and producer ‘b’ is 100 (b)
    - Selecting a 80% coverage level
      - a’s guarantee = 112 bpa
      - b’s guarantee = 80 bpa
  - Value = average of previous years yields, therefore we can say APH is path dependent

Crop Insurance

- Producer makes a number of choices each year when signing up (I will use Multiple Peril Policy's for examples)
  - ***<u>Trend adjustment</u>***
    - Availability depends upon county
      - Corn – All but 2 counties in NE qualify
      - Soybeans – check county availability
      - Wheat – check county availability
    - Need reason not to use it
      - Small number may do this
    - Represents only other way to increase guarantee besides coverage level

Crop Insurance

- Three choices make up the insurance contract
  - ***Unit type*** – represents the size of the 'field'
    - Four types available but only two are typically used – Optional (field) and Enterprise (one policy per crop)
  - ***Insurance type*** – yield or revenue
  - ***Coverage level (or deductible)*** – select between 50 and 85% in 5% increments
- Without actual production history, producer can make use of transitional yields (T-yields)

- ***Indemnity and premium depend upon the insurance contract AND producer specific info***

2013 Premium Subsidies, in Percent

Coverage Level	Non-Enterprise	Enterprise
50%	0.67	0.8
55%	0.64	0.8
60%	0.64	0.8
65%	0.59	0.8
70%	0.59	0.8
75%	0.55	0.77
80%	0.48	0.68
85%	0.38	0.53

Objective Function

- Crop Income = yield*fall cash price
  - + Crop Insurance(APH Yield, coverage level (65-85%), unit type (enterprise), insurance type [(RP, RP-HPE) (base price, harvest price)], trend adjustment, premium)
  - + hedged yield*hedged price
  - + hedging cost (buying back over contracted bushels, interest on margin calls)

- ***<u>Balance Risk vs. Reward</u>***. Risk = 1 in 100 year event. Reward = expected income

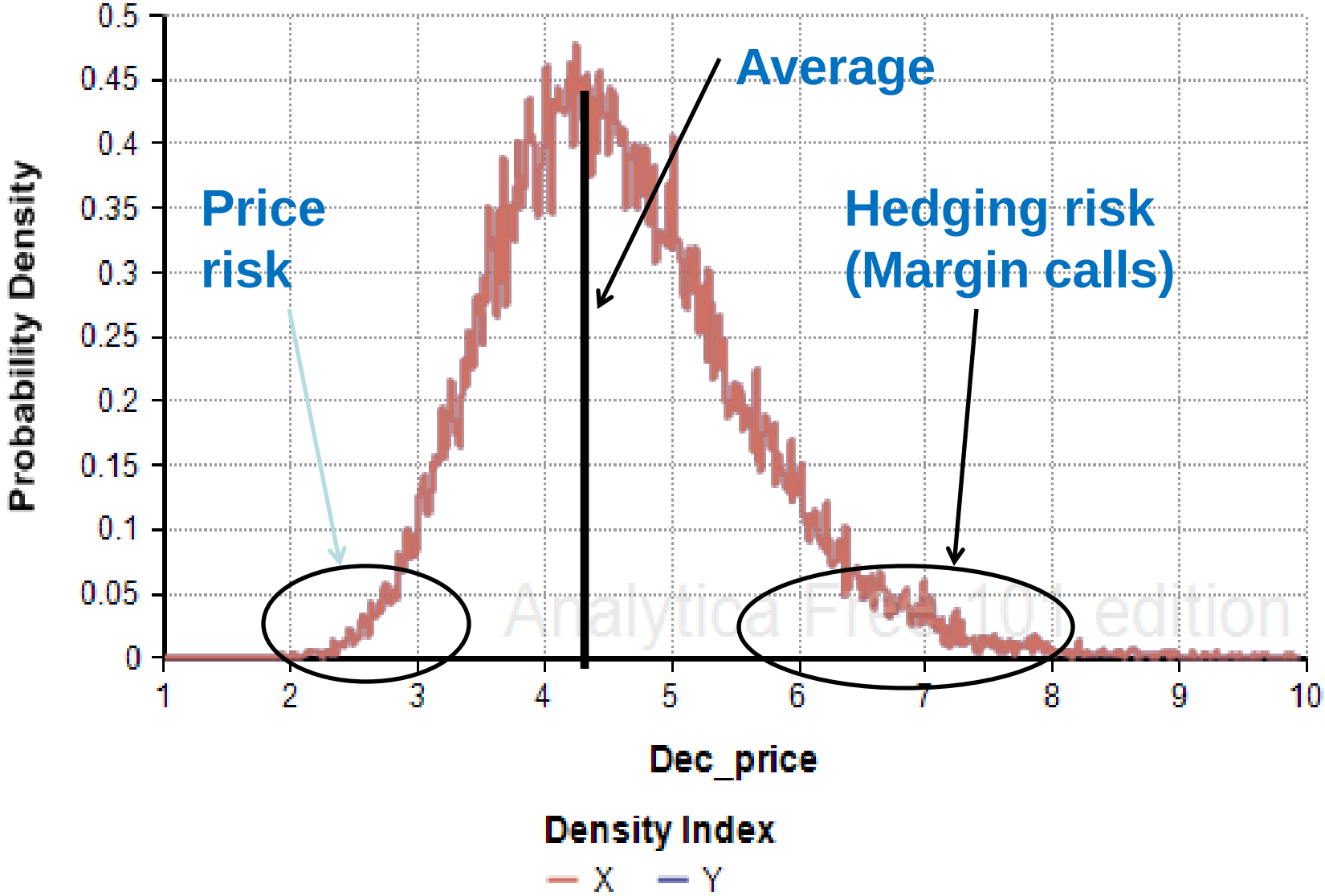
Modeling 2014 Income Uncertainty

- Focus on net income
- Crop: Corn

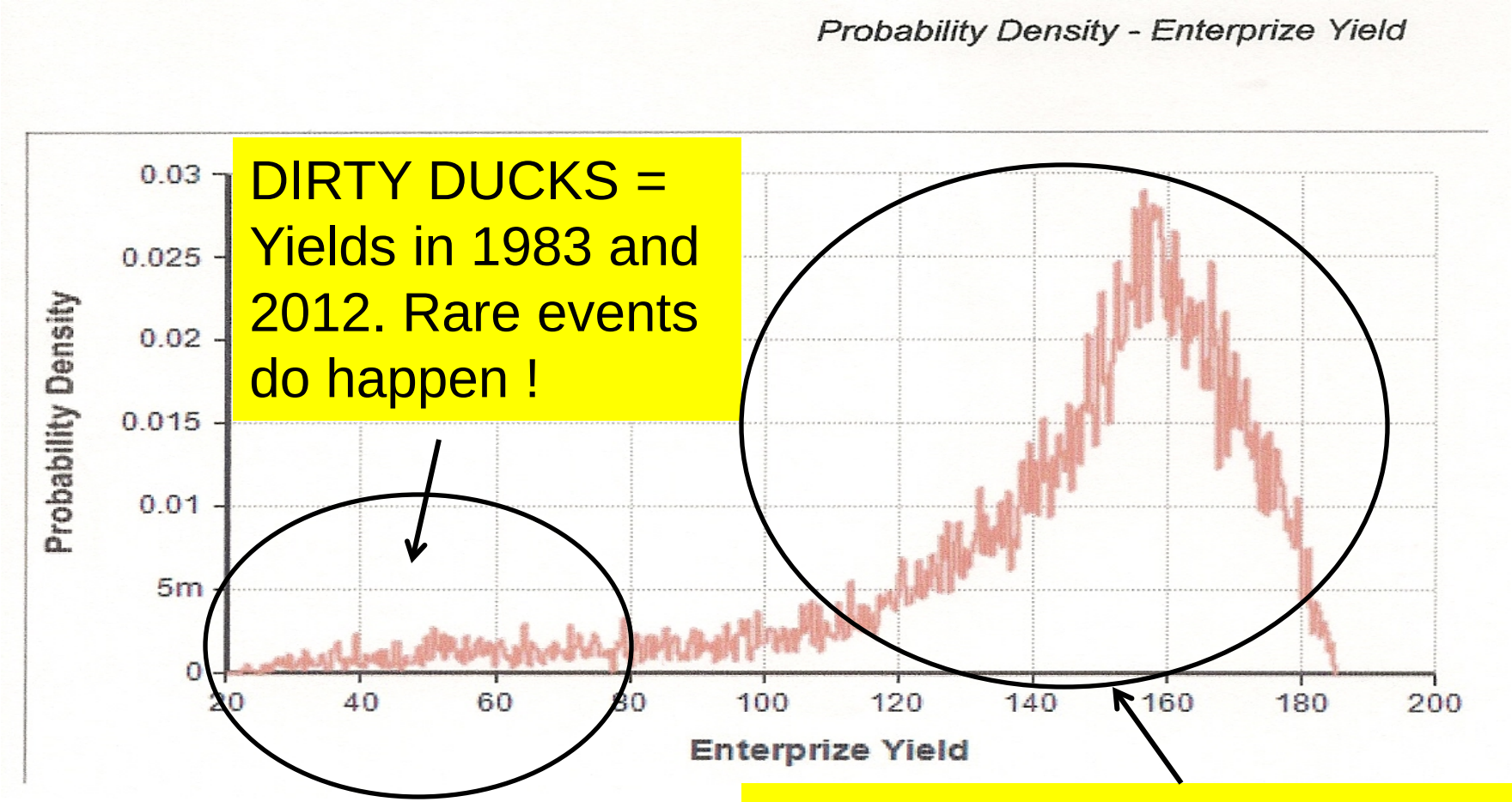
- Revenue = yield*price
  - Empirical yield distribution = Producer yield data

  - Price probability distribution
    - December 2014 futures market options prices
      - Contains all market info available
- Cost
  - Break cost into fixed and variable portion
    - Cost is a function of yield = $0.58 per bushel

December 2014 Corn Futures Prices



Farm Corn Yield

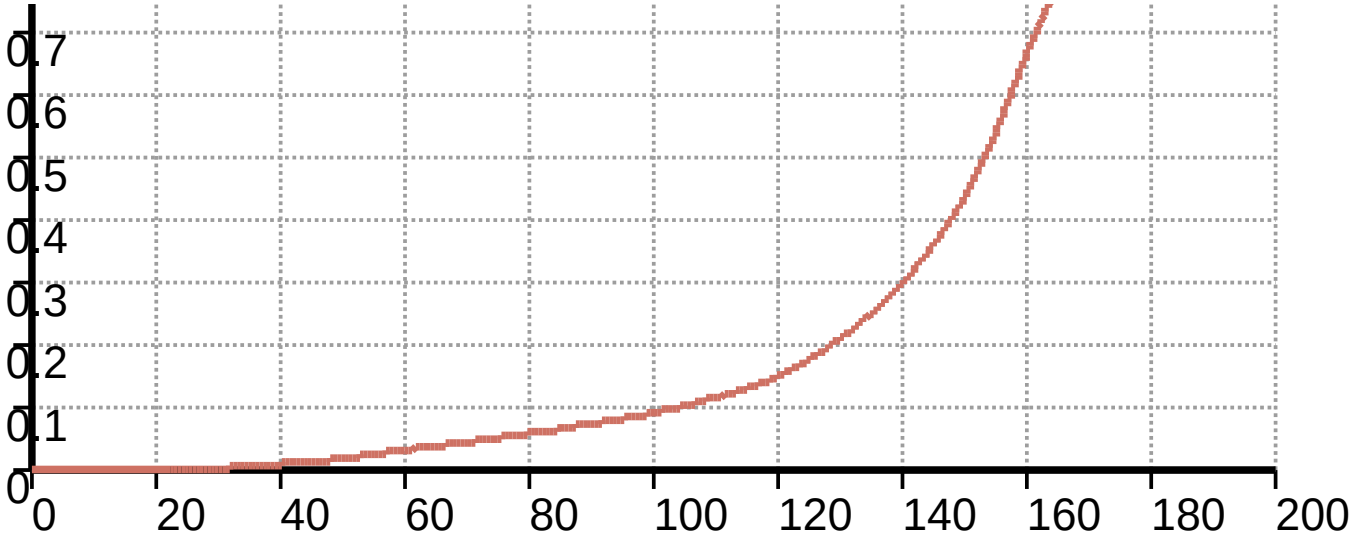


DIRTY DUCKS = Yields in 1983 and 2012. Rare events do happen !

Farm average = 144.4 bu/acre

Most years expect yields between 110 and 170 bu/acre

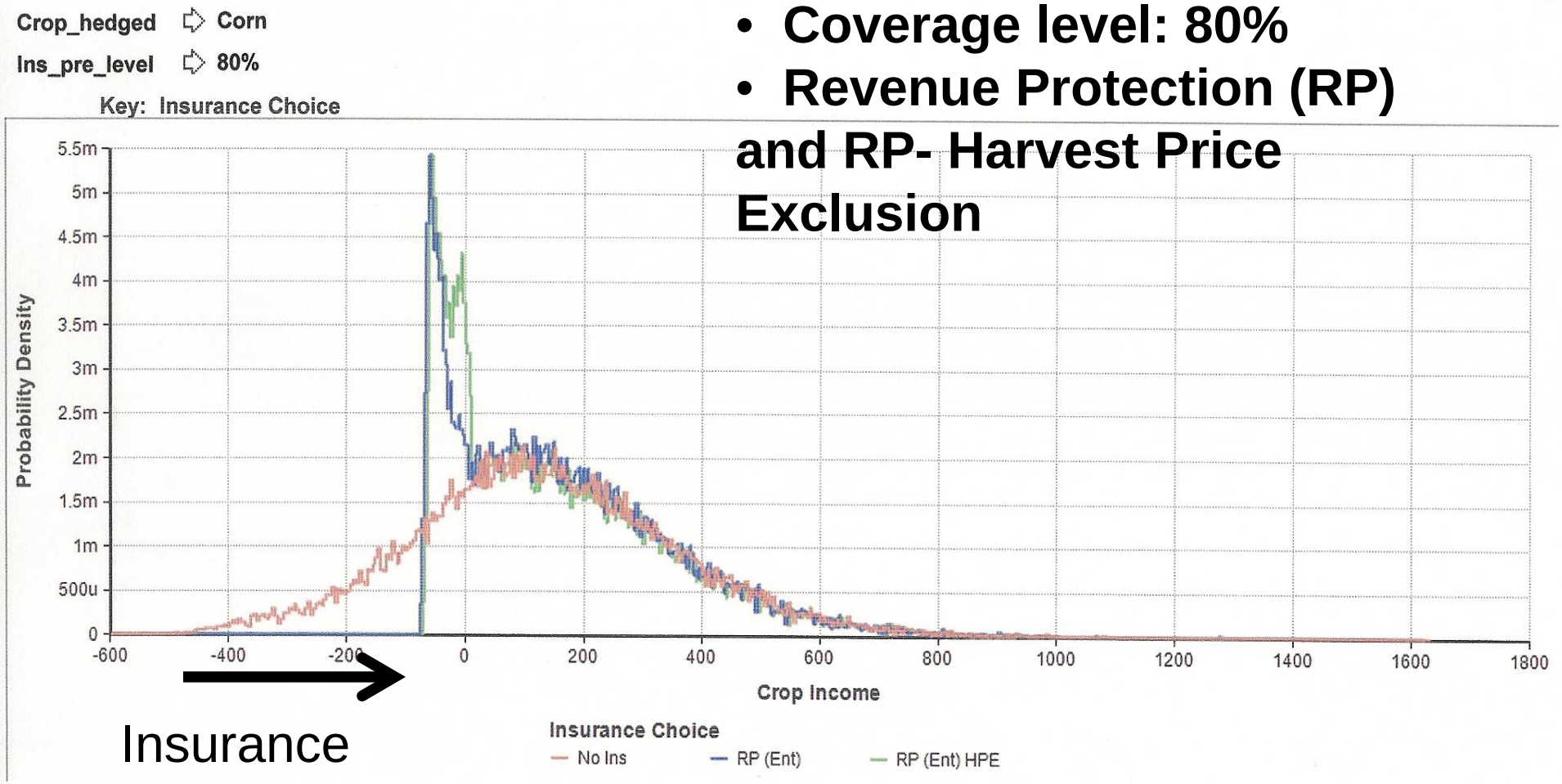
Farm Corn Yield



Farm Yield

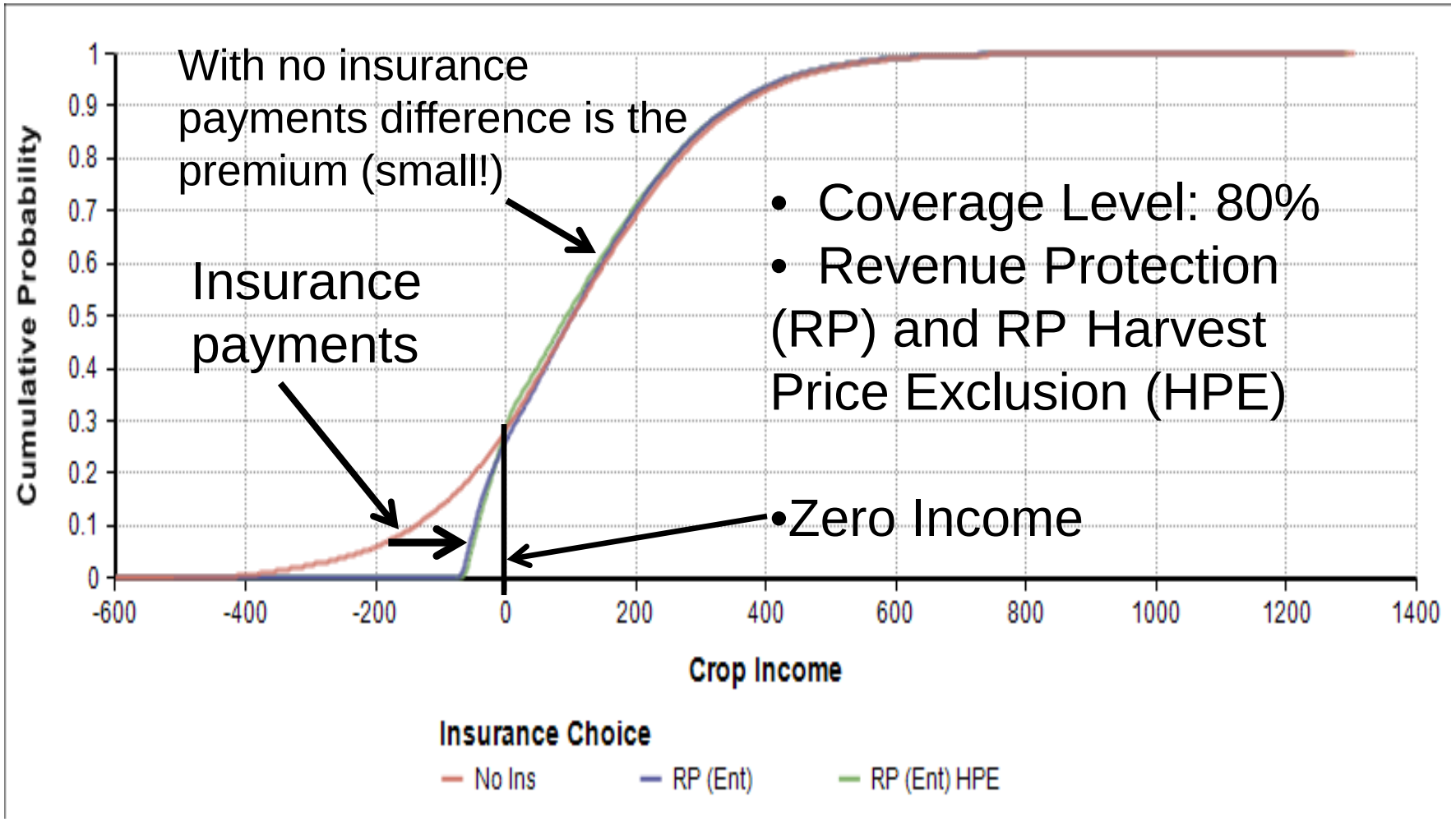
Crop Income With and Without Insurance

- Coverage level: 80%
- Revenue Protection (RP) and RP- Harvest Price Exclusion



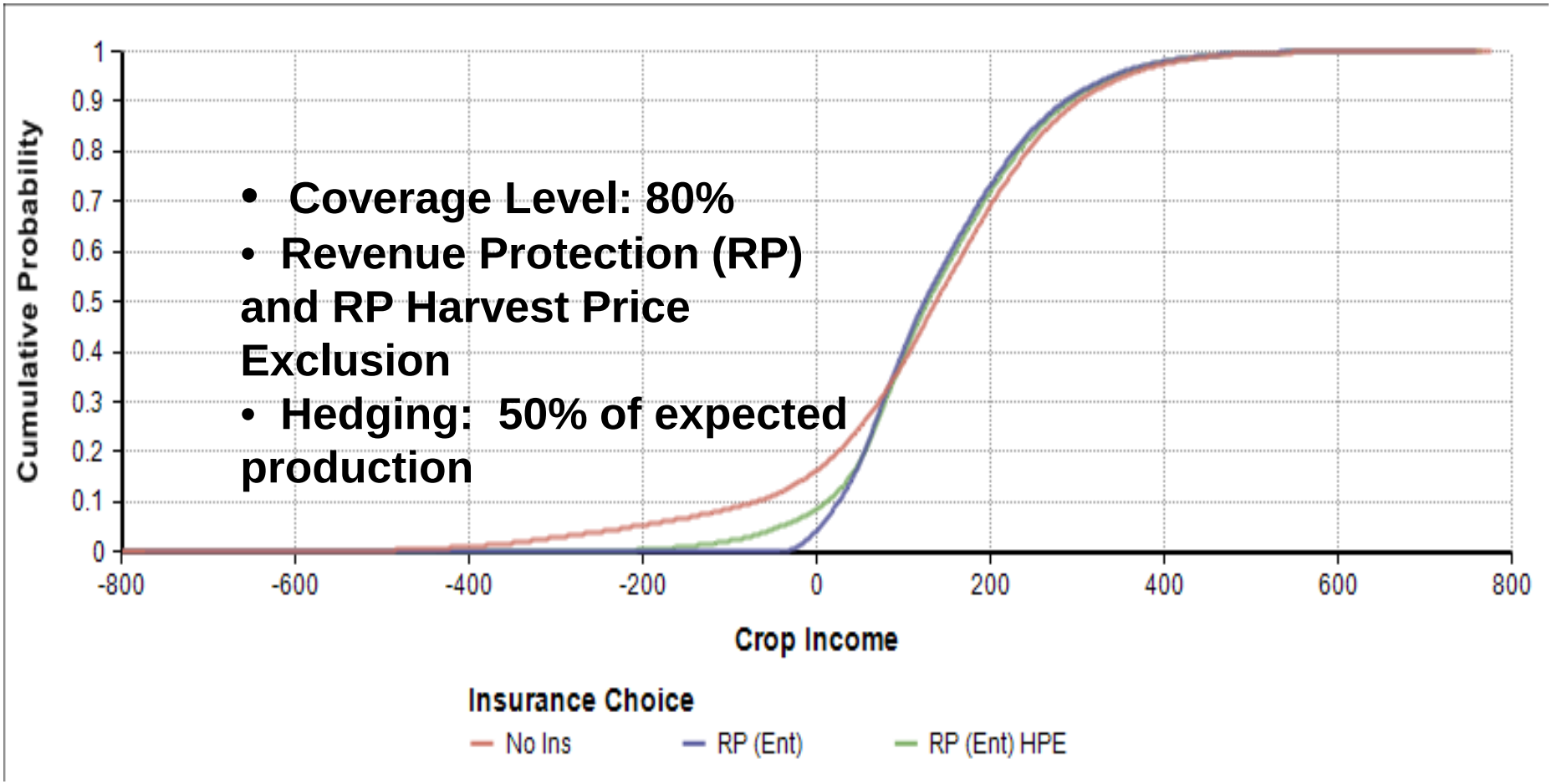
Insurance payments

Crop Income and Insurance



- 80% CL, enterprise units does not guarantee positive income
- No hedging at this point

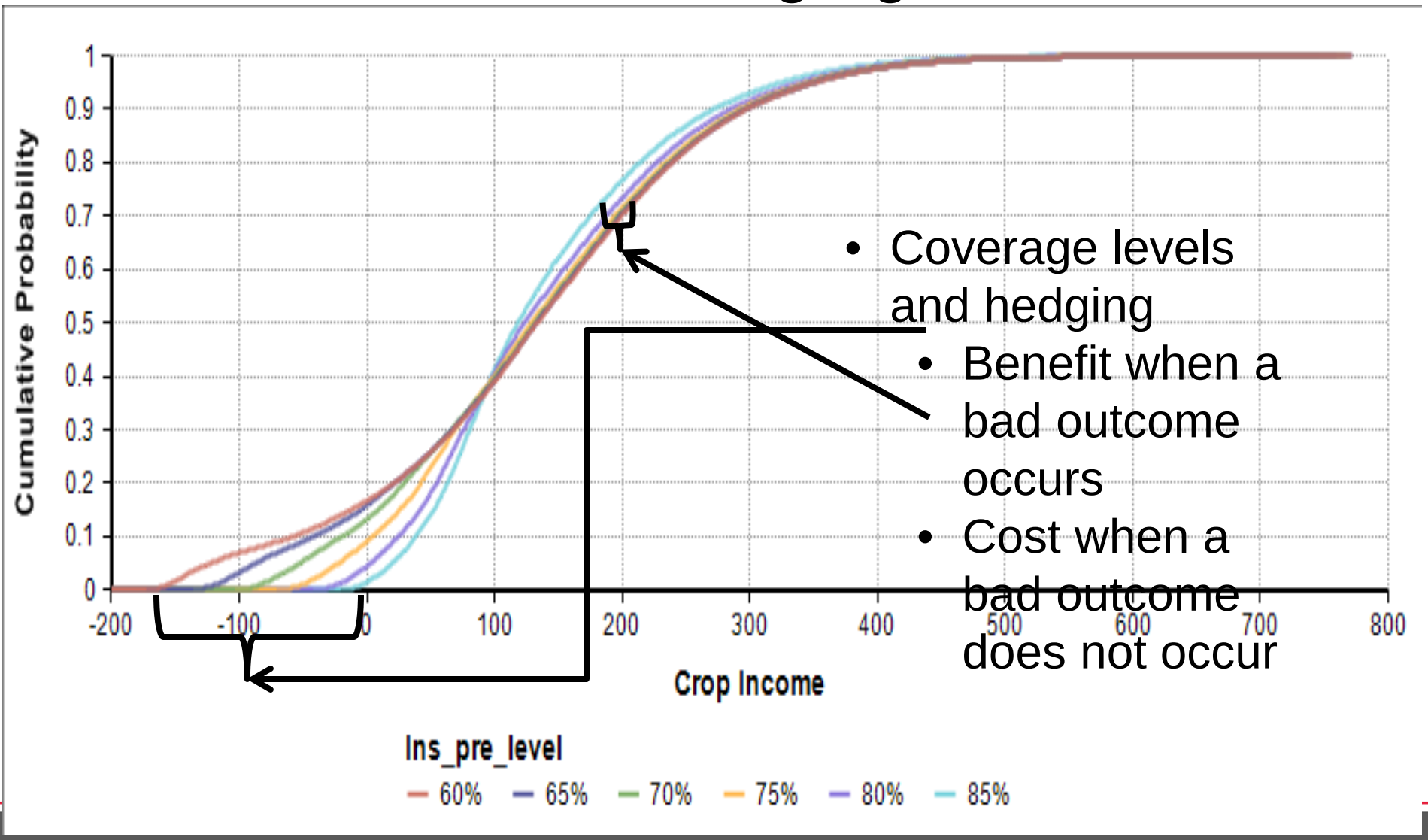
Crop Income, Insurance and Hedging



- Coverage Level: 80%
- Revenue Protection (RP) and RP Harvest Price Exclusion
- Hedging: 50% of expected production

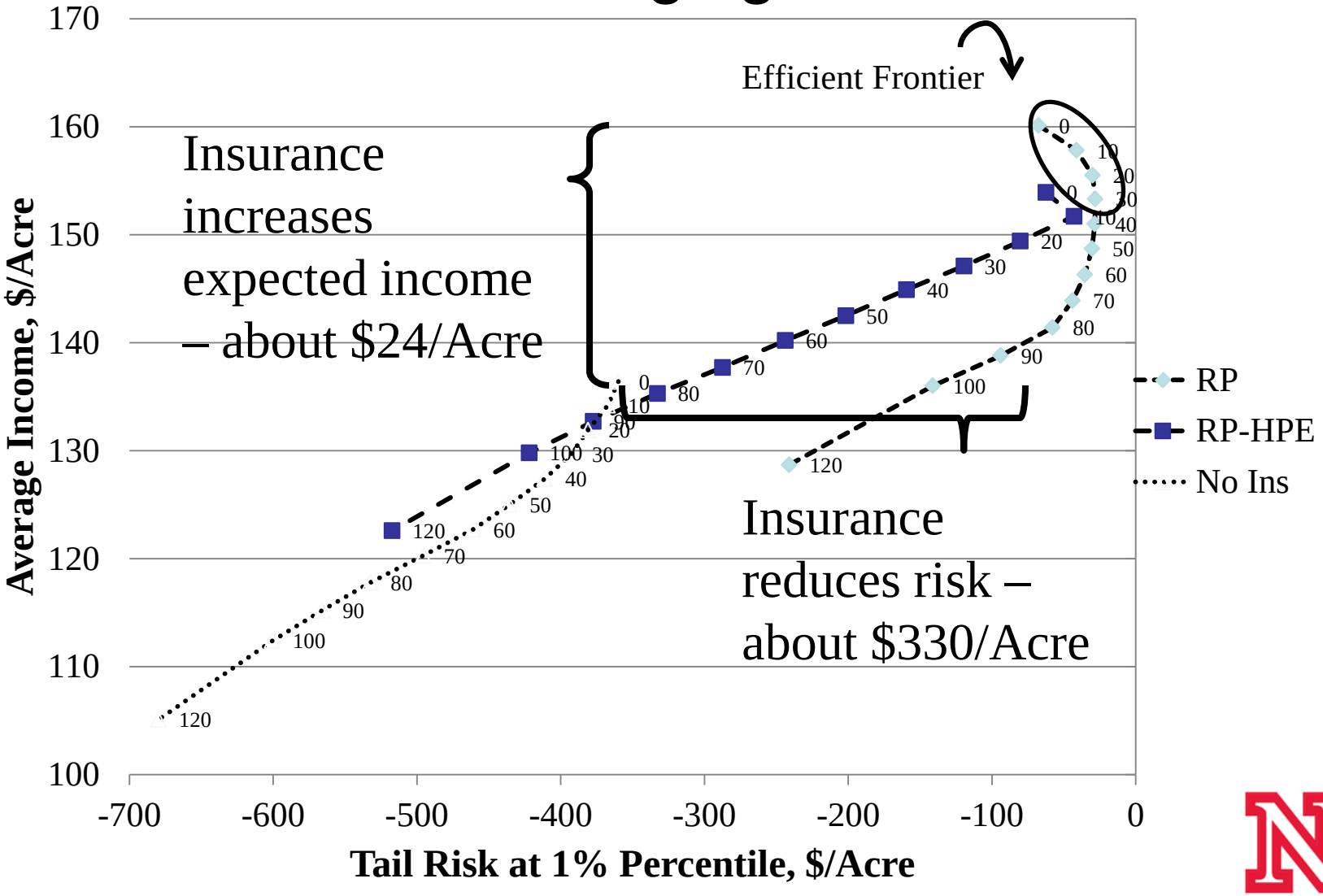
- HEDGING PLUS INSURANCE (RP, 80% Coverage Level, Enterprise units), 50% hedged reduces risk to about -$30/acre

Income Across Coverage Levels with 50% hedging

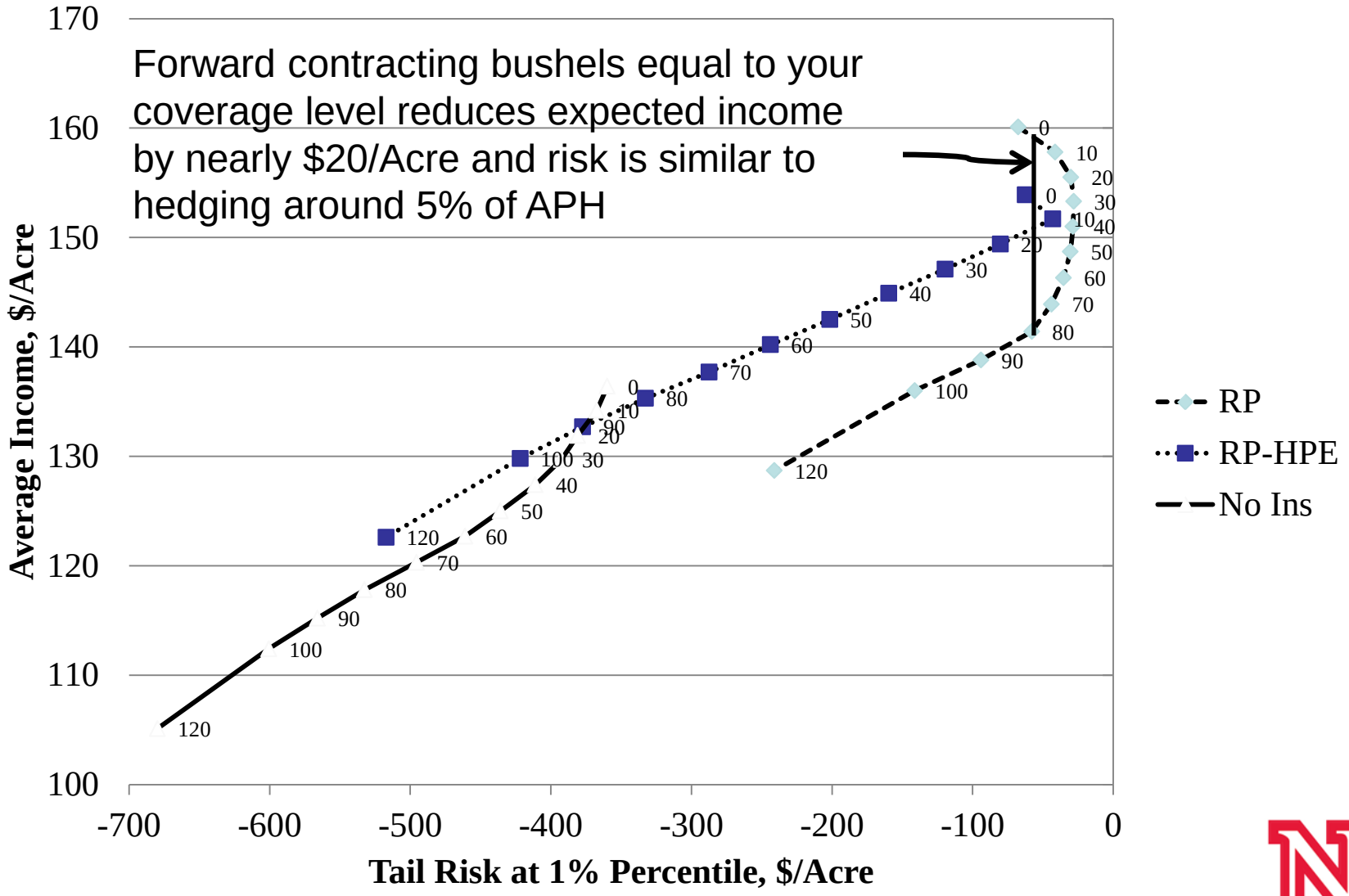


- Coverage levels and hedging
  - Benefit when a bad outcome occurs
  - Cost when a bad outcome does not occur

Crop Income, Insurance (80% CL, Ent, TA), Hedging

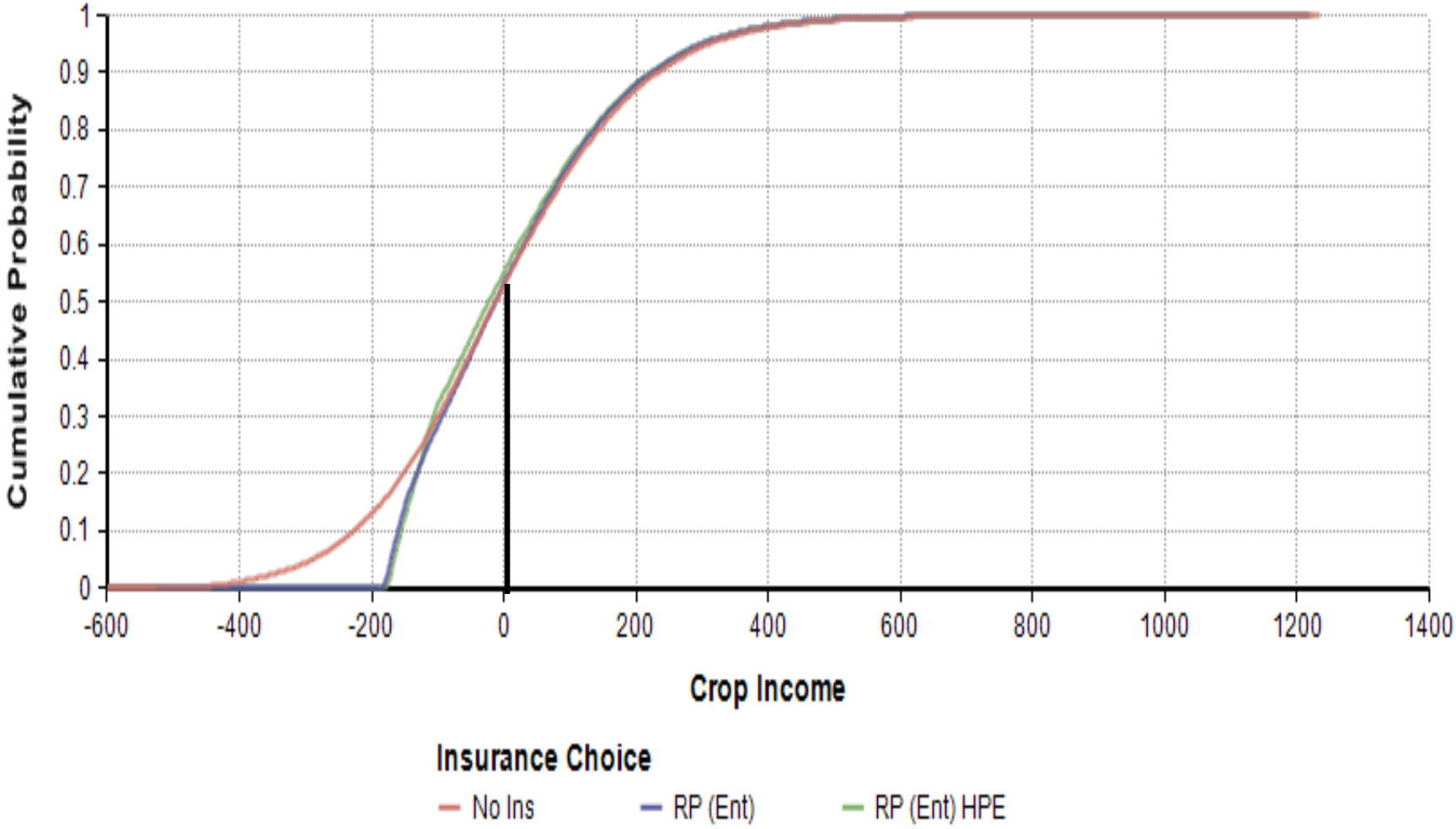


Crop Income, Insurance, Hedging



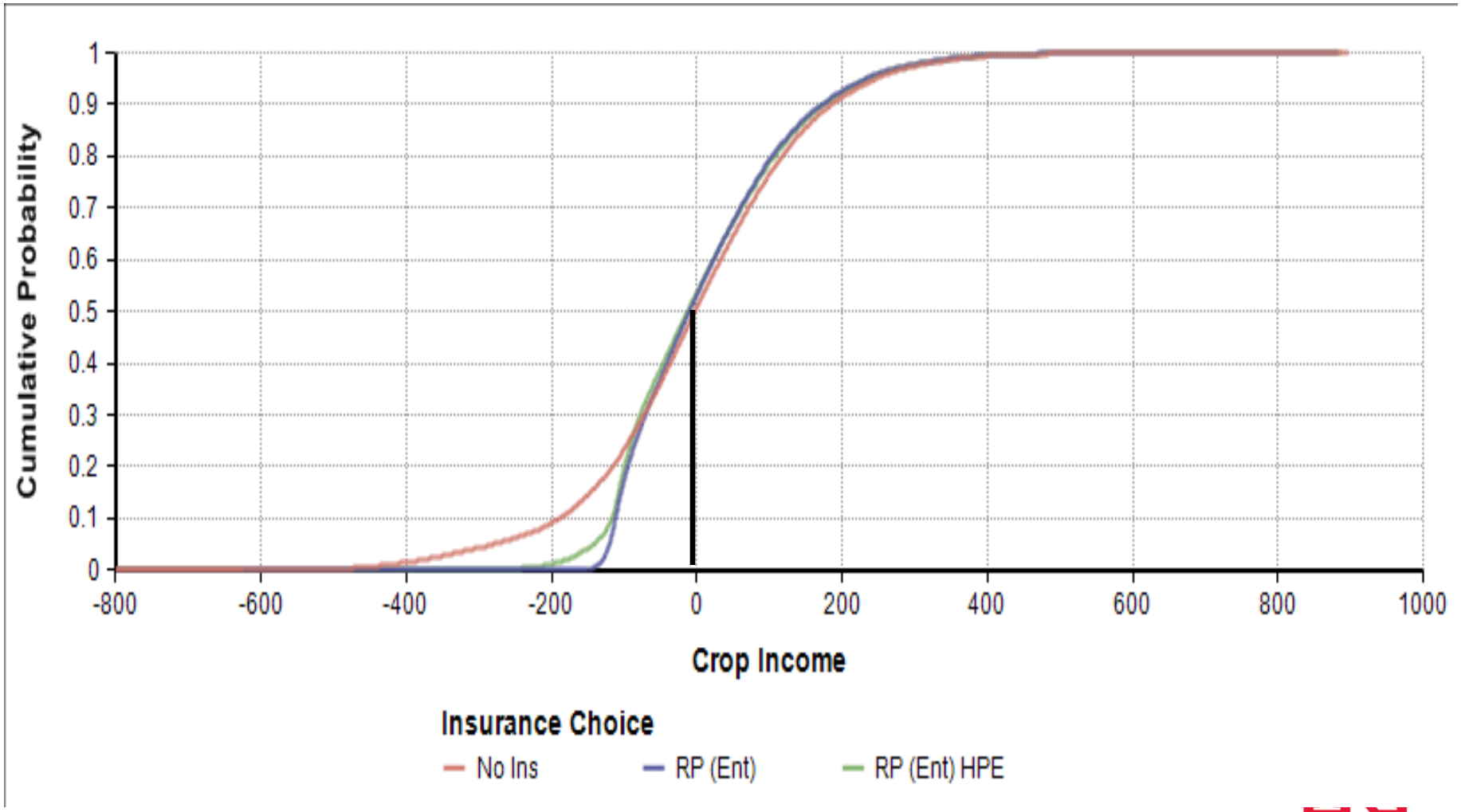
Looking into 2014

80% Coverage Level zero hedging



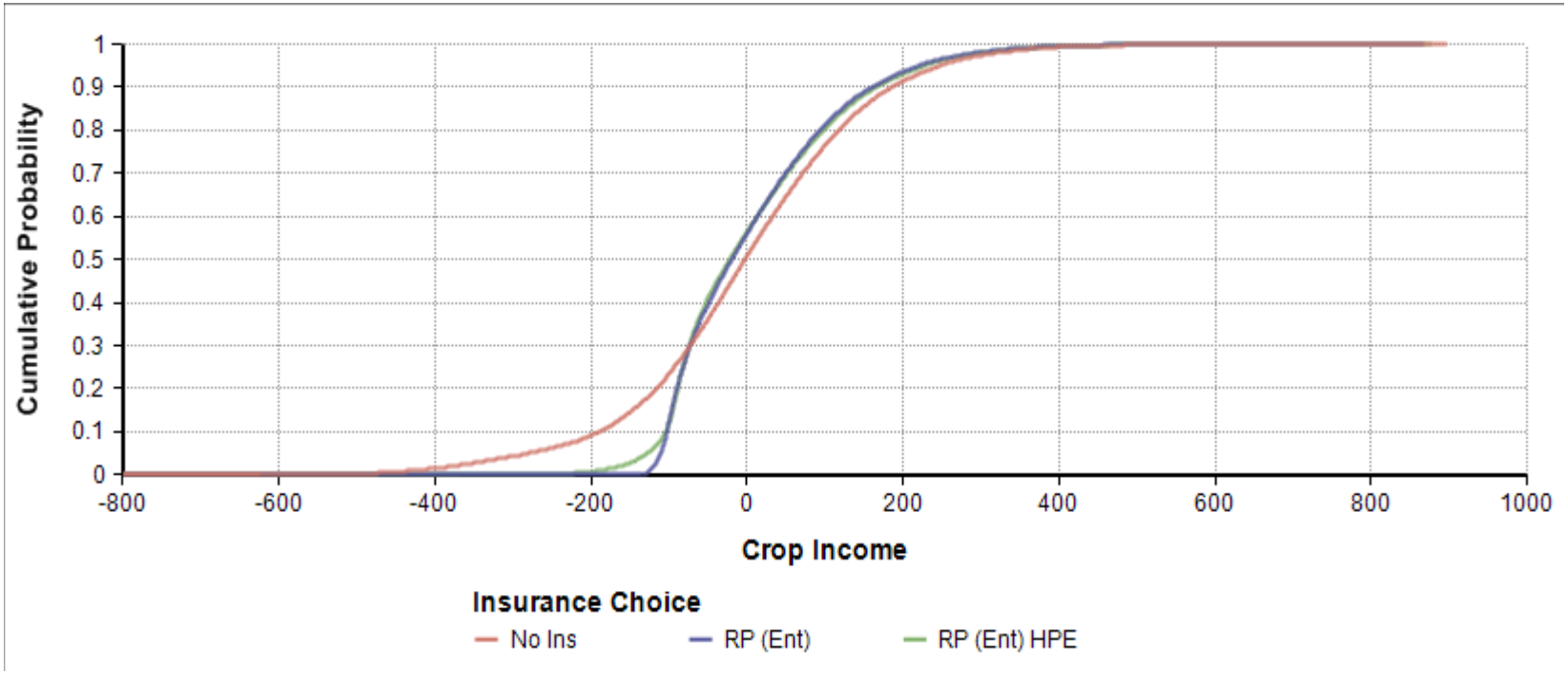
Looking into 2014

Hedging at 30% Expected Production

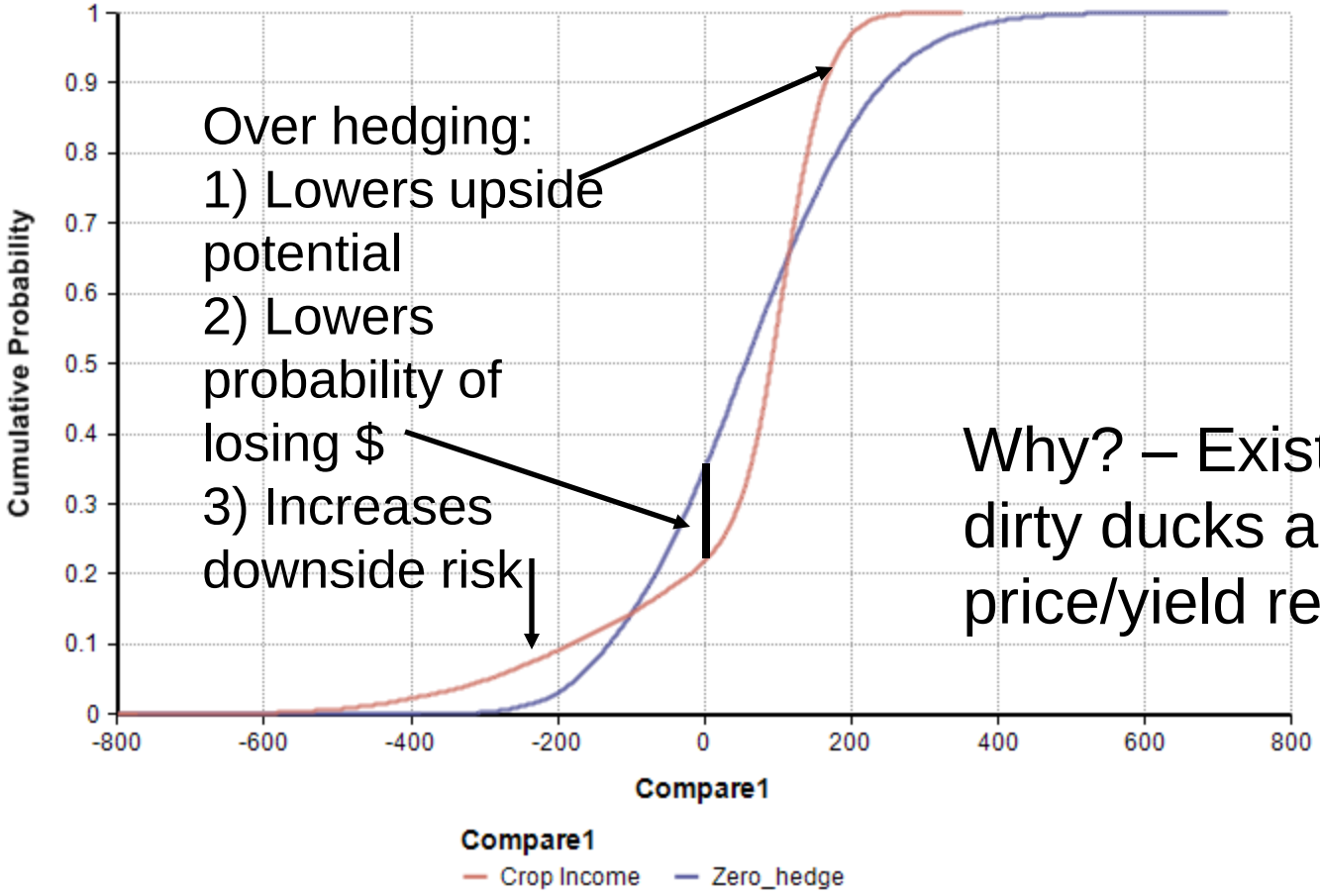


Looking into 2014

30% Hedged, 85% Coverage Level



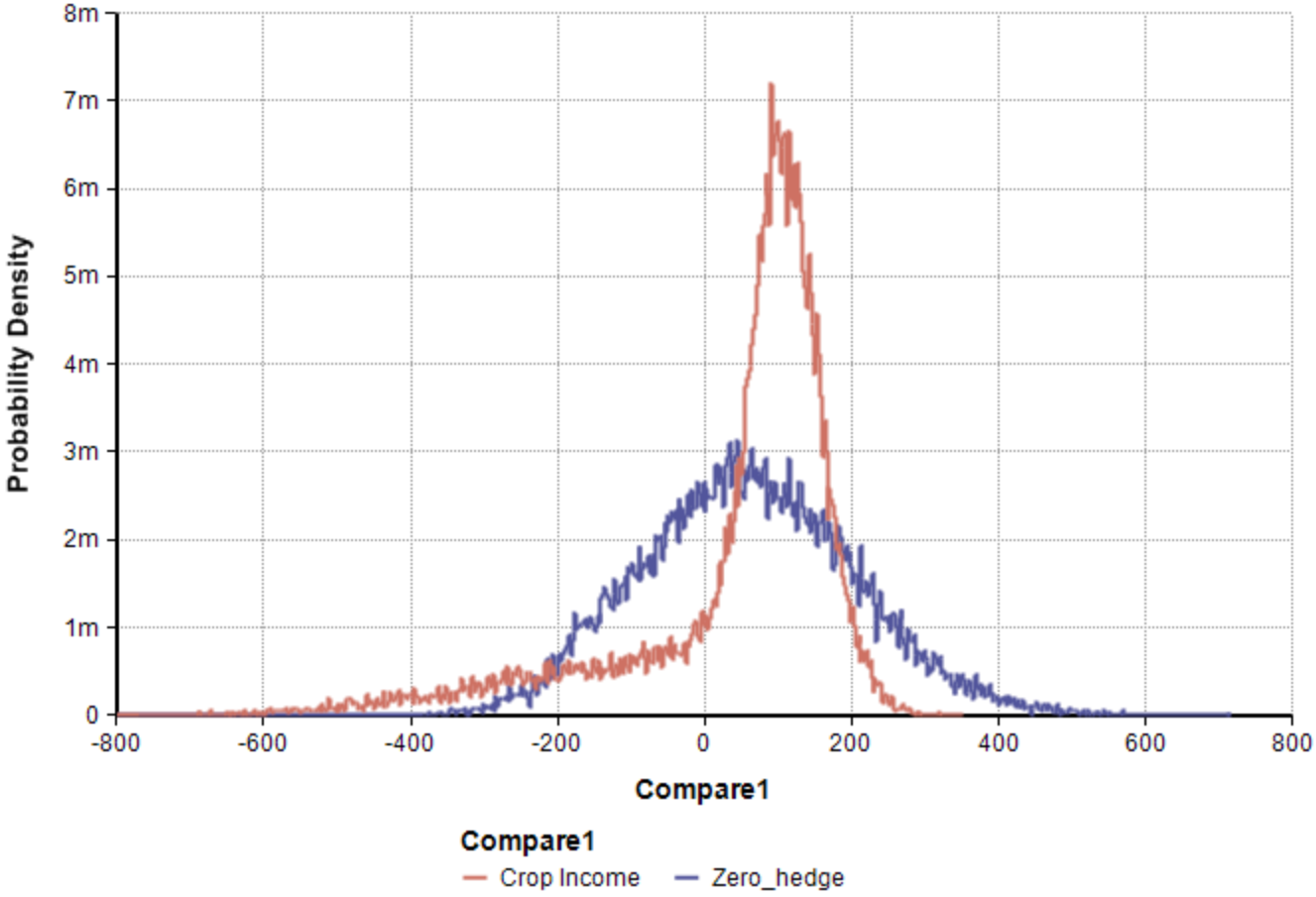
2014 Comparison of 80% APH hedged with No hedging and no insurance Ballard County



Over hedging:
1) Lowers upside potential
2) Lowers probability of losing $
3) Increases downside risk

Why? – Existence of dirty ducks and strong price/yield relation

2014 Comparison of 80% APH hedged with No hedging and no insurance Ballard County



Summary

- Everyone faces the same futures prices but not basis
- Results are specific to risk faced by this farm
  - Location, planting dates, soil types, etc…
  - APH relationship to actual
    - 2012, APH = 138.7, expected = 143.5 (-4.8)
    - 2013, APH = 132.7, expected = 145.0 (-12.3)
- Hedging without crop insurance increases risk of farm failure even though it reduces income uncertainty
  - Validity in – ‘he gambled on the futures market’ or ‘don’t sell a crop you don’t have’
  - Results change when using a different definition of risk
- RP dominates all other insurance contract types when hedging is involved and a bad outcome occurs.

Summary

- Results indicate that crop revenue risk (the ‘dirty duck’ rare event of 1 in 100 years) are reduced when using crop insurance (RP, enterprise units, 80% CL)
  - - $333/acre
- Income risk is further reduced by futures hedging
  - - $39/acre (30% hedged)

- Consequently, this producer does not need to hold as much capital in reserves for a bad event
  - Can invest this money

Summary

- For 2014,
  - This producer better have about $150 per acre in working capital available for a bad event, even with insurance (RP, TA, Ent, 80% CL) and 30% hedging.
    - Without insurance this amount increases to about $450 per acre.
  - About 50/50 chances of making or losing $ this year in corn – regardless of risk management option. Risk management just reduces the bleeding, if it occurs.
  - For Nebraska, harvest basis is wider and yield risk is different. How do you stack up?

Caution

- Portfolio evaluation
  - March 1st (Base price just set) to last trading day in November (December futures enter delivery)
- No storage consideration
- No carry or basis consideration
- No continuous hedging decision making
- No option contracts

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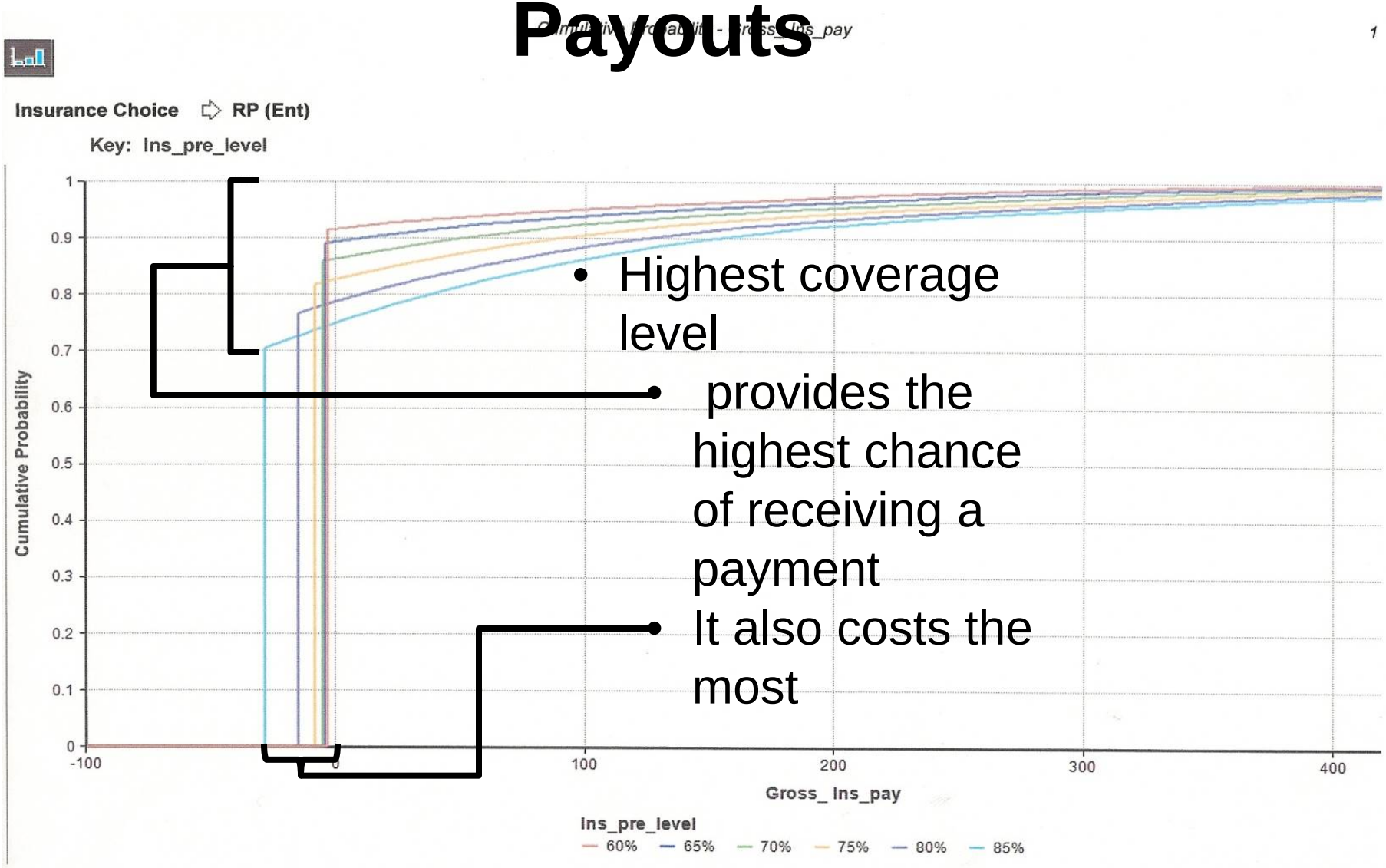
Insurance Coverage Level Payouts



- Highest coverage level
  - provides the highest chance of receiving a payment
  - It also costs the most