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Crop Insurance Decisions for 2020

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The 2020 price discovery period used to determine projected prices and volatility factors for Federally-sponsored corn and soybean crop insurance products is completed for areas with a 3/15 sales closing date (SCD). For the majority of the Cornbelt, the approved Projected Price (PP) for corn is $3.88 and the Volatility Factor (Vol) is .15, and for soybeans, the Projected Price is $9.17 with a Volatility Factor of .12.

Table 1 below contains Projected Prices, Volatility Factors, and Harvest Prices for the previous 10 years. The Projected Price (PP) and Harvest Price (HP) are used to determine guaranteed revenue based on futures prices, and do not reflect the local cash 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 during February. 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.

Table 1. Projected Prices, Harvest Prices, and Volatilies, Corn and Soybeans, SCD 3/15 (RMA)

Corn	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Proj Price	6.01	5.68	**5.65**	**4.62**	**4.15**	**3.86**	**3.96**	**3.96**	**4.00**	*3.88*
Harvest Price	**6.32**	**7.50**	4.39	3.49	3.83	3.49	3.49	3.68	3.90	*?*
Volatility	0.29	0.22	0.20	0.19	0.21	0.17	0.19	0.15	0.15	0.15
Soybeans										
Proj Price	**13.49**	12.55	12.87	**11.36**	**9.73**	8.85	**10.19**	**10.16**	**9.54**	*9.17*
Harvest Price	12.14	**15.39**	12.87	9.65	8.91	**9.75**	9.75	8.60	9.25	*?*
Volatility	0.23	0.18	0.17	0.13	0.16	0.12	0.16	0.14	0.12	0.12

For corn, the projected price is $.12 below last year's PP, and for soybeans $.37 lower than for 2019. As a result of lower PPs, coverage will be less in 2020 as compared to 2019 if the same coverage level has been selected and the Actual Production History (APH) yield has not changed greatly. The volatility factor summarizes the market's estimates of the likelihood for price movements of various magnitudes,

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and has corresponding impacts on premiums paid for Revenue and Harvest Price related products. All else equal, lower volatilities result in lower premiums and vice versa, though other ratings changes from year to year often outweigh the direct effects. This year's volatility estimates are the same as in 2019, suggesting that the market's estimates of likely price changes has not changed greatly from 2019 to 2020.

The higher of the PP or HP is in bold each year in the table. Interestingly, corn Harvest Prices have not exceeded PPs since the drought year of 2012, in large part due to the exceptional run of relatively high yield years since 2013, and recently due to increased trade uncertainty impacts. Soybeans have a nearly similar story except for 2016, again largely explained by production patterns and basic supply and demand conditions. Both volatility factors are the same, but are at low levels relative to anytime prior to 2018. The lower PPs and volatility factors both make the cost of insurance lower, all else equal.

At the time of this writing -- near the beginning of the insurance period, the November 2020 soybean futures price is about 9.085, or $.085 a *below* the Projected Price, and the corn futures price of $3.765 is more than a dime below the projected price. When actual futures prices are below the Projected Prices, there is a higher likelihood for experiencing an insured revenue shortfall because the insured price is somewhat above the market's estimate of actual value; but the harvest price option decreases in relative value as it is then less likely that prices will end the insurance period above the Projected Price. When actual futures prices are higher than the projected price, there is an increased likelihood that products with the harvest price option embedded will result in an increase in guarantee value, but part of the market's view of actual value is omitted from the insured portion. Importantly, the premiums for crop insurance products do not change in response to different price paths experienced during the establishment of the PP even though the values of coverage provided across different products are directly affected. In other words, the value of RP insurance is increased if the average price during February is above the futures price during the sales period, and the value of RP insurance is decreased if the average price during February is below the futures price during the sales period, but the cost of insurance is unaffected by either case. This fact can substantially influence the net cost of insurance from year to year, and can have a material effect on relative desirability of different products and coverage levels.

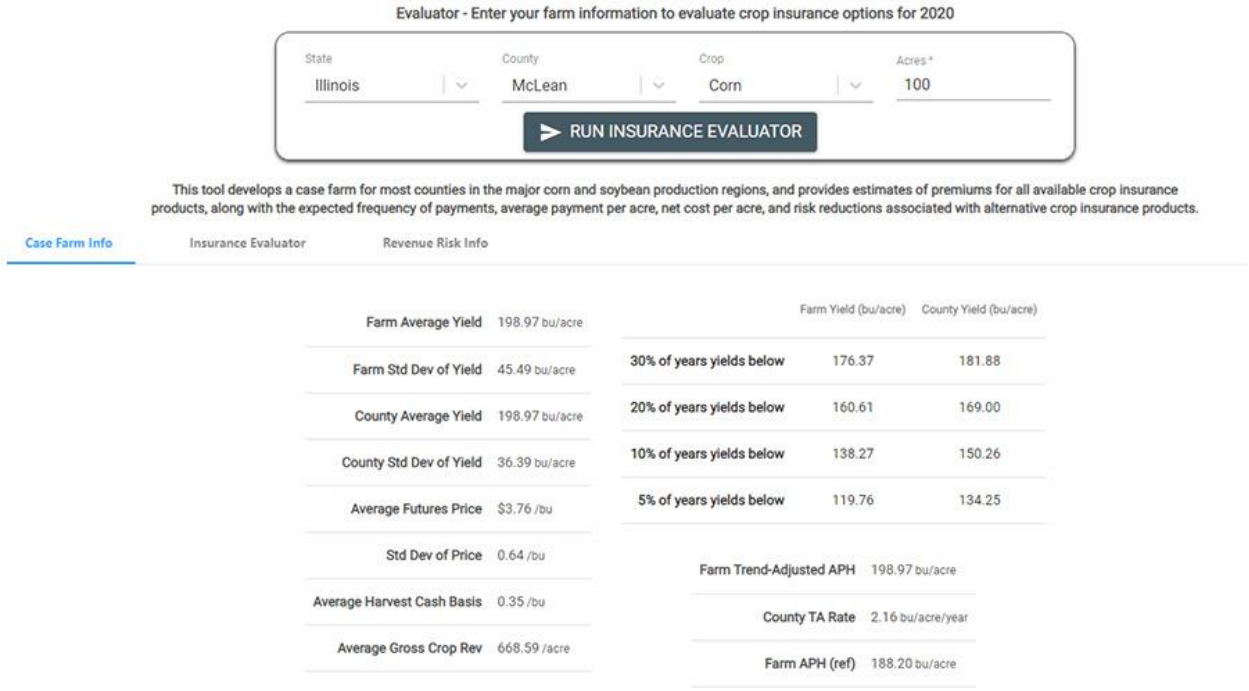
The question faced each year at this point on the calendar is: How can one sensibly evaluate their crop insurance options for their own case, reflecting current insurance information, current price expectations, and their own farm's operating conditions? The following materials provide one approach for 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 McLean County, a large and high yielding county in central Illinois. This case, and similar analyses for approximately 750 other counties throughout 11 states (IL, IN, IA, MD, MI, MN, ND, OH, SD, and WI) largely across the Midwest for both corn and soybeans under both basic and enterprise elections are available at the *farmdoc* website in the crop insurance section at: https://fd-tools.ncsa.illinois.edu/evaluator

The tool is free to use, but users need to register with their email and a chosen password. Importantly, there can be large differences in premiums even over short distances or among contiguous counties, and over the choice of unit and APH endorsement. Thus, while the case farm information provided for each county is helpful in understanding the relationships among choices, it is important to compare to conditions that most closely match your own case. It is also important to carefully discuss final options and decisions with a qualified insurance agent to insure accurate information about the specific costs.

The case farm information shown below is from McLean County, Illinois with starting price conditions are shown in the table below. It is assumed that the case farm qualifies for the Trend Adjusted APH endorsement which takes its average Corn APH from 188.2 to 198.97. The case shown is for a basic Unit on 100 acres (the online version can be selected for any county/crop of interest and toggled across units, and at actual acreage). The county standard deviation of yields is estimated to be about 36.39 bu./acre and the farm yield risk is about 9 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 138, 1 in 5 years the county will be less than about 134 and so on), and the average (cash basis adjusted) gross revenue with no insurance is calculated at approximately $669/acre. The gross revenue calculation reflects the negative correlation between the yield and prices, as well as simulated local basis conditions and starting prices. The

average futures price reflected in the 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, and importantly is connected to the actual futures prices, not the RMA Projected Price. This number updates regularly as market conditions change as well. 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. The table below shows the case farm information for McLean County in more detail.



The next table shows information grouped by type of policy across coverage levels. There are three blocks of results with the left-side collection related to Revenue Protection (RP) policies (by far the most commonly purchased), the center block corresponding to RP-Harvest Price Exclusion or RP-HPE policies, and the right side set for Yield Protection or YP policies. The table has information for each type of policy with each row corresponding to a different coverage level from 50% to 85%. The County-level products shown in a following table are calculated assuming maximum protection levels in all cases, and maximum protection factor of 1.2 for Area products. For each insurance policy choice, there are five columns that show:

1. the Farmer-Paid Premium per Acre (Est Premium) – gives the costs of the product for a representative case. An 85% RP policy has a $12.60 per acre premium
2. the Average Payment per acre (Avg Payment) – gives the average expected payment from the insurance product. The average payment for 85% RP is $46.08 per acre. Over time, payment from the product will equal this value. Some years payments will equal $0, and some years the payments be positive. The average of all those payments equals $46.08 for an 85% RP policy.
3. the Frequency that the policy makes a payment (Payment Frequency) – gives the percent of time the policy will make a payment. For 85% RP policies, the frequency of payments is 37.9%, meaning that this policy will pay in slightly more than one-third of the time.
4. the Net Cost of insurance – gives estimated premium minus average payments. Over time, this value represents the “cost” of the insurance policy. Negative costs indicate that the policy hodles should expect the payments from the policy to exceed the farmer-paid premium. All costs in the table below are negative. The 85% RP policy has a -$33.48 net cost. Negative values result because there is significant Federal-assistance provided for crop insurance premiums

There is a separate tab accessible by navigating to the Revenue Risk section that also shows graphically and numerically how each product limits downside risk in addition to the impacts on the averages.

Case Farm Info | Insurance Evaluator | Revenue Risk Info

Individual Farm Level Policies

Unit: Enterprise

Coverage Level	Revenue Protection (RP)					Revenue Protection With Harvest Price Exclusion (RP-HPE)					Yield Protection (YP)				
	Est. Premium /Acre ($)	Avg. Payment /Acre ($)	Payment Frequency (%)	Net Cost /Acre ($)	Avg. Gross Rev ($)	Est. Premium /Acre ($)	Avg. Payment /Acre ($)	Payment Frequency (%)	Net Cost /Acre ($)	Avg. Gross Rev ($)	Est. Premium /Acre ($)	Avg. Payment /Acre ($)	Payment Frequency (%)	Net Cost /Acre ($)	Avg. Gross Rev ($)
50%	0.34	1.68	2.6%	-1.34	670	0.30	1.04	1.8%	-0.74	669	0.28	1.23	1.8%	-0.95	669
55%	0.48	3.14	4.4%	-2.66	671	0.37	1.99	3.4%	-1.62	670	0.38	2.20	2.9%	-1.82	670
60%	0.70	5.55	7.0%	-4.85	673	0.45	3.69	5.4%	-3.24	672	0.53	3.73	4.6%	-3.20	672
65%	1.08	9.26	10.9%	-8.18	676	0.52	6.34	8.7%	-5.82	674	0.76	6.11	7.1%	-5.35	674
70%	1.52	14.68	15.4%	-13.16	681	0.67	10.49	12.6%	-9.82	678	1.04	9.59	10.2%	-8.55	677
75%	2.53	22.25	21.2%	-19.72	688	0.97	16.29	17.4%	-15.32	684	1.61	14.51	14.4%	-12.90	681
80%	5.84	32.43	28.8%	-26.59	695	2.36	24.12	23.8%	-21.76	690	3.17	21.17	19.3%	-18.00	686
85%	12.60	46.08	37.9%	-33.48	702	5.56	34.86	32.0%	-29.30	698	5.91	29.98	25.5%	-24.07	692

Enterprise Unit policies shown in the table above cost less than Basic unit policies because of the slightly lower risk represented, and lower higher rates (Enterprise units have the greatest subsidy). To understand the items in the table, consider 85% policies (bottom row) and note that the estimated premiums for this farm in McLean county would be $12.60 per acre with a base guaranteed revenue of $656/*acre* = 199*bu* x 3.88*PP* x .85*coverage*. Under the RP case, if Harvest Prices at the end of the insurance period are higher than $3.88, the guaranteed revenue is adjusted to the higher price. Under RP-HPE policies, the guarantee is fixed and does not increase if the Harvest prices increase. Note that a comparable Basic Unit policy would cost $16.89/acre (not shown in table, available by toggling Unit at website). The RP-HPE policy in the center block would have a premium cost of $5.56/acre, and the YP policy (right side block) would be $5.91/acre

Other rows in the table have comparable information for different coverage levels. As can be seen, scaling back coverage levels can result in substantially lower premiums both because of the lower implied revenue or yield covered, and the lower likelihood of triggering the insurance. The subsidy rate for lower coverage policies is higher than for higher coverage policies with an intent to roughly equalize the dollar value of the subsidy per acre.

Next, the table below shows comparable results, but for County Level or Area products, again for McLean county. These are calculated assuming maximum elected coverage factors.

County Level Products

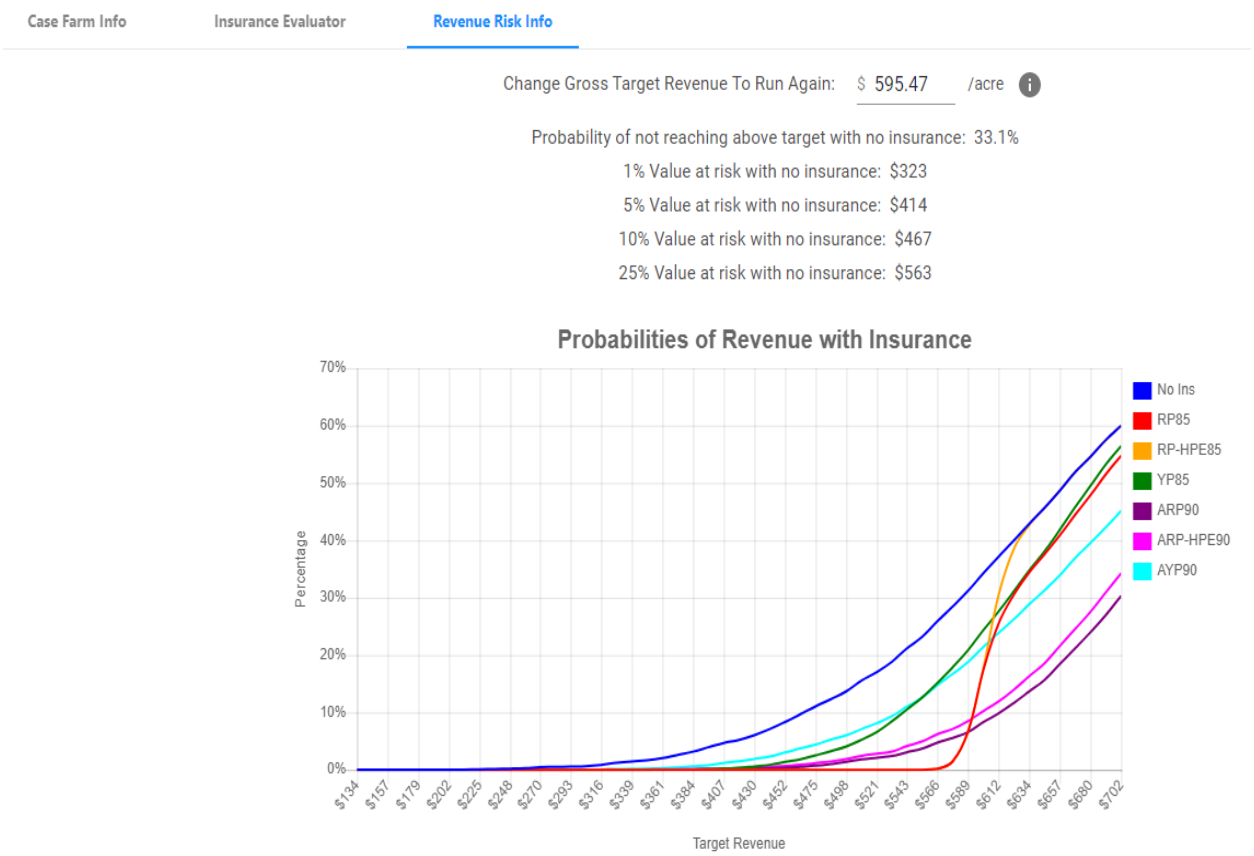
Coverage Level	Area Revenue Protection (ARP)					Area Revenue Protection With Harvest Price Exclusion (ARP-HPE)					Area Yield Protection (AYP)				
	Est. Premium /Acre ($)	Avg. Payment /Acre ($)	Payment Frequency (%)	Net Cost /Acre ($)	Avg. Gross Rev ($)	Est. Premium /Acre ($)	Avg. Payment /Acre ($)	Payment Frequency (%)	Net Cost /Acre ($)	Avg. Gross Rev ($)	Est. Premium /Acre ($)	Avg. Payment /Acre ($)	Payment Frequency (%)	Net Cost /Acre ($)	Avg. Gross Rev ($)
70%	7.00	26.18	10.5%	-19.18	677	4.09	15.43	14.3%	-11.34	691	6.36	17.05	9.3%	-10.69	679
75%	10.48	41.30	18.2%	-30.82	684	6.26	26.36	23.3%	-20.10	704	8.38	25.53	14.0%	-17.15	686
80%	14.26	62.65	28.0%	-48.39	697	8.93	42.37	34.9%	-33.44	722	11.68	37.07	20.4%	-25.39	694
85%	20.94	90.16	39.1%	-69.22	712	13.24	63.86	47.4%	-50.62	746	14.57	52.22	28.6%	-37.65	706
90%	29.19	123.31	51.6%	-94.12	730	18.74	90.39	61.3%	-71.65	773	18.67	71.45	38.4%	-52.78	721

The County Level Policies begin with 70% coverage options and range to 90% unlike farm-level policies that have maximums of 85%. The highest coverage ARP policies also have the highest expected average premiums and payments due to the protection factor allowing a 1.2 scaling of payments to help offset the farm-to-county basis risk that remains due to imperfect correlation between the farm and the county yields. In other words, the payments may occur when not needed, and not occur in years where they are more needed to offset low on-farm revenues. ARP policies have the highest payments through

time, but can result in fairly low risk protection as a result. Finally, shown in the right hand block, the Area Yield Protection policy is triggered directly by the county yield shortfall from its guaranteed fraction of the county's expected yield, but paid as a limited fraction of the shortfall. It again shows fairly high payments, but can result in limited risk protection because of the possibility of localized yield disruptions, and thus a farm could have very low yields but not receive any payments at all because the county yields were relatively unaffected.

While the materials above provide a great amount of information about the expected performance of different insurance policies and coverage levels, they focus primarily on the average through time in each case. However, 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 most consistently cover cash rent plus all variable costs, 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 Revenue Risk and associated revenue levels and their associated probabilities. This type of information is often termed VARs or "Values at Risk" under different insurance contracts. These results are shown in the Revenue risk tab, a screen shot of which is provided below for the McLean county case farm being examined. The results are summarized first in graphical form and also tabulated in terms of the likelihoods of achieving different target revenue levels.

To understand the impact on risk reduction by different insurance policy, the graph tabulates the likelihood of achieving different gross revenue levels (bottom axis) against the probability of occurrence (vertical axis). 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 blue line provides the possible revenue outcomes with no insurance. The entries above the graph give specific percentile and revenue pairs at the 1%, 5%, 10%, and 25% revenue levels. For example, there is about a 25% chance of revenue with no insurance being below $563 without insurance, and a 5% or 1 in 20 year chance of revenue being below $414/acre with no 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, ARP at a 90% coverage level shifts the distribution to the right by its large average payments, but does little to cut off the severe low revenue outcomes. YP (green) has almost a slight effect compared to no insurance, moving the revenue distribution to the right, but still not cutting off the low revenue tail risk. RP 85% and RP-HPE 85% (largely hidden behind the RP line) do the best job of "cutting off the tail" of the revenue distribution with minimum revenues of roughly $570 or more, guaranteed in most cases. The group products in general are interesting in that they pay back more than premiums over a large range of revenues, but do not protect against particularly severe revenue shortfalls. Further, in years with high crop revenue they 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 Area Protection 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. The *iFARM* Crop Insurance Tools are intended to provide 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 at: https://farmdoc.illinois.edu/crop-insurance#tools