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Evaluating your Crop Insurance Options in 2013

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The Risk Management Agency (RMA) has now concluded its price discovery period used to determine final prices and volatility factors for federally sponsored corn and soybean crop insurance products for 2013. For the majority of the midwest, the Projected Price for corn is \$5.65 and the volatility factor relating to the price risk is anticipated to be .20. For soybeans, the Projected Price is \$12.87 and the volatility factor is likely to be .17. For comparison, the 2012 prices (volatility factors) were \$5.68 (.22) and \$12.55 (.18) for corn and soybeans respectively. The Projected Prices are used to determine the guarantee revenue indexes based on futures prices and do not reflect local basis. The Projected Price for corn is determined by averaging the closing December futures price during the trading days of February, and for soybeans by averaging the November Futures closing prices. The volatility factors are determined by an average of the most recent five trading days' implied volatility estimates, scaled for the interval of time from now until the middle of October -- the month during which average prices are used to determine Harvest Prices. For both corn and soybeans, the volatility factors are considerably lower than in both 2011 and 2012 which has important implications for premiums and for the value of the Harvest Price options embedded in many products. Additionally, the projected prices were calculated during a month which witnessed generally falling prices for both corn and soybeans and as a result, the closing prices on the final day of trading in February (the price discovery month) were \$5.57 for Dec. corn and \$12.595 for Nov. soybeans -- thus the insurance prices are higher than current trade estimates of future prices. As a result, there is a somewhat decreased likelihood that the harvest prices will exceed the projected prices compared to a year when projected prices are at or below current futures prices. Among the other changes complicating insurance evaluation this year, the RMA modified base rates across much of the corn and soybean production region to try to move premiums and loss rates into closer congruence. Additionally, the Trend Adjusted APH Endorsement was implemented last year resulting in significant increases in many producers' APH levels, followed by very low yields in the lower and western portions of the cornbelt that negatively impacted many APH levels. Group policies likewise became more attractive in some regions that had low historic loss rates, while other areas experienced increases. The result again is that producers face a complex array of choices across products and election levels available to manage the risks associated with their crop production.

The perennial question faced at this point in the year is: How can one sensibly evaluate their crop insurance options for their own case, reflecting current insurance information and their own farm's operating conditions? The following materials provide one approach for evaluating the most important crop insurance product and election choices facing corn and soybean producers using the University of Illinois *iFARM* crop insurance evaluator.

The case presented is for Sangamon Co., a high yielding county in central Illinois (this case, and similar analyses for approximately 675 other counties throughout the midwest for both corn and soybeans under both basic and enterprise elections are available at the *farmdoc* website in the crop insurance section [here](#)).

The case farm information and starting price conditions are shown in the table below. It is assumed that the farm qualifies for the Trend Adjusted APH endorsement which takes its average Corn APH from 179 to 187. The county standard deviation of yields is estimated to be about 19 bu./acre and the farm yield risk is about 4.5 bu./acre higher. Some basic risk information is given related to yield risk (e.g., 1 in 10 years the farm yield will be below 155.91, 1 in 5 years the county will be less than 172.44 and so on), and the average gross revenue with no insurance is calculated at \$967/acre. The gross revenue calculation reflects the negative correlation between the yield and prices, as well as simulated local basis conditions. The average futures price is a result of the process used to model the price distribution implied by the options markets for the settlement period and can differ from current futures prices at any point in time. Consistent with RMA rules, the APH and Trend APH are rounded to nearest whole bushels, and other features of the indemnity calculations are maintained to comply within RMA rules and procedures.



Crop Insurance Evaluation Model



Case Farm Information

County: Sangamon	Crop: Corn		Farm Yield	County Yield
Farm Average Yield	187.3 bu./acre		<i>bu./acre</i>	<i>bu./acre</i>
Farm St. Dev. of yield	23.50 bu./acre	30% of years yields below:	177.10	179.33
County Average Yield	187.3 bu./acre	20% of years yields below:	168.63	172.44
County St. Dev. of yield	19.02 bu./acre	10% of years yields below:	155.91	161.95
Average Futures Price	\$5.57 /bu	5% of years yields below:	144.61	152.49
St. Dev. of Price	\$1.27 /bu	Farm Trend Adjusted-APH	187	<i>bu./acre</i>
Ave. Harvest Cash Basis	\$0.35 /bu	County TA Rate	1.88	<i>bu./acre/yr</i>
Average Gross Crop Rev.	\$967 /acre	Farm APH (ref)	179	<i>bu./acre</i>

- case: Enterprise unit on 320 acres. Projected price of 5.65

as of date: 2/28/2013

The next table shows approximate premiums and guarantee values for the available products, unit decisions, and coverage levels in this county for the case farm shown. The group products are calculated assuming 100% liability price elections. Importantly, the revenue guarantee levels are calculated with reference to the underlying Projected Price which does not account for local basis.

As is the case across the majority of the corn production region, the Enterprise policy is much less expensive than Basic or Optional coverage, both because of the lower risk represented, and the higher subsidy rates associated with Enterprise coverage. Moreover, the policies with the Harvest Price Exclusion are also considerably less expensive. Under RP-HPE, the guarantee level is dependent on current projected prices and does not increase if harvest prices are higher. Under RP, if the Harvest price is higher than the projected price, the guarantee increases to reflect the higher price. Currently, December corn futures prices are slightly below the projected price, but November soybean futures prices are much lower than the projected price used in the indemnity calculations, thereby increasing the relative attractiveness of RP-HPE relative to RP at the time of sign-up. Given the experience in 2012 where harvest prices were significantly elevated due to the drought effects on yield, the RP products paid out considerably better, and thus provide better risk protection so it is understandable if the relative advantage of HPE products does not result in widespread use. The lower section of the table shows the revenue or yield level guarantee associated with each possible coverage election level. These values reflect RMA's definition of insured yield and revenue and do not translate exactly to minimum receipts for the producer (more detailed price quoting information is also available at the [farmdoc website here](#)).

Sangamon Co. Premiums (\$/Acre)

Coverage	Revenue Protection (RP)			RP- Harvest Price Excl.			Yield Protection (YP)			Area Coverage Products		
	Opt	Basic	Enterp.	Opt	Basic	Enterp.	Opt	Basic	Enterp.	GRP	GRIP	GRIPHPO
50%	\$1.80	\$1.17	\$0.71	\$1.36	\$0.92	\$0.56	\$1.46	\$0.91	\$0.55			
55%	\$2.87	\$1.93	\$1.03	\$1.90	\$1.35	\$0.71	\$2.17	\$1.42	\$0.79			
60%	\$4.33	\$3.16	\$1.55	\$2.56	\$1.88	\$0.84	\$3.09	\$2.14	\$1.19			
65%	\$6.79	\$5.19	\$2.19	\$3.90	\$2.85	\$1.04	\$4.64	\$3.36	\$1.62			
70%	\$9.55	\$7.65	\$3.23	\$5.32	\$4.20	\$1.55	\$6.14	\$4.66	\$2.20	\$4.15	\$4.60	\$4.85
75%	\$14.93	\$12.56	\$5.57	\$8.11	\$6.81	\$2.63	\$8.88	\$7.04	\$3.40	\$4.75	\$6.36	\$8.30
80%	\$24.91	\$22.15	\$11.79	\$13.71	\$12.08	\$5.59	\$13.72	\$11.43	\$6.45	\$7.09	\$10.44	\$13.35
85%	\$38.61	\$35.68	\$23.78	\$21.27	\$19.56	\$11.56	\$19.73	\$17.11	\$11.85	\$11.29	\$22.11	\$27.36
90%										\$20.33	\$42.96	\$52.34

Com - Enterprise on 320 Acres Projected Price of 5.65 and vol. factor of 0.20 used.

Guarantees

Coverage	RP Indem.	YP Indem.	GRP	GRIP
	Revenue	Yield	Yield	Revenue
50%	\$528	93.5		
55%	\$581	102.9		
60%	\$634	112.2		
65%	\$687	121.6		
70%	\$740	130.9	127.0	\$717
75%	\$792	140.3	136.0	\$769
80%	\$845	149.6	145.1	\$820
85%	\$898	159.0	154.2	\$871
90%			163.3	\$922

These tables allow a quick comparison of the costs and coverages available across alternative products, coverage levels, and unit designations. The farmer -paid premiums and Guarantee levels are based on the case farm and location presented for available products. A qualified insurance agent should be contacted for final values.

The remainder of the presentation focuses on Enterprise units as many farmers will find Enterprise policies to be a better choice because the policy will be less expensive and more related to overall revenue from the crop insured. Comparable analyses considering Basic units are available at the *farmdoc* website for those interested.

The following table provides the average payments per acre expected if this year's conditions were repeated over and over, a large number of times across all possible outcomes, and the average across all iterations calculated. As shown in the table, the payments increase as election levels increase reflecting the increased value of coverage for all insurance products. The Yield Protection policy would be expected to make average payments of \$9.80 at the 85% election level over a large number of times. Of course, many years the payments will be zero, and some years the payments would be much higher. Notice that the RP policy always is expected to make larger payments than the RP-HPE policy, but not always by as much as the difference in premium costs. Under an 85% election, for example, RP would be expected to make indemnity payments of \$37.04 per acre on average over a large number of years, while the RP-HPE policy would make average payments of \$32.95. The highest coverage GRIP policies also have the highest average payments and the HPO policy has the highest average payments to accompany its higher premium cost (note: unlike RP-HPE, the Group policy option requires an election into the harvest price option GRIP-HPO, rather than opting out or excluding the option as in RP-HPE).

Average Insurance Payments/Acre

Coverage Election	YP	RP-HPE	RP	GRP	GRIP	GRIP-HPO
50%	\$0.03	\$0.03	\$0.04			
55%	\$0.09	\$0.23	\$0.27			
60%	\$0.23	\$0.80	\$0.93			
65%	\$0.52	\$2.28	\$2.59			
70%	\$1.16	\$5.38	\$5.96	\$0.71	\$4.71	\$5.28
75%	\$2.47	\$10.95	\$12.12	\$1.62	\$10.44	\$11.77
80%	\$5.03	\$19.86	\$22.12	\$3.49	\$20.15	\$22.96
85%	\$9.80	\$32.95	\$37.04	\$7.15	\$35.45	\$40.76
90%				\$13.97	\$56.87	\$66.35

Next, a table is provided with the frequency of payment, or the fraction of years that at least some payment would occur. As can be seen in the table, the YP policy makes payments in about 12% of years at an 85% election and virtually never gets triggered at lower coverage levels. The revenue policies increase in frequency faster as coverage levels are increased due to the possibility of price movements also generating claims even under near typical yields. In the case of RP at 85%, a farm with these characteristics would expect to a claim in about 33% of the years. YP by contrast will pay in only about 12% of the cases over a long period of time. Group policies, while they tend to pay in high frequencies at high elections, are less correlated with revenue shortfalls and thus may provide less risk protection.

Frequency of payment

Coverage Election	YP	RP-HPE	RP	GRP	GRIP	GRIP-HPO
50%	0.1%	0.1%	0.2%			
55%	0.2%	0.6%	0.7%			
60%	0.4%	1.7%	1.9%			
65%	0.8%	3.9%	4.2%			
70%	1.8%	8.1%	8.7%	0.6%	4.2%	4.7%
75%	3.4%	13.4%	14.6%	1.3%	8.0%	9.1%
80%	6.7%	20.6%	22.6%	2.8%	14.1%	16.3%
85%	11.9%	29.4%	32.6%	5.7%	22.5%	26.4%
90%				11.0%	32.3%	39.2%

The next table combines information from the previous tables and presents the net cost of insurance expected over time given the starting conditions of the farm and the insurance provisions for this year. Net cost is defined as the farmer paid premium less the average payment received. A negative "cost" indicates that the product pays back more on average than it costs -- as would often be expected given the overall target loss ratio of approximately 1.0, and the fact that the farmer paid portion of the premium is subsidized to encourage participation. As shown in the table, Revenue Protection pays back on average about \$13.26 more than its premium cost while under RP-HPE a producer would expect to gain \$21.39 over the long run by purchasing this insurance. Although sometimes counterintuitive, numbers in parentheses that are larger are more negative and are thus more preferred. Higher positive numbers are associated with larger net costs through time. A zero would be a breakeven policy that paid back just what it cost over time. Recall that the RP policy pays more on average and in more years, but the lower

premium cost of the HPE policy more than offsets the payment differences in this case. GRP has a net cost that is positive indicating that even with subsidy considered, it is not expected to return even the producer paid portion of the premium, and the GRIP policies do generally return about the amount of subsidy through time as expected.

Estimated Net Average Cost of Insurance

Coverage Election	YP	RP-HPE	RP	GRP	GRIP	GRIP-HPO
50%	0.52	0.53	0.67			
55%	0.70	0.48	0.76			
60%	0.96	0.04	0.62			
65%	1.10	(1.24)	(0.40)			
70%	1.04	(3.83)	(2.73)	3.44	(0.11)	(0.43)
75%	0.93	(8.32)	(6.55)	3.13	(4.08)	(3.47)
80%	1.42	(14.27)	(10.33)	3.60	(9.71)	(9.61)
85%	2.05	(21.39)	(13.26)	4.14	(13.34)	(13.40)
90%				6.36	(13.91)	(14.01)

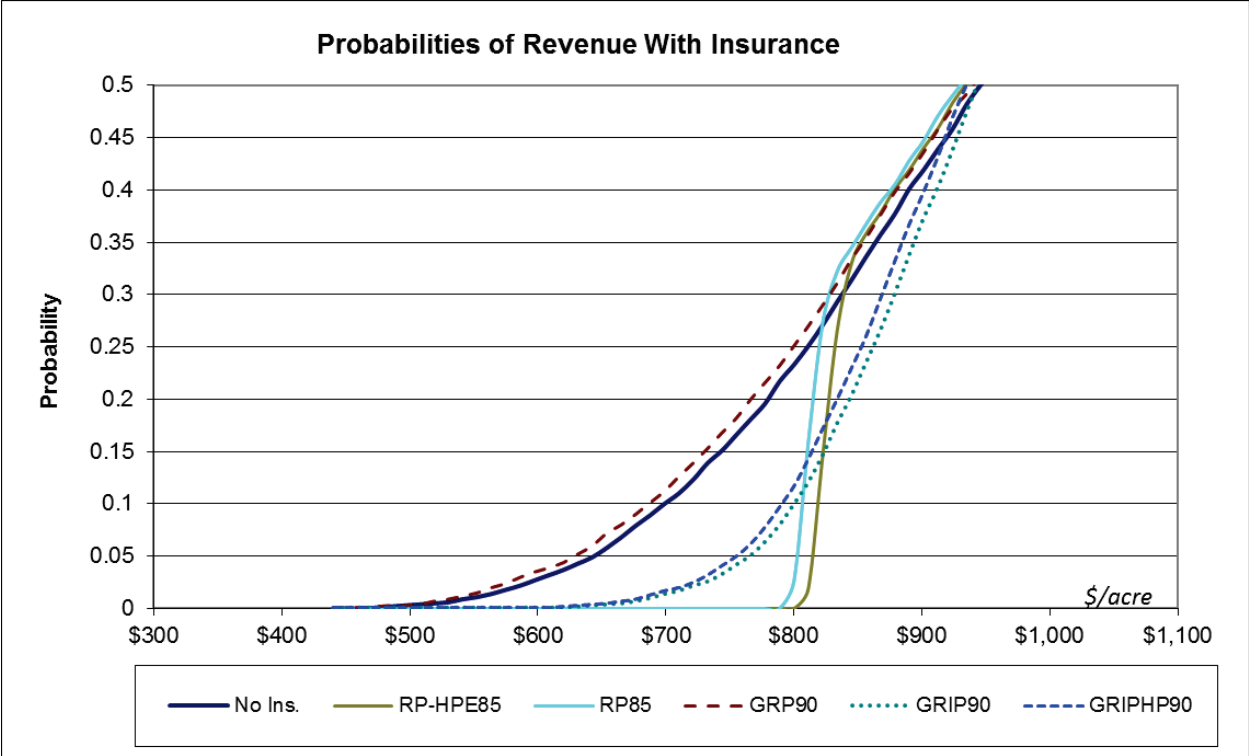
Net cost does not provide a complete picture of the impact of insurance usage however as it is also important to understand the impact of insurance on the likelihood of experiencing particularly low revenues. For example, one might be most interested in which insurance allows a farmer to bid most for cash rent, or insure that all variable costs can be covered, or do the best job of offsetting particularly low revenue outcomes under hedged production, and so on. One way to begin to understand this type of impact is to examine the VARs or "Values at Risk" under different insurance contracts. A 5% gross revenue VAR, for example, shows the value at which 5% of the possible outcomes fall below, and 95% of the outcomes exceed. The table below shows the 5% VARs for the various insurance products and elections to better help appreciate the relatedness of payments to revenue shortfall. Notice that with no insurance, the 5% VAR for revenue is about \$643 meaning that in 5% of the cases, revenue would be below that value. Using YP insurance generally simply limits the possible cases to about that same value. RP and RP-HPE do a far better job of "cutting off the low tail" of the revenue distribution and provide substantially better downside risk protection. A producer considering covering \$775 in total production costs would thus likely find higher elections of the revenue products most appealing. The GRP policy actually makes the risk position slightly worse in this case, and the GRIP policies, while paying slightly higher totals through time, do not do as well at limiting downside revenue risk. Payments from the GRIP policies are simply less correlated with farm-level revenues and thus can occur when not needed as much or occur when not as needed to cover crop revenue shortfalls.

VAR at 0.05

Coverage Election	YP	RP-HPE	RP	GRP	GRIP	GRIP-HPO
50%	\$642.70	\$641.86	\$641.71			
55%	\$642.68	\$641.71	\$641.39			
60%	\$642.39	\$641.58	\$641.30			
65%	\$643.44	\$644.45	\$643.30			
70%	\$643.36	\$679.16	\$677.48	639.54	665.26	666.12
75%	\$644.35	\$723.47	\$720.53	638.94	690.94	690.14
80%	\$644.48	\$770.60	\$764.40	636.78	718.16	716.24
85%	\$644.95	\$815.03	\$802.81	634.27	741.91	739.17
90%				627.36	763.39	759.38
5% Value at risk without insurance			643.25			

The final information presented in the graph below helps summarize the impacts across the lower tail of the revenue distribution. The bottom axis gives levels of gross revenue with insurance payments, less premiums paid. The vertical axis shows the probability of occurrence. Because distributions with higher likelihood of higher revenue are preferred, lines to the bottom and right are preferred to those above and to the left in this graph. The dark blue line provides the possible revenue outcomes with no insurance. For example, there is a 5% chance of revenue with no insurance being below \$644 and a 10% chance of revenue being below \$698, a 25% chance of being below \$810, and so on without insurance. Purchasing insurance has two types of consequences on the revenue distribution -- first, it shifts the whole schedule left by the amount of the premium. Then, it adds back payments to outcomes covered by insurance, there by shifting specific portions of the revenue distribution back to the right. Ideally, insurance should make payments when revenue is lowest and not make payments when revenue is highest resulting in an overall shift in the revenue distribution to the right at lower revenue levels, and resulting in lower revenues when only premiums are paid and no indemnities are paid (top portion of the curves are not shown in the graph, but would be shifted to the left of the no-insurance case). As can be seen in the graph, GRP actually reduces the revenue distribution relative to no insurance over most of the lower half (probability less than 50%) of the revenue distribution. YP (omitted from the graph) has almost no effect compared to no insurance, roughly covering its own cost, but not much more or less. RP 85% and RP-HPE 85% do the best job of "cutting off the tail" of the revenue distribution with minimum revenues of roughly \$800 guaranteed in most cases. The GRIP outcomes are interesting in that they pay back more than premiums over a large range of revenues, but do not protect against particular revenue shortfalls as well and in years with high crop revenue actually cost the most in terms of total revenue due to their higher initial premiums.

Similar patterns to these results occur with soybeans, although with more muted magnitudes, and in many locations with relatively less valuable group options. These cases and cases involving Basic units are also provided at the *farmdoc* website for most counties covering the majority of the corn belt plus Maryland.



Crop insurance is increasingly viewed as providing the cornerstone for active risk management programs, and its importance is elevated in environments with higher input costs and greater margin risk. The differences in underlying rates and starting price and volatility conditions can substantially impact the relative performance of the alternatives from year to year, and across different operations within a given year. Hopefully the *iFARM* Crop Insurance Tools will provided producers with insights needed to make informed crop insurance decisions most suitable for their own operations.

Visit the crop insurance tools section of farmdoc on the web [here](#).

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