Complexity, Strategy and Knowledge in Managing Production Risk

Four State Crop Insurance Workshop
2019

By Dr. Cory G. Walters, Associate Professor, UNL
cwalters7@unl.edu 402-472-0366

Presented by Dr. Monte Vandeveer, KSU Extension Economist

What is "*RISK*"?

- We need to frame 'risk' before moving on
  - What generates 'risk'?
- Is it risky to cross the road?
  - This is a tricky question…
- Risk involves knowing something about probability
  - But we can use information and analysis to ensure the highest probability of success.

Dictionary Definition of Risk

- ***Risk*** is "The possibility of suffering harm or loss…"*
  - *Objectively measured* (will use crop insurance data for this…)
- ***Uncertainty*** is "The condition of being in doubt…*
  - *Subjectively measured*

*The American Heritage Dictionary

Driving down the road

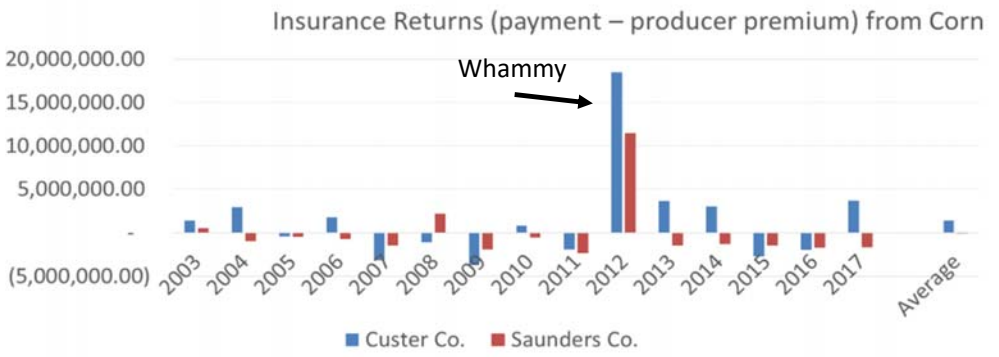
Insurance is the Guard Rail

- Severity of driving off the road grows exponentially
- Can you survive hitting the river?

Strict Definition of RISK

- I am defining risk as *financially devastating, low probability events*
  - Events that can wipe you out or place high levels of financial stress on the operation. Think of landing in the river

- Absence of evidence is not evidence of absence
  - One bad observation can wipe you out (or apply intense stress to the farm)



- Insurance is an option, in that you receive payments (often big), when you need them (droughts are really bad) and pay a small amount when you don't use your option.
- Not using your option is NOT BAD. Cannot forecast! One bad event can be devastating (2012) – playing with fire.

- ***<u>In order to make money you MUST to survive</u>*** (Warren Buffett)
  - Tells us: ***Maximize profit and minimize events leading to farm ruin (OR UNCLE POINTS!)***
    - Alternatively - avoid uncle points so you can be there when good things happen
    - Rely on PAYOFFS, not forecasts

Article from a recent Corn and Soybean digest:
Marketing discipline and focus: Part 1 (and 2)

"When do you market corn? During planting or harvest? Find out what a data analysis shows."

- Authors show an average of $0.19/bu benefit of selling in the spring over the fall from 30 years of data. And a $0.68/bu benefit from spring selling during 2013-2017.

- Argument is deeply flawed.
  - Using an average…
    - Would you cross a river that is on average 4 feet deep?
  - Inspect variations in the strategy – 2012 gave this opportunity
    - Identifies farm survival
    - Insurance can help pre-harvest selling but not as much as you think
      - More on this later
      - Hint: costs matter
    - Irrigation matters
      - More on this later

<u>PAYOFFS</u>

TIME

Financially devastating, low probability risks depend upon your expected farming career (i.e., time)

Suppose you are planning on farming for the next 20 years

Probability of experiencing a low yield event (5% risk event) = 64%

Note: you get to draw, with replacement, 20 times from the yield distribution

10 years = 40%

4 years = 18%

Probability of experiencing a 1% event

20 years = 18%

10 years = 9%

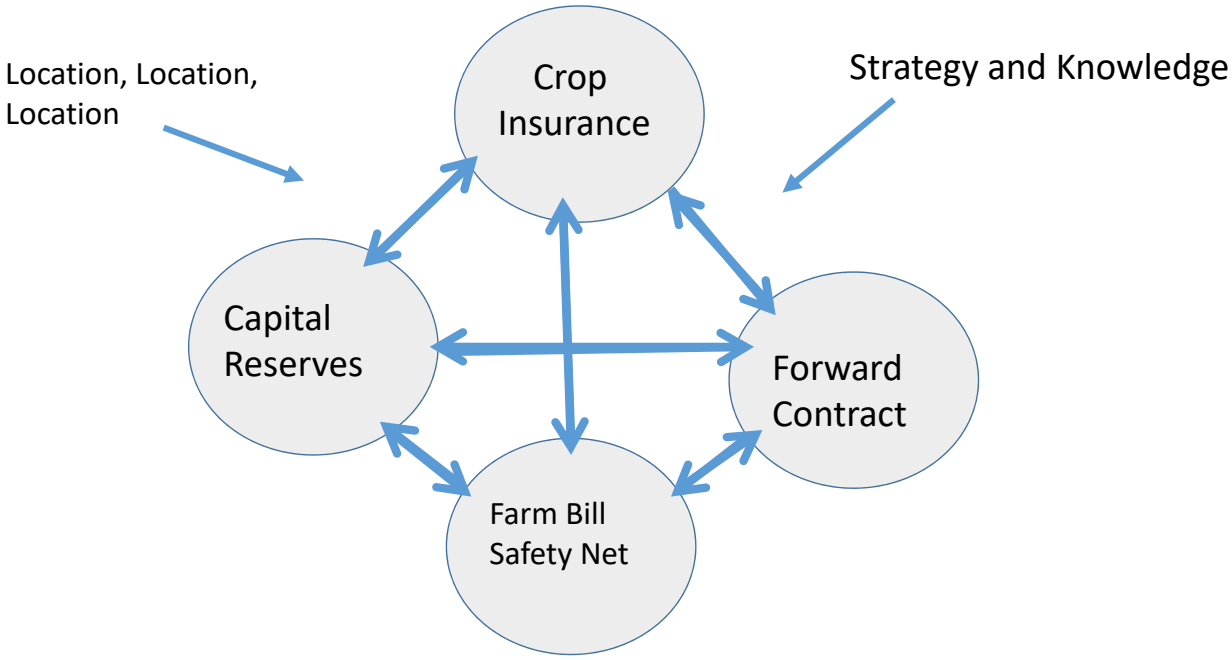
4 years = 4%

What is the most successful risk management strategy?

Those that survive ***time***

- Droughts expose complexity in decision making
  - One bad event can cause ruin

Risk Management Tools work Together



Discuss* risk management strategies with your close neighbors. Those who you read about in magazines or are far away WILL have different conditions…

Magazines can give you ideas but those ideas need to pass conditions faced by you. Example ARC vs. PLC (with SCO).

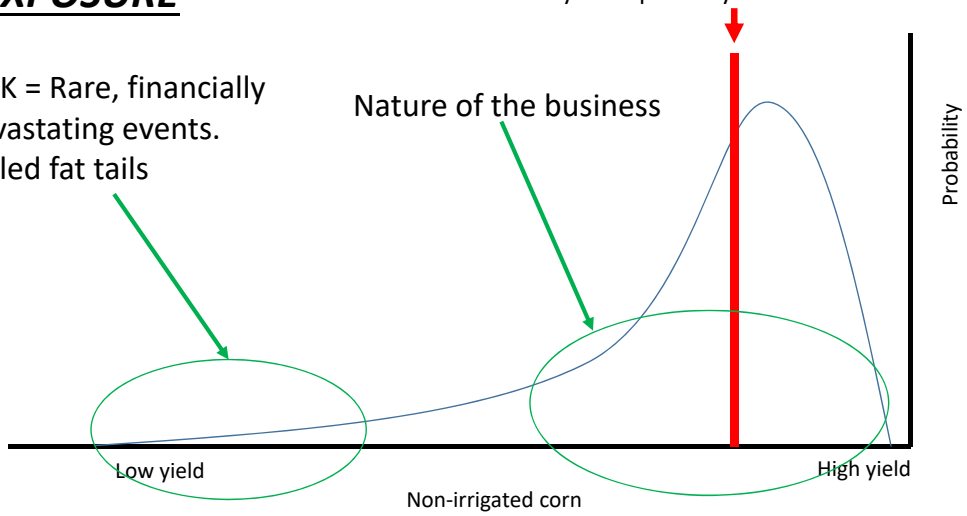
* Consider differences in financial standing when listening

Yield risk EXPOSURE

At the beginning of the year we only know little to nothing about upcoming growing season weather so rely on expected yield

RISK = Rare, financially devastating events. Called fat tails

Nature of the business



Financial Tools:	Insurance	Credit	Self-insure

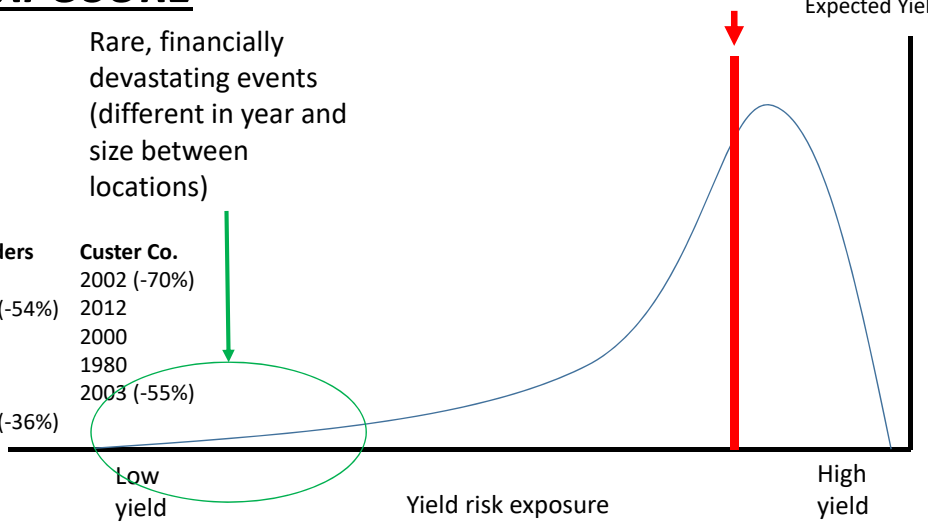
Yield risk EXPOSURE

At the beginning of the year we only know little to nothing about upcoming growing season weather so rely on expected yield

Expected Yield: 153.5 bu/acre Saunders Co
103 bu/acre Custer Co.

Rare, financially devastating events (different in year and size between locations)

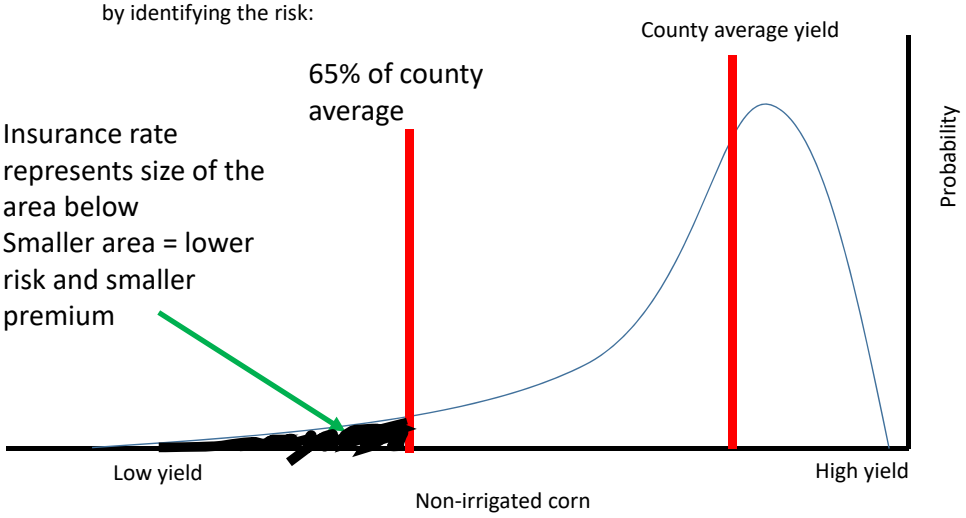
Saunders Co.	**Custer Co.**
1974 (-54%)	2002 (-70%)
1976	2012
2012	2000
1995	1980
2002 (-36%)	2003 (-55%)



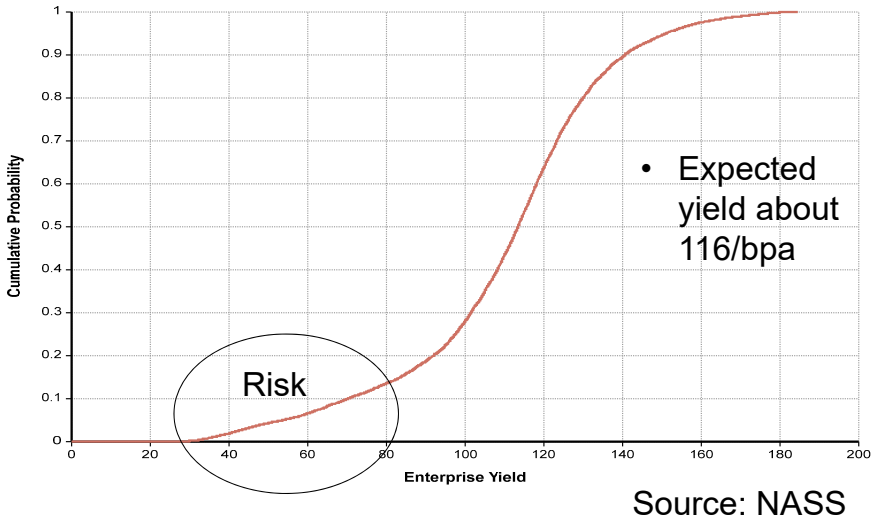
Saunders Co.	**Custer Co.**
1978 (+42%)	1996 (+43%)
1986	2009
1985	2010
1992	1993
1979	1988
1981	2016
2009	1994
2004	1985
1982	1987
1998 (+17%)	1977 (+23%)

Yield risk EXPOSURE and Crop Insurance

For each county, crop and practice insurance determines the premium by identifying the risk:

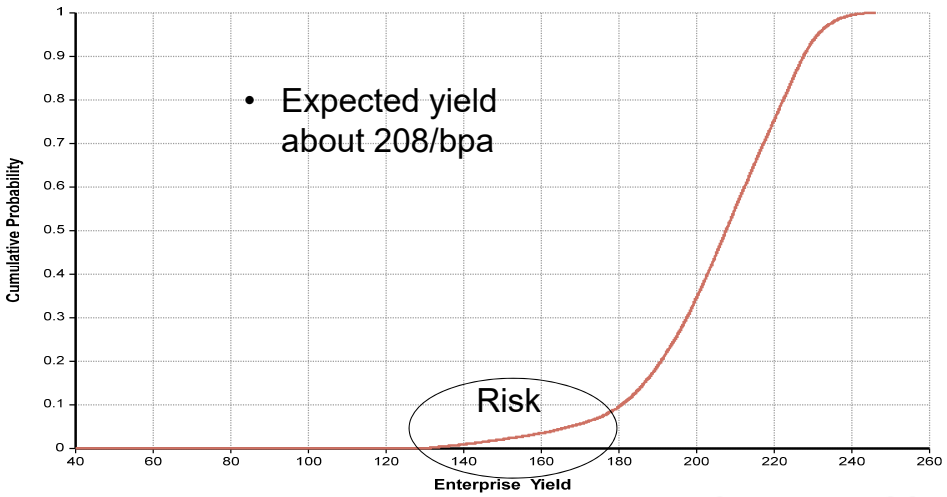


Non-Irrigated Corn Yield Distribution for Thayer Co. NE



Source: NASS

Irrigated Corn Yield Distribution, Thayer, Co. NE

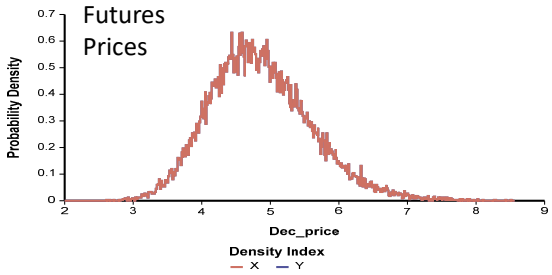


- Expected yield about 208/bpa

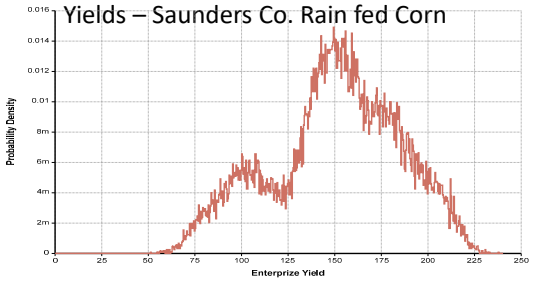
Source: NASS

Complexity in Producing Revenue

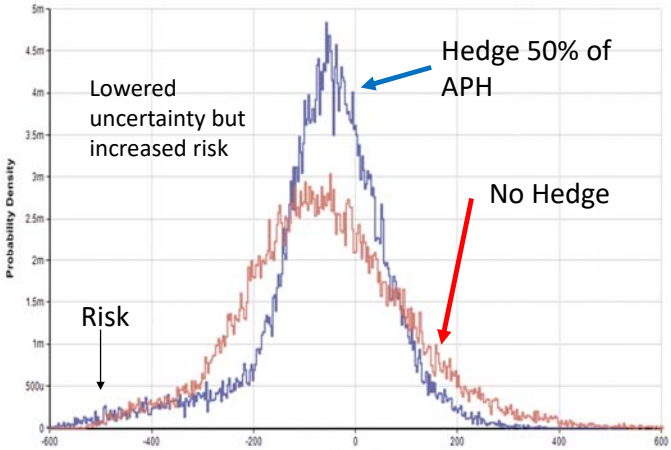
And the role of risk management tools



- Price/yield correlation = -.51

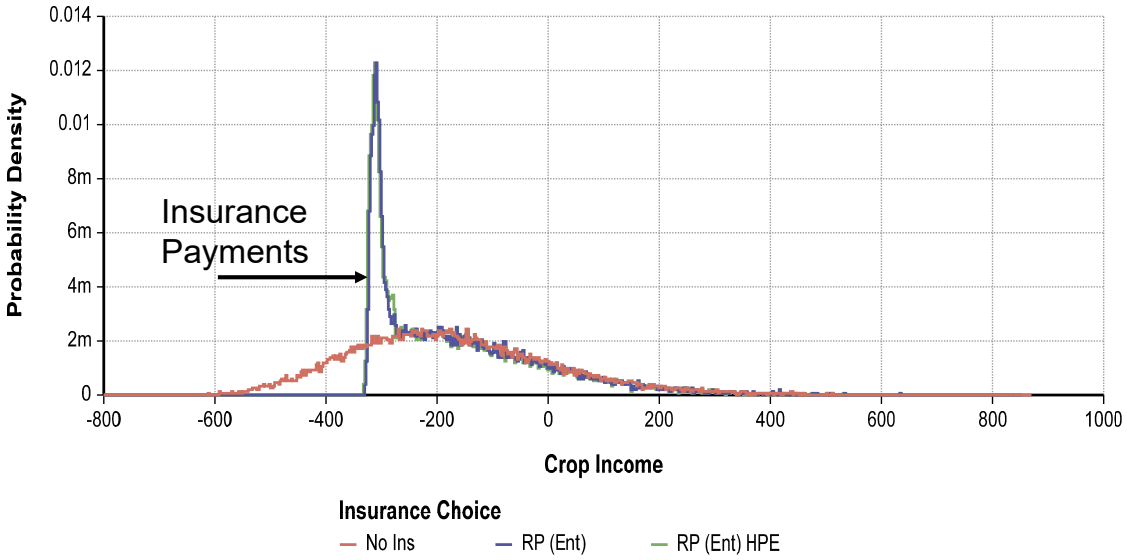


Revenue (N0 insurance)



- Different outcome under irrigated production AND different price/yield correlations

Crop Income With and Without Insurance



The amount of risk exposure is specific certain characteristics

- Crop insurance rates influence premiums
  - higher rates = higher premiums
- Rates created at the county level (with state level adjustments)
  - By crop
  - Practice (irrigated, non-irrigated, summer fallow, continuous crop)
  - Type (spring or winter wheat, organic, corn for grain or silage)
  - Farm level rates come from adjusting the reference rate by APH yield (to base county yield), coverage level, insurance type, unit structure.

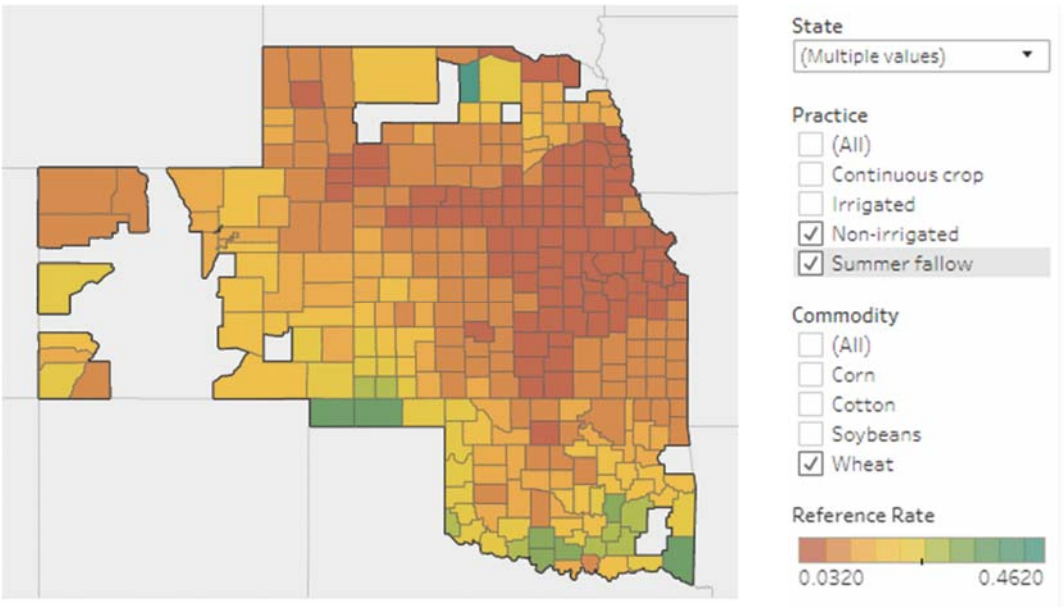
Rating Production Risk

- Evaluate the historical ratio of indemnities and liability

- Indemnity = payment from insurance to producers
- Liability = amount of insurance (expected yield*coverage level*price)

- Lost cost ratio = Indemnity / liability
    - Higher lost cost ratio = higher premiums and vice versa

https://public.tableau.com/profile/jessica.groskopf#!/vizhome/CornReferenceRates/Sheet1?publish=yes

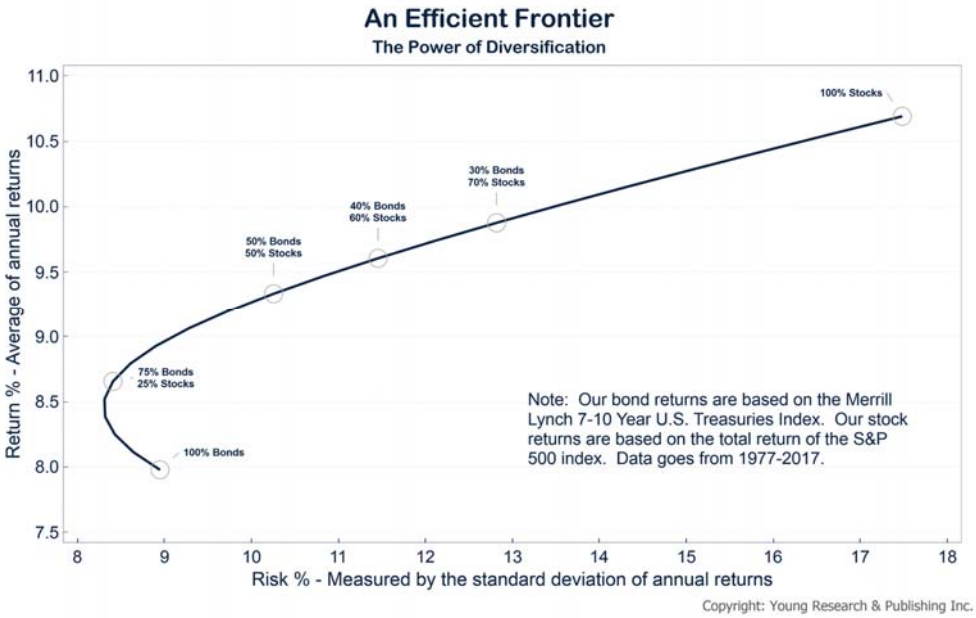


Maximize profit and minimize events leading to farm ruin (OR UNCLE POINTS!)

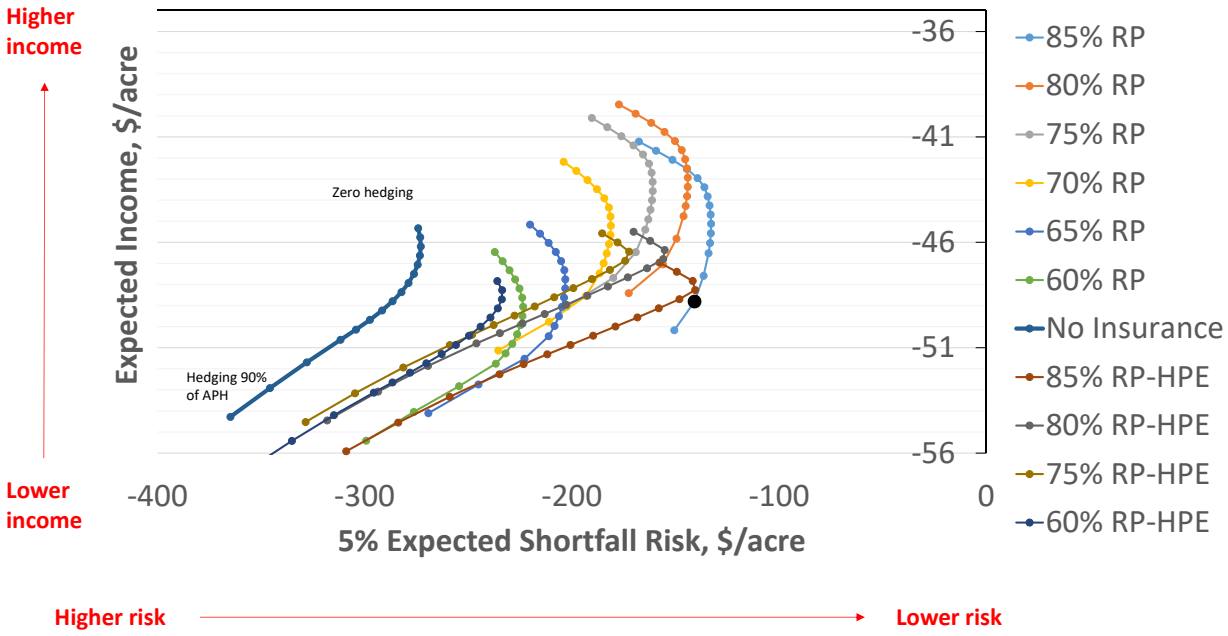
I am going to calculate profit and farm ruin events for different coverage levels, insurance types and hedging levels. We want to find the contracts that give us the *best profit* at the *lowest risk*

Each dot in a particular crop insurance (or no insurance) path represents a hedging level starting at zero hedging, which is the highest point as hedging is costly.

Review: risk-return tradeoffs

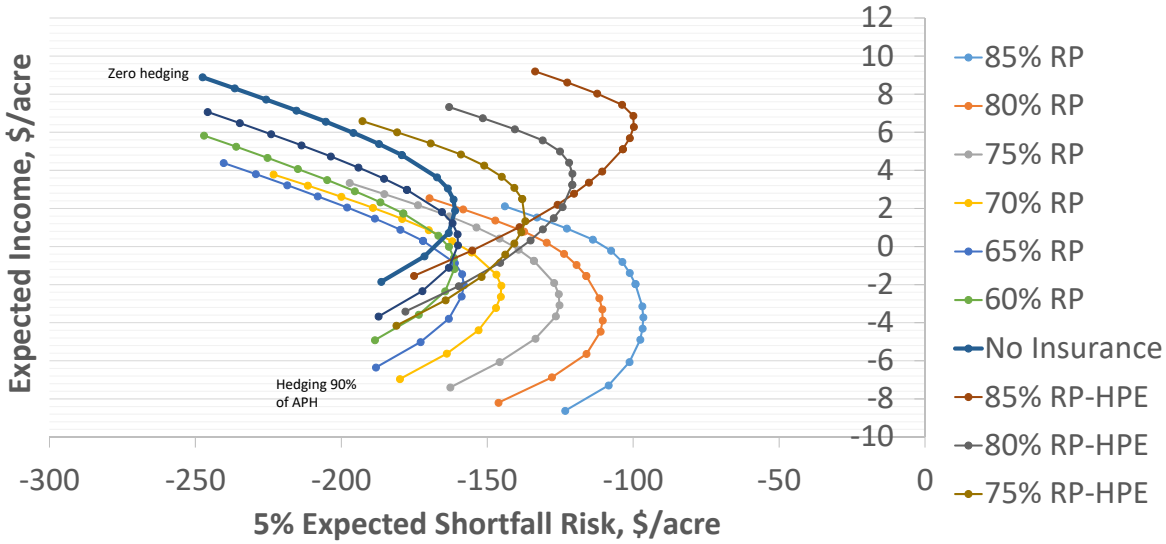


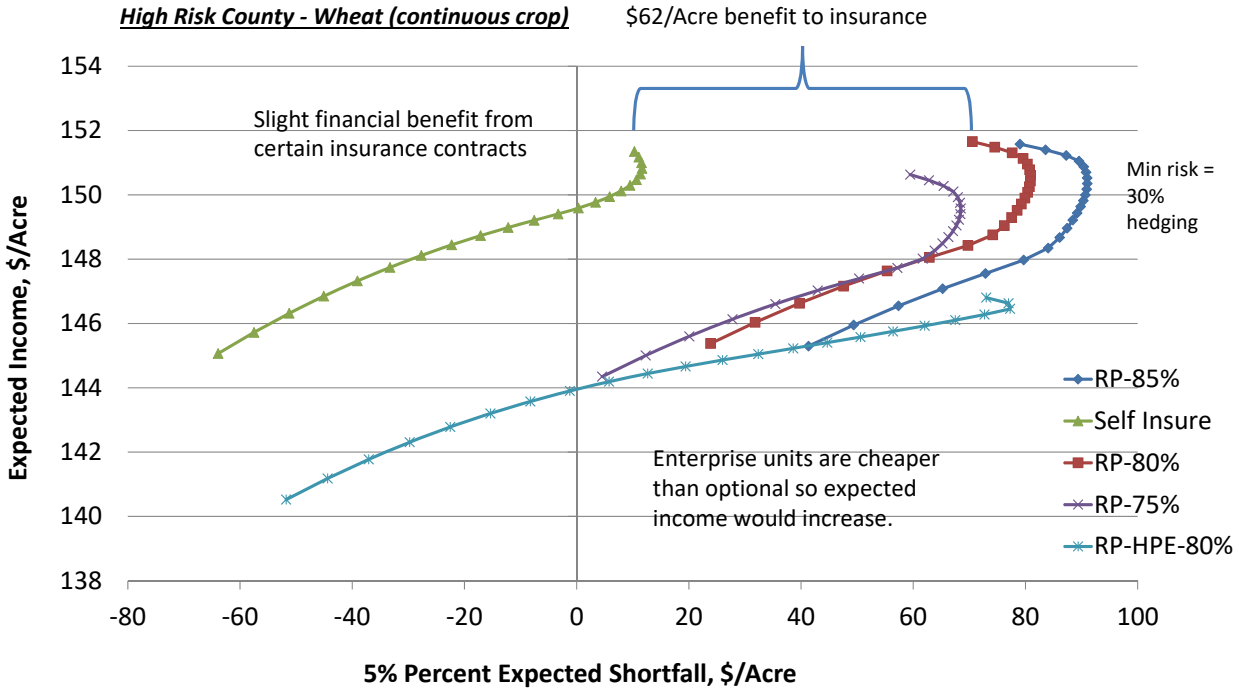
Low Risk County – Non-Irrigated Corn



Higher risk → Lower risk

Low Risk County – Irrigated Corn





Remarks

- Will you cross a river that is on average 4 feet deep?
  - Point: rely on payoffs not averages
- Consider conditions in your area when thinking of what others in other areas are doing
- Role of time; protect your hard earned wealth
- Crop insurance is not expensive. Not understanding your exposure can be!
- Premium subsidization provides a positive return to insurance participation and helps you compete for resources (especially during hard times)
  - Purchasing crop insurance is profit maximizing!