

Crop Insurance: Helpful Hints to Make More Money

Central Wisconsin Heart of the Farm

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Paul D. Mitchell

Agricultural and Applied Economics

Office: (608) 265-6514

Cell: (608) 320-1162

Email: pdmitchell@wisc.edu

Extension Web Page:

www.aae.wisc.edu/mitchell/extension.htm

Goal Today

- Overview APH insurance and how it works
- General and specific hints on how to use APH to make more money
- Focus on corn and soybeans
- Focus on yield risk (not price risk)

Actual Production History (APH)

- If harvested yield is less than yield guarantee, farmer receives an indemnity
- Yield guarantee based on actual yield history (APH)
- Other names
 - Multiple Peril Crop Insurance (MPCI)
 - Catastrophic Coverage (CAT) is the minimum APH coverage available

How APH Works

- Unit Structure (Basic, Optional, Enterprise)
- Coverage Level (50% to 85%)
- Price Election (55% to 100%)
- Premiums

Insurance Unit

- Yield from a “unit” is what is insured
- If yield for the whole unit is less than the unit’s yield guarantee, triggers indemnity
 - A 300 acre unit with a 100 bu/ac guarantee would have to yield less than $100 \times 300 = 30,000$ bu to trigger an indemnity
- Each unit is possibly/likely several fields
- Farm must choose one of three unit types
 - Basic Unit, Optional Unit, Enterprise Unit

Basic Unit

- One basic unit for all acres farmer owns/cash rents in a county
- Additional basic unit for all acres the farmer share rents with a different landlord in a county
- If insure all acreage as basic units, you receive a 10% premium discount

Optional Unit

- Break basic units into optional units
- One optional unit for all acres in different township sections that a farmer owns or cash rents
- Can separate optional units if different practices or crop types
 - Dryland and Irrigated Corn
 - Corn for Grain and Corn for Silage

Enterprise Unit

- Combine basic units into enterprise unit
- Combine all acreage for a crop in a county into a single unit
- Farmer using an enterprise unit pays lower premiums

Farms A-G: Same operator planting the same crop in the same county

Farm A Owned Township Section 1	Farm B 50-50 crop share lease from Smith	Farm D cash rent lease from Jones	Township Section 2
	Farm C cash rent lease from Smith	Farm E 50-50 crop share lease from Smith	
Farm F Owned		Farm G 60-40 crop share lease from Black	Township Section 11
Township Section 12			

Basic Units

- 1) $A + C + D + F$
- 2) $B + E$
- 3) G

Optional Units

- 1) $A + C$
- 2) B
- 3) D
- 4) E
- 5) F
- 6) G

Enterprise Unit

- 1) All units A to G

Best Unit Structure

- 300 acre unit with 100 bu/ac guarantee must yield less than $100 \times 300 = 30,000$ bu to trigger an indemnity
- Suppose three 100 ac fields: one with 0 bu/ac & two with 150 bu/ac = 30,000 bu, so triggers no indemnity
- **Farmers make more money with Optional Units than with Basic Units and Enterprise Units, even though pay higher premiums**

Coverage Level

- Pick percent of APH yield to guarantee:
50% to 85% by 5% intervals
55% 60% 65% 70% 75% 80% 85%
- Unit yield below this yield guarantee triggers an indemnity
- 100% – Coverage Level \sim Deductible
- Higher coverage level has higher premium
- **65%-75% generally are best deal**
- **50% (CAT) is essentially free**

Price Election

- Crop price used to pay indemnities
- RMA announces price elections at sign-up, based on CBOT futures prices
- Available options: 55% to 100% by 1% increments of announced price election
- **Best to take max price election**
 - **If you have a loss, want to be paid as much as you can for the lost yield**

Premium Subsidies

- Producer premiums subsidized by RMA, so should be better than fair

Coverage Level (%)	50	55	60	65	70	75	80	85
Premium Subsidy (%)	67	64	64	59	59	55	48	38
Producer Share (%)	33	36	36	41	41	45	52	62

- Producers should on average make money with APH crop insurance, if the RMA has correct premiums

2006 Corn APH Premiums (\$/ac)

100% Price Election, Optional Units

150 APH Dryland

200 APH Irrigated

Adams

Juneau

Marquette

Adams

Juneau

Marquette

55% APH	5.18	4.76	3.74	5.35	5.99	3.62
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65% APH	7.70	7.12	5.77	8.09	8.95	6.10
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75% APH	12.86	11.20	9.61	13.23	14.08	10.80
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2007 premiums higher, as RMA corn price jumped to \$3.30/bu from \$2/bu

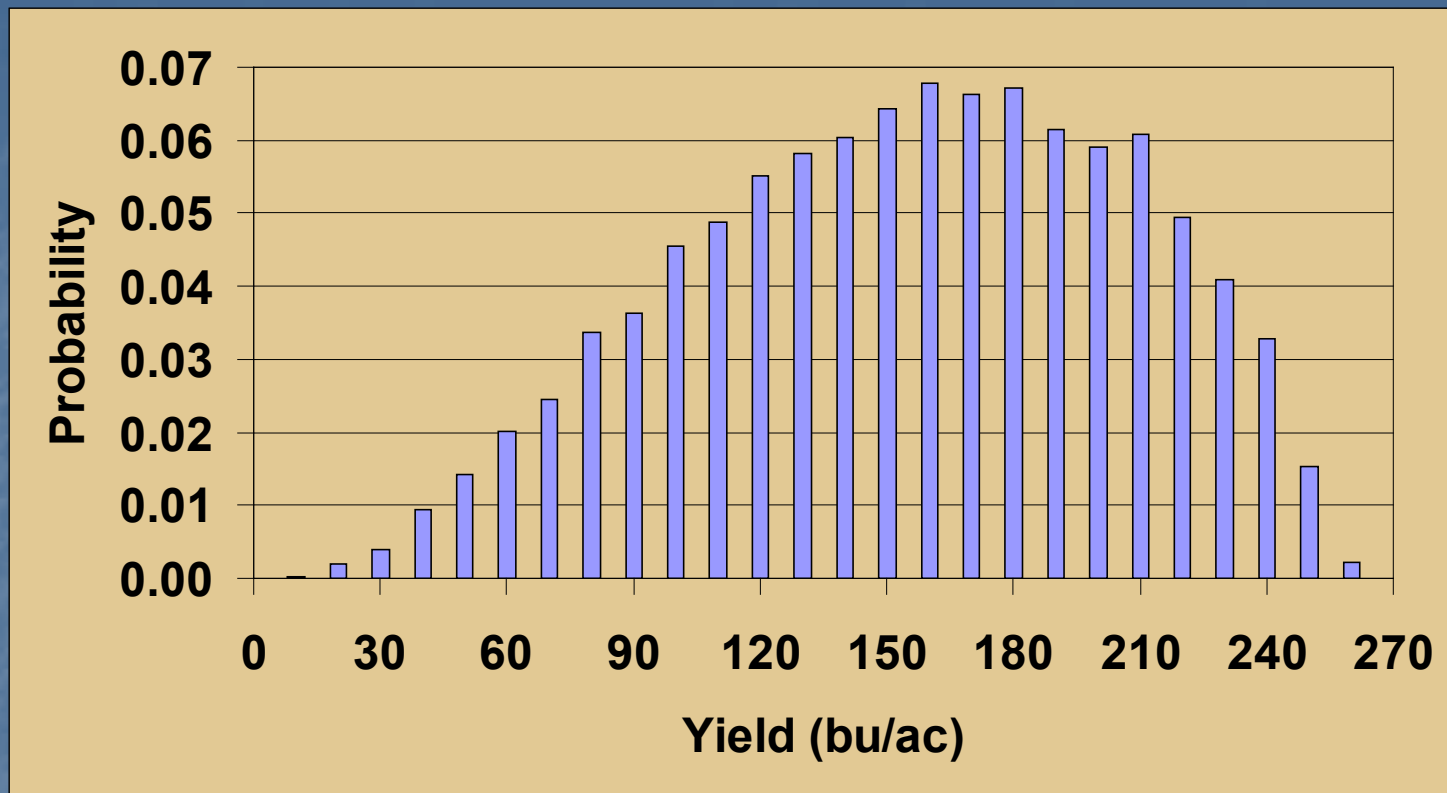
APH Hints to Make More Money

If APH valuable (which is not certain)

- Use as many Optional Units as possible
- Take the maximum 100% price election
- 65%-75% coverage levels generally best deal (Avoid 80% and 85% coverage: too expensive)
- Premium subsidies imply that on average should make money with APH crop insurance, if RMA has correct premiums (yet to examine)
- Coverage available even if no yield history
- Consider at least CAT, since essentially free

Benefit of Crop Insurance

- Crop yield is uncertain: money borrowed, inputs bought, crop planted without knowing for certain how much yield will you get at harvest
- Each possible yield has a probability and farmers usually have some idea of the likelihood of each yield outcome
- Implies a yield distribution or histogram



Corn Yield Histogram

Monte Carlo simulations in Excel using a Beta distribution

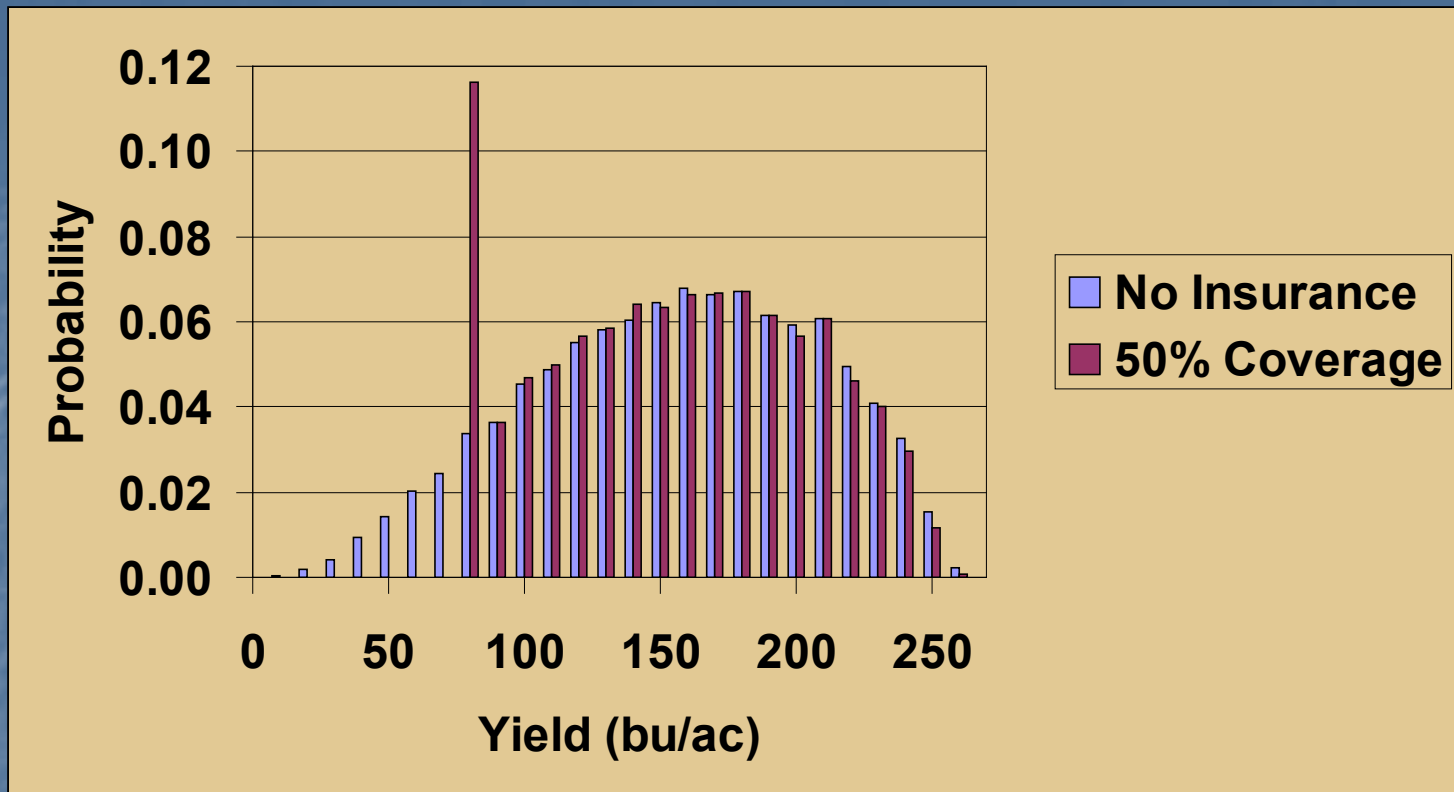
Average Yield 150 bu/ac, Standard Deviation 52.5 bu/ac

Coefficient of Variation (CV) = $\text{StDev}/\text{Avg} = 35\%$

Minimum 0 bu/ac, Maximum 255 bu/ac

Effect of Crop Insurance

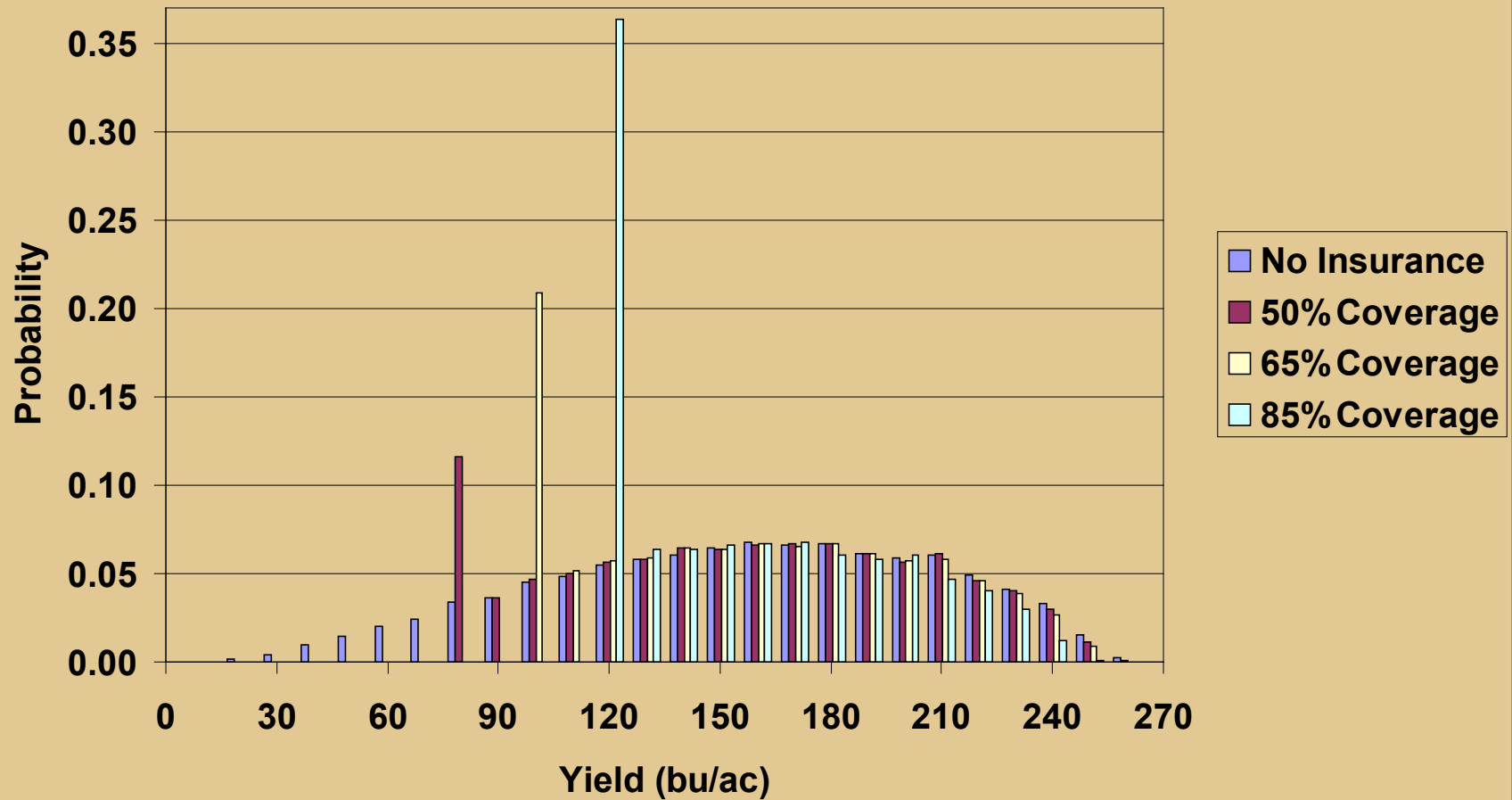
- With crop insurance you pay a premium no matter what happens, and receive an indemnity only if your yield is below the yield guarantee
- The premium reduces your returns in all outcomes (shifts the distribution down/left)
- The indemnity puts a “floor” on your returns so you will receive at least your yield guarantee (piles up histogram at the yield guarantee)



Same yield distribution as before, plus crop insurance

Yield guarantee = 50% coverage X 150 bu/ac = 75 bu/ac
See "pile up" of yield outcomes at the 75 bu/ac guarantee

Hard to see the slight shift due to the premium reducing returns, clearest at right end: blue higher than maroon bars



Effect of Coverage Level: Higher coverage shifts yield “floor” right (75 bu, 98 bu, 128 bu), makes higher “pile” at the floor since receive indemnities more often

- Hard to see effect of higher premiums on upper end

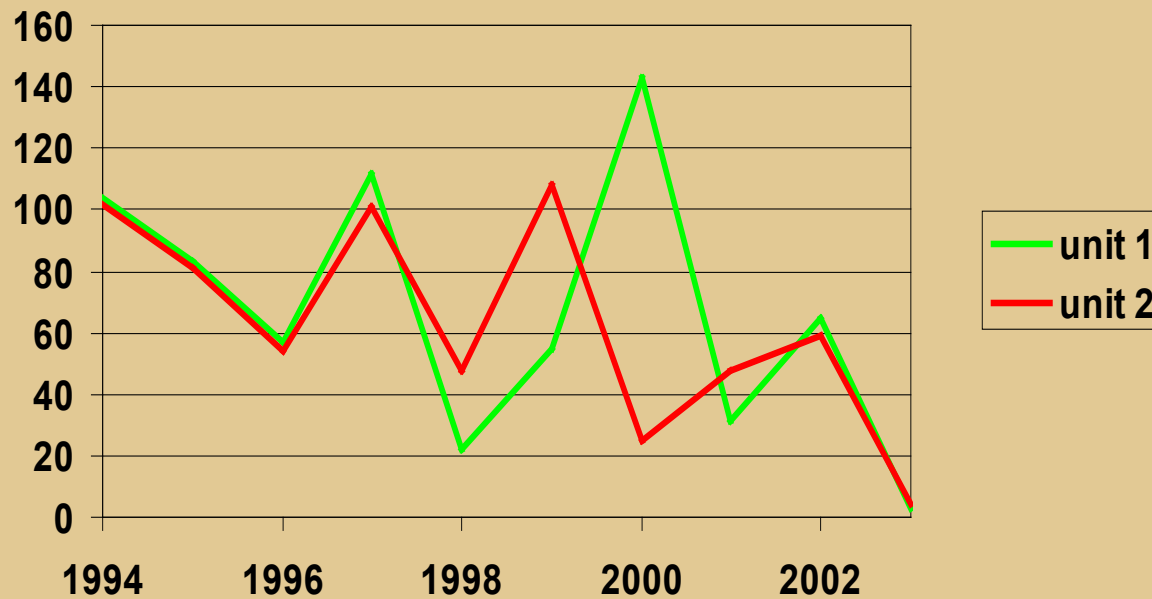
Main Point and Next Question

- Crop insurance reduces risk by eliminating low yield outcomes for a relatively small price (the premium)
- Higher coverage levels give greater risk reduction, but have higher premiums
- Government subsidizes premiums, so crop insurance is supposed to be a winning bet.
- **Is this true???—Do you on average make money with APH???**

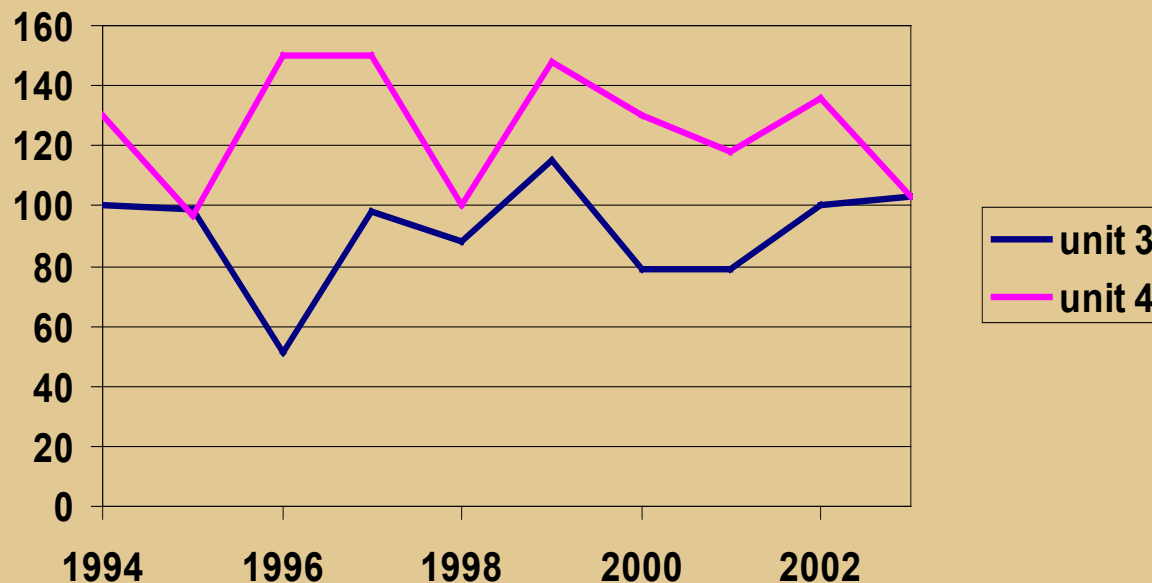
Is APH worth it?

- Monte Carlo simulations to estimate net return
= average indemnity – premium
- Corn price: \$3.30/bu
- Vary mean yields
 - 120 to 160 bu/ac dryland corn
 - 170 to 210 irrigated corn
 - 30 to 50 bu/ac dryland soybeans
- Yield Coefficient of Variation (CV)
 - 25% to 35% for dryland corn and soybeans
 - 20% to 35% for irrigated corn

What do variable yields look like?



	unit 1	unit 2
avg	67.5	63.0
stdev	43.6	34.6
cv	65%	55%



	unit 3	unit 4
avg	91.2	126
stdev	17.9	20.8
cv	20%	16%

2007 Premiums (\$/ac) Dryland Corn Adams County, \$3.30/bu

Coverage	----- Average Yield (bu/ac) -----				
Level	120	130	140	150	160
50%	6.17	6.04	5.91	5.85	5.82
55%	7.85	7.68	7.51	7.43	7.39
60%	9.03	8.84	8.64	8.56	8.52
65%	11.73	11.49	11.22	11.12	11.06
70%	14.00	13.70	13.39	13.26	13.19
75%	18.14	17.76	17.36	17.19	17.10
80%	25.43	24.90	24.33	24.10	23.97
85%	37.96	37.16	36.31	35.97	35.78

2007 Premiums (\$/ac) Irrigated Corn Adams County, \$3.30/bu

Coverage	----- Average Yield (bu/ac) -----				
Level	120	130	140	150	160
50%	6.57	6.52	6.53	6.51	6.51
55%	8.36	8.29	8.30	8.28	8.28
60%	9.63	9.55	9.57	9.54	9.54
65%	12.66	12.56	12.58	12.55	12.55
70%	15.48	15.35	15.38	15.34	15.34
75%	20.76	20.58	20.63	20.57	20.57
80%	29.27	29.03	29.09	29.01	29.00
85%	42.47	42.11	42.20	42.08	42.08

2007 Premiums (\$/ac) Dryland Soybeans Adams County, \$6.50/bu

Coverage	----- Average Yield (bu/ac) -----				
Level	30	35	40	45	50
50%	1.48	1.47	1.48	1.50	1.53
55%	2.00	1.99	2.00	2.03	2.07
60%	2.57	2.55	2.56	2.60	2.66
65%	3.82	3.79	3.80	3.87	3.95
70%	5.27	5.22	5.25	5.33	5.45
75%	7.91	7.85	7.88	8.01	8.17
80%	12.35	12.24	12.31	12.49	12.76
85%	19.59	19.46	19.53	19.85	20.25

2007 Premiums (\$/ac) Dryland Corn Juneau County, \$3.30/bu

Coverage	----- Average Yield (bu/ac) -----				
Level	120	130	140	150	160
50%	6.15	6.02	5.92	5.86	5.82
55%	7.81	7.65	7.53	7.45	7.40
60%	9.00	8.81	8.67	8.58	8.53
65%	11.75	11.50	11.32	11.20	11.13
70%	14.27	13.97	13.75	13.61	13.52
75%	19.04	18.64	18.35	18.16	18.04
80%	26.97	26.39	25.98	25.71	25.55
85%	42.72	41.81	41.16	40.73	40.48

2007 Premiums (\$/ac) Irrigated Corn Juneau County, \$3.30/bu

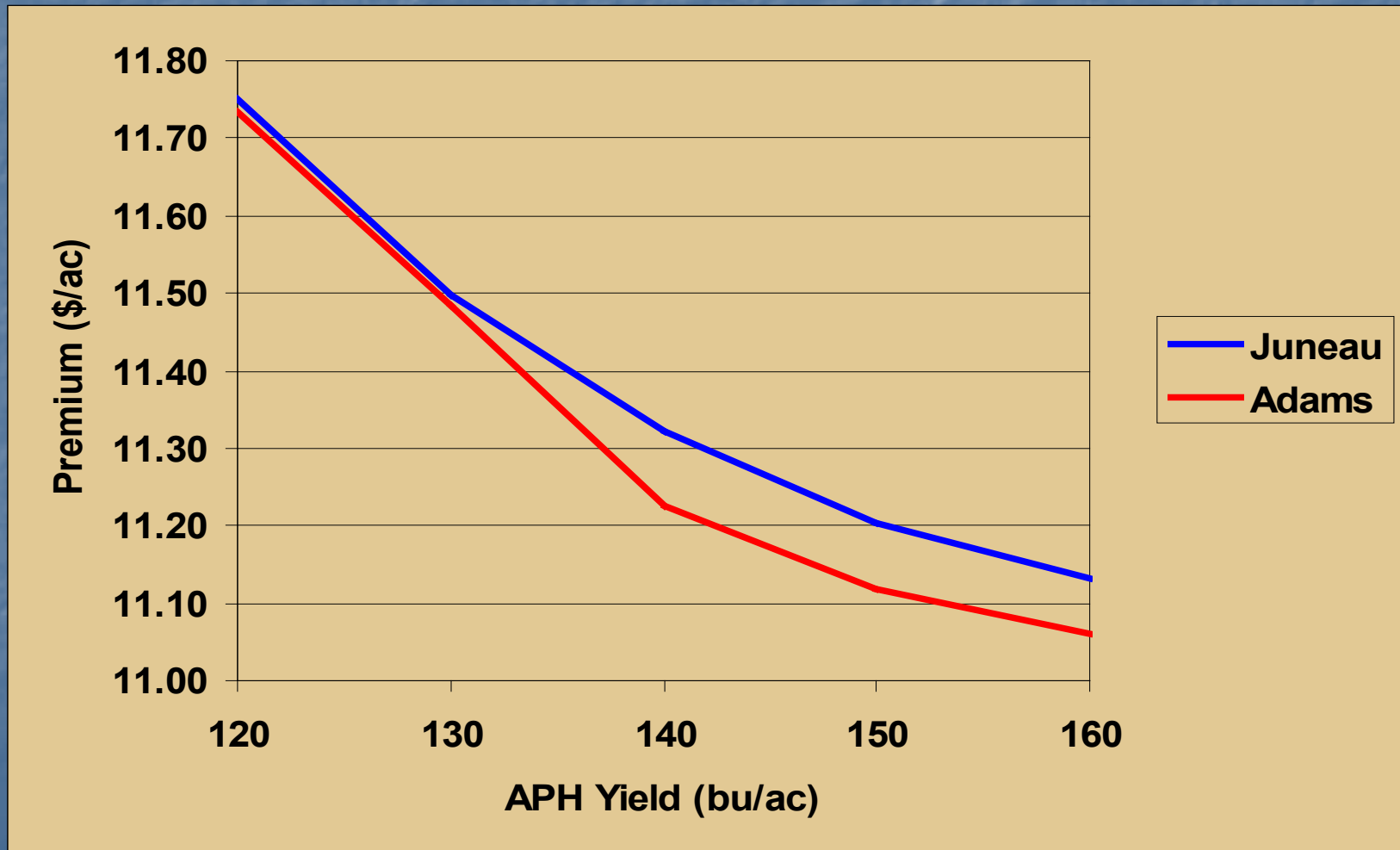
Coverage	----- Average Yield (bu/ac) -----				
Level	120	130	140	150	160
50%	5.77	5.78	5.80	5.83	5.88
55%	7.34	7.34	7.37	7.41	7.47
60%	8.45	8.46	8.49	8.54	8.60
65%	11.03	11.04	11.08	11.15	11.23
70%	13.40	13.41	13.46	13.54	13.64
75%	17.88	17.90	17.96	18.07	18.21
80%	25.32	25.34	25.44	25.58	25.78
85%	40.11	40.15	40.30	40.53	40.84

2007 Premiums (\$/ac) Dryland Soybeans Juneau County, \$6.50/bu

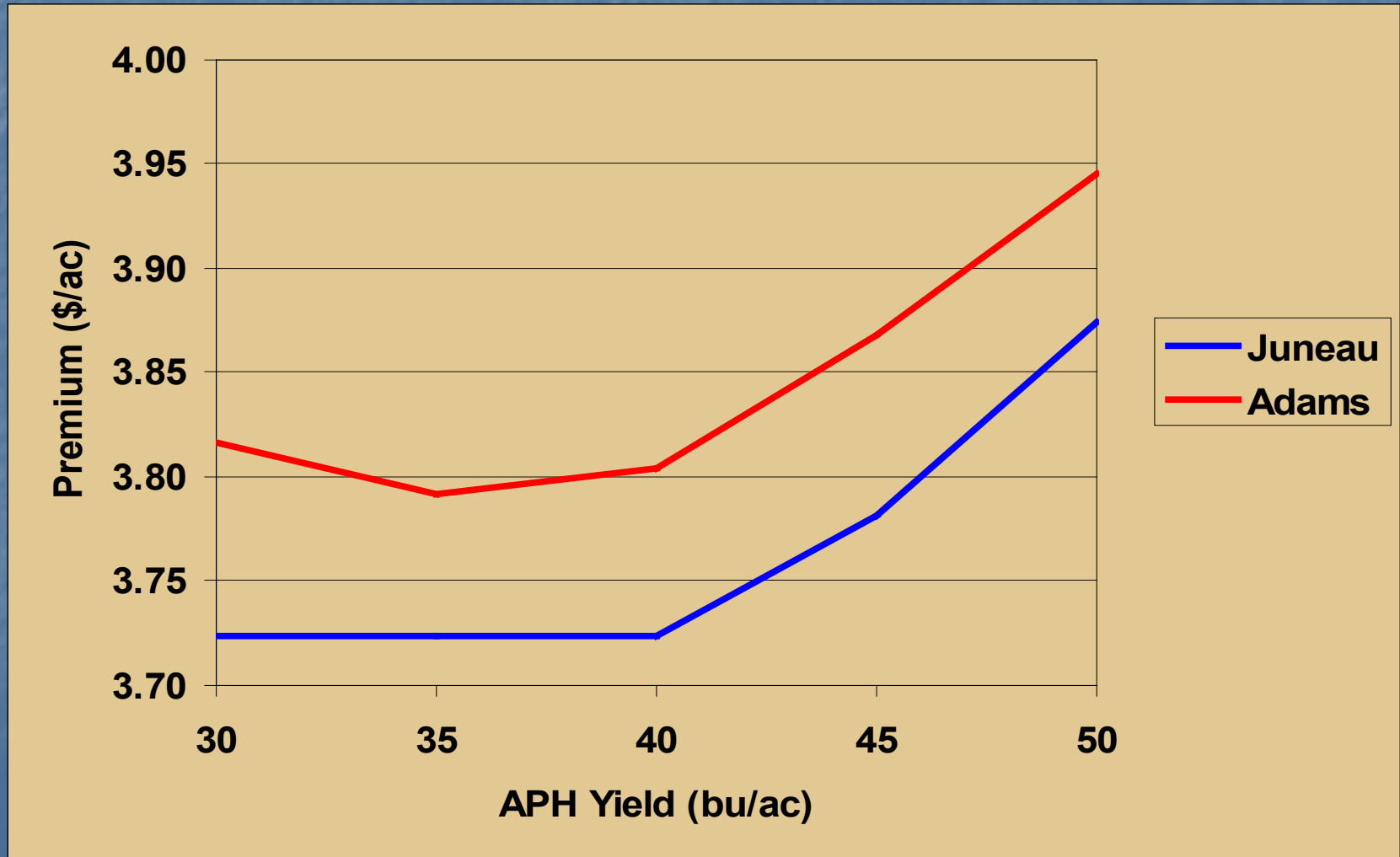
Coverage	----- Average Yield (bu/ac) -----				
Level	30	35	40	45	50
50%	1.41	1.41	1.41	1.43	1.47
55%	1.93	1.93	1.93	1.96	2.01
60%	2.49	2.49	2.49	2.53	2.59
65%	3.72	3.72	3.72	3.78	3.87
70%	5.16	5.15	5.16	5.23	5.37
75%	7.76	7.76	7.76	7.88	8.08
80%	12.14	12.11	12.14	12.30	12.63
85%	19.28	19.27	19.28	19.57	20.06

Effect of APH Yield on Premium

Corn 65% coverage, \$3.30/bu



Effect of APH Yield on Premium Soybeans 65% coverage, \$6.50/bu



Summary: Premiums in 2007

- At 65% coverage in Adams county
 - Dryland corn premiums range \$11-\$11.75/ac
 - Irrigated corn premiums about \$12.50/ac
 - Soybean premiums about \$4/ac
- At 65% coverage in Juneau county
 - Dryland corn premiums range \$11-\$11.75/ac
 - Irrigated corn premiums range \$11-\$11.25/ac
 - Soybean premiums not quite \$4/ac
- Increasing APH yield
 - Decreases corn premium
 - Can increase or decrease soybean premium

APH Net Return

- Net Return is the premium paid minus the average indemnity received
- Use Monte Carlo simulations to calculate average indemnity for 3 yield risk levels
 - Low Risk: 25% CV for yield
 - Medium Risk: 30% CV for yield
 - High Risk: 35% CV for yield
 - 20%, 25%, 30% yield CV's for irrigated corn

APH Net Return (\$/ac) Dryland Corn, Medium Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>120</u>	<u>130</u>	<u>140</u>	<u>150</u>	<u>160</u>
50%	-1.10	-0.99	-0.89	-0.80	-0.73
55%	-1.19	-1.04	-0.89	-0.77	-0.66
60%	-0.99	-0.79	-0.58	-0.41	-0.25
65%	-1.07	-0.79	-0.50	-0.26	-0.04
70%	-0.83	-0.46	-0.08	0.24	0.55
75%	-0.93	-0.43	0.07	0.50	0.91
80%	-1.73	-1.07	-0.40	0.17	0.70
85%	-3.84	-2.96	-2.06	-1.32	-0.62

APH Net Return (\$/ac) Dryland Corn, High Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>120</u>	<u>130</u>	<u>140</u>	<u>150</u>	<u>160</u>
50%	-0.42	-0.26	-0.10	0.04	0.17
55%	-0.31	-0.09	0.14	0.33	0.52
60%	0.12	0.42	0.72	0.98	1.23
65%	0.27	0.66	1.06	1.41	1.75
70%	0.76	1.27	1.78	2.23	2.67
75%	0.89	1.54	2.20	2.78	3.34
80%	0.32	1.15	1.99	2.72	3.43
85%	-1.59	-0.52	0.56	1.49	2.38

APH Net Return (\$/ac) Dryland Corn, Medium Risk Juneau County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>120</u>	<u>130</u>	<u>140</u>	<u>150</u>	<u>160</u>
50%	-1.09	-0.98	-0.89	-0.81	-0.73
55%	-1.18	-1.03	-0.89	-0.77	-0.66
60%	-0.98	-0.78	-0.59	-0.42	-0.26
65%	-1.08	-0.79	-0.53	-0.29	-0.06
70%	-0.91	-0.54	-0.19	0.14	0.45
75%	-1.20	-0.70	-0.23	0.21	0.62
80%	-2.20	-1.52	-0.90	-0.32	0.23
85%	-5.28	-4.37	-3.53	-2.76	-2.05

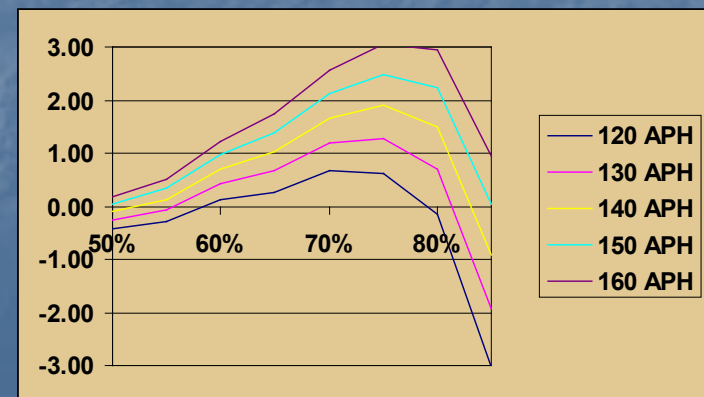
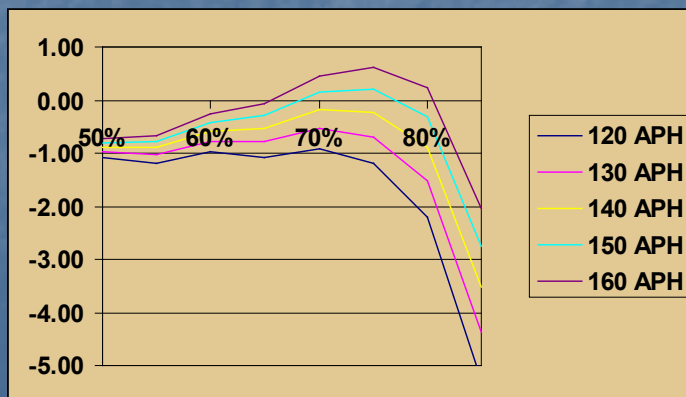
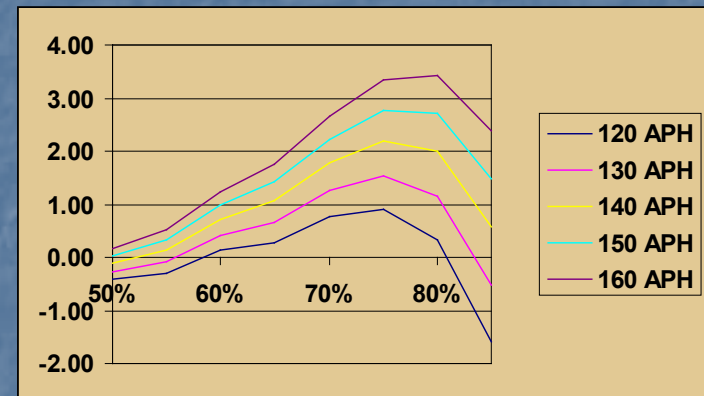
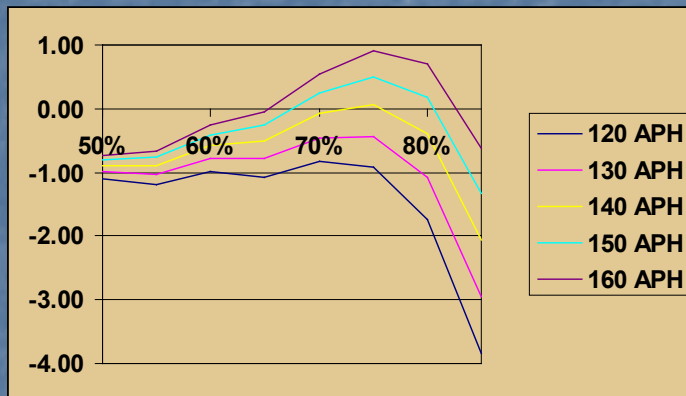
APH Net Return (\$/ac) Dryland Corn, High Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>120</u>	<u>130</u>	<u>140</u>	<u>150</u>	<u>160</u>
50%	-0.41	-0.25	-0.10	0.03	0.17
55%	-0.30	-0.07	0.13	0.33	0.52
60%	0.13	0.43	0.71	0.98	1.23
65%	0.27	0.66	1.03	1.39	1.73
70%	0.68	1.19	1.67	2.13	2.57
75%	0.62	1.28	1.90	2.49	3.05
80%	-0.15	0.69	1.49	2.24	2.95
85%	-3.03	-1.93	-0.91	0.05	0.95

APH Net Returns (\$/ac) by Coverage Level

Medium Risk (left) and High Risk (right)

Adams (top) and Juneau (btm)



APH for Dryland Corn in Adams and Juneau Counties

- To make money on average with APH, need
 - Higher yield risk/variability (more indemnities)
 - Higher average yield (lower premiums)
- Best deal is 70%-80% coverage
- On average, will not make or lose much money (\pm about \$3/ac)
 - Avoid high coverage levels with low average yield
 - Higher coverage levels better with higher average yield
- **Remember: APH still gives risk benefit of no low yields (creates yield “floor”)**

APH Net Return (\$/ac) Irrigated Corn, Medium Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	-1.53	-1.49	-1.47	-1.44	-1.41
55%	-1.75	-1.68	-1.64	-1.59	-1.54
60%	-1.65	-1.55	-1.48	-1.40	-1.32
65%	-1.88	-1.74	-1.63	-1.51	-1.39
70%	-1.79	-1.58	-1.42	-1.23	-1.06
75%	-2.13	-1.83	-1.60	-1.34	-1.09
80%	-3.08	-2.67	-2.34	-1.98	-1.64
85%	-5.03	-4.46	-4.03	-3.53	-3.07

APH Net Return (\$/ac) Irrigated Corn, High Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	-0.89	-0.81	-0.75	-0.68	-0.62
55%	-0.85	-0.73	-0.63	-0.53	-0.43
60%	-0.45	-0.28	-0.14	0.02	0.16
65%	-0.32	-0.08	0.12	0.34	0.55
70%	0.14	0.46	0.74	1.03	1.32
75%	0.18	0.62	0.98	1.38	1.76
80%	-0.40	0.17	0.65	1.17	1.67
85%	-2.01	-1.27	-0.65	0.02	0.66

APH Net Return (\$/ac) Irrigated Corn, Medium Risk Juneau County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	-1.29	-1.27	-1.25	-1.23	-1.22
55%	-1.44	-1.40	-1.36	-1.32	-1.30
60%	-1.29	-1.22	-1.15	-1.09	-1.04
65%	-1.39	-1.28	-1.18	-1.08	-0.99
70%	-1.15	-0.99	-0.83	-0.69	-0.55
75%	-1.26	-1.02	-0.79	-0.58	-0.38
80%	-1.88	-1.55	-1.24	-0.94	-0.66
85%	-4.31	-3.87	-3.45	-3.06	-2.69

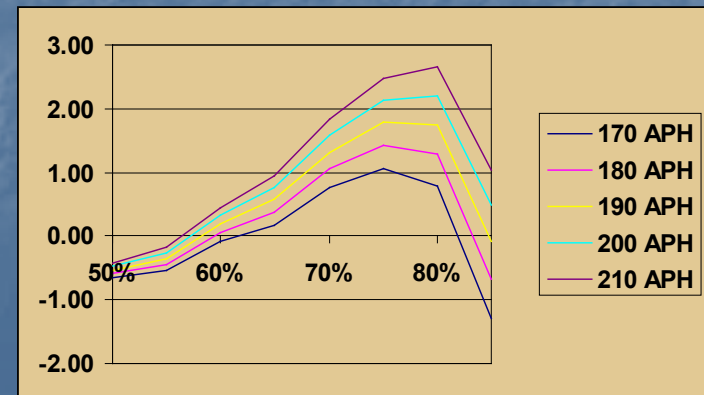
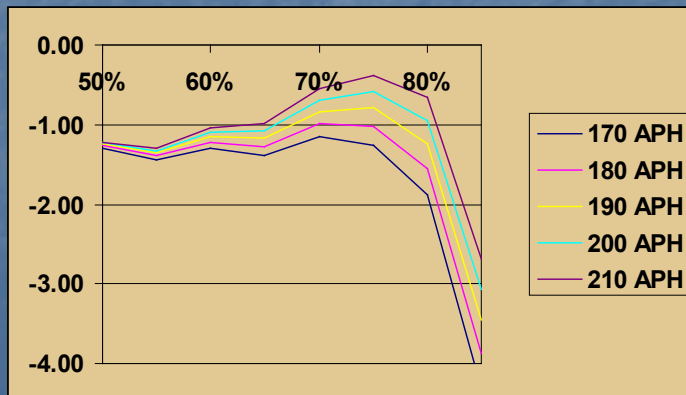
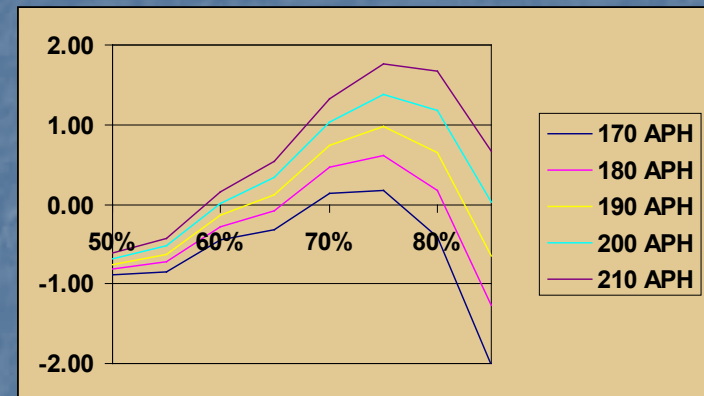
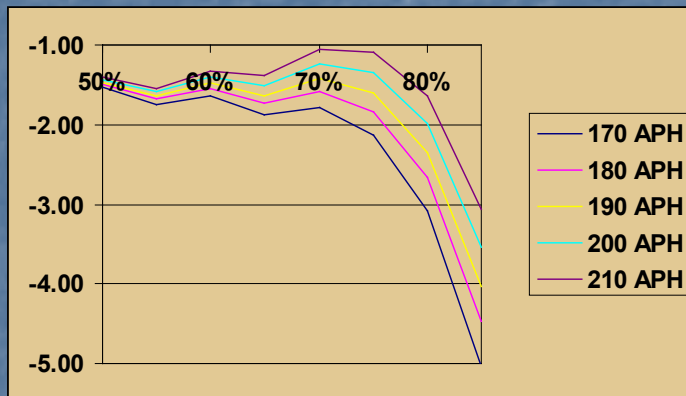
APH Net Return (\$/ac) Irrigated Corn, High Risk Juneau County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	-0.65	-0.59	-0.53	-0.47	-0.42
55%	-0.54	-0.44	-0.35	-0.27	-0.18
60%	-0.09	0.05	0.19	0.32	0.45
65%	0.18	0.38	0.57	0.76	0.94
70%	0.77	1.05	1.32	1.58	1.83
75%	1.05	1.43	1.79	2.14	2.48
80%	0.79	1.28	1.75	2.21	2.65
85%	-1.30	-0.67	-0.08	0.49	1.04

APH Net Returns (\$/ac) by Coverage Level

Medium Risk (left) and High Risk (right)

Adams (top) and Juneau (btm)



APH for Irrigated Corn in Adams and Juneau Counties

- Same results, but average net returns a little lower
- To make money on average with APH, need
 - Higher yield risk/variability (more indemnities)
 - Higher average yield (lower premiums)
- Best deal is 70%-80% coverage
- On average, will not make or lose much money
 - Avoid high coverage with low average yield
 - Higher coverage better for higher average yield
- **Remember: APH still gives risk benefit of no low yields (creates yield “floor”)**

APH Net Return (\$/ac) Soybeans

Medium Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	-0.03	0.00	0.03	0.06	0.09
55%	-0.01	0.04	0.09	0.14	0.18
60%	0.04	0.12	0.19	0.25	0.32
65%	0.03	0.15	0.24	0.34	0.43
70%	0.04	0.19	0.33	0.46	0.58
75%	-0.07	0.13	0.31	0.49	0.65
80%	-0.41	-0.14	0.10	0.32	0.53
85%	-1.10	-0.74	-0.45	-0.16	0.08

APH Net Return (\$/ac) Soybeans

High Risk Adams County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	0.13	0.20	0.26	0.31	0.37
55%	0.21	0.30	0.38	0.47	0.54
60%	0.32	0.44	0.56	0.67	0.78
65%	0.37	0.54	0.69	0.85	0.99
70%	0.44	0.65	0.86	1.06	1.25
75%	0.38	0.67	0.92	1.18	1.41
80%	0.11	0.46	0.78	1.09	1.38
85%	-0.54	-0.08	0.30	0.68	1.02

APH Net Return (\$/ac) Soybeans

Medium Risk Juneau County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	-0.02	0.01	0.04	0.07	0.10
55%	0.00	0.05	0.10	0.15	0.19
60%	0.05	0.13	0.20	0.27	0.33
65%	0.05	0.16	0.26	0.36	0.44
70%	0.06	0.20	0.34	0.47	0.60
75%	-0.05	0.15	0.33	0.51	0.66
80%	-0.37	-0.12	0.12	0.35	0.55
85%	-1.05	-0.71	-0.41	-0.12	0.11

APH Net Return (\$/ac) Soybeans

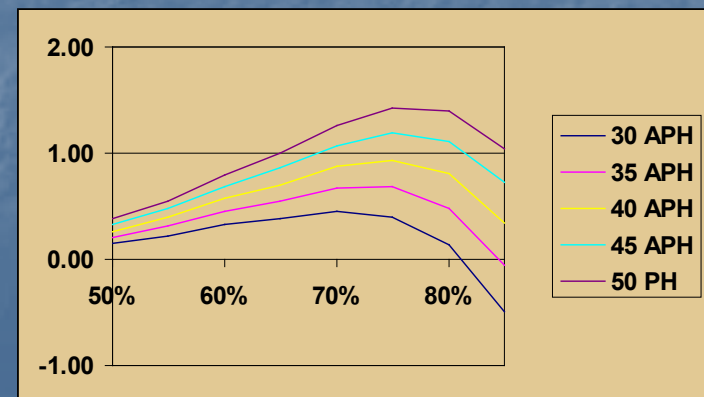
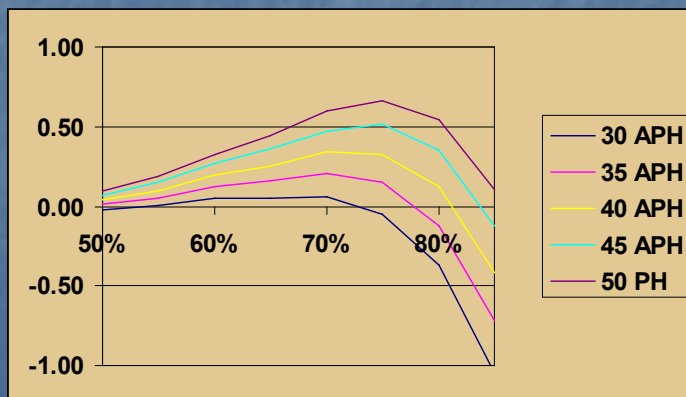
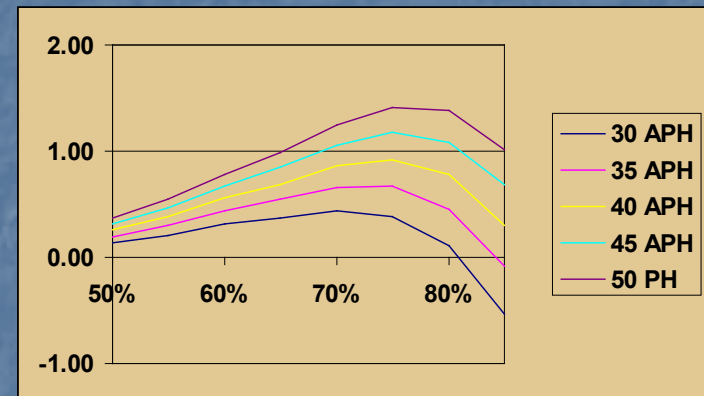
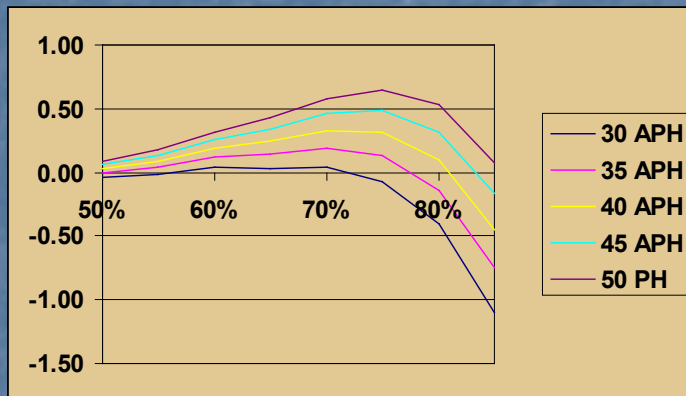
High Risk Juneau County

Coverage	----- Average Yield (bu/ac) -----				
Level	<u>170</u>	<u>180</u>	<u>190</u>	<u>200</u>	<u>210</u>
50%	0.14	0.21	0.27	0.32	0.38
55%	0.22	0.31	0.39	0.48	0.55
60%	0.33	0.45	0.57	0.68	0.79
65%	0.38	0.55	0.70	0.86	1.00
70%	0.46	0.67	0.87	1.07	1.26
75%	0.40	0.68	0.94	1.20	1.42
80%	0.14	0.48	0.81	1.12	1.40
85%	-0.49	-0.06	0.34	0.72	1.05

APH Net Returns (\$/ac) by Coverage Level

Medium Risk (left) and High Risk (right)

Adams (top) and Juneau (btm)



APH for Dryland Soybeans in Adams and Juneau Counties

- Same results, but average net returns much lower
- To make money on average with APH, need
 - Higher yield risk/variability (more indemnities)
 - Higher average yield (lower premiums)
- Best deal is 70%-75% coverage
- On average, will not make or lose much money (range -\$1.00/ac to +\$1.50/ac)
 - Avoid high coverage with low average yield
 - Higher coverage better for higher average yield
- **Remember: APH still gives risk benefit of no low yields (creates yield “floor”)**

Summary

Helpful hints on how to use APH

- 1) Use as many Optional Units as possible
- 2) Take the maximum 100% price election
- 3) 70%-75% coverage levels generally best deal
- 4) Consider at least CAT, since essentially free and coverage available even if no yield history
- 5) Avoid high coverage with low average yield
- 6) Higher coverage better for higher average yield
- 7) On average, will not make or lose lots of money with APH insurance (not a sure bet)

Summary

Helpful hints on how to use APH

- 8) Most irrigated farmers will find APH less valuable, but they should at least use hail/fire
- 9) Dryland farmers will find APH more valuable, especially if have higher yield risk
- 10) Calculate yield CV = $\text{st dev} \div \text{mean}$ from yield history: if $> 35\%$, APH likely a good deal
- 11) All APH still gives risk benefit of no low yields (creates yield “floor”)
- 12) Even if you feed your crops to livestock, if you have low yield, can use indemnity to buy feed

Contact me with questions

Paul D. Mitchell

Agricultural and Applied Economics

University of Wisconsin-Madison

Office: (608) 265-6514

Cell: (608) 320-1162

Email: pdmitchell@wisc.edu

Extension Web Page:

www.aae.wisc.edu/mitchell/extension.htm