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### **Crop Insurance Provides “Low” Cost Price Protection<sup>1</sup>**

Starting in the fall of 2010, the Risk Management Agency (RMA) combined Actual Production History (APH), Income Protection (IP), Revenue Assurance (RA) and Crop Revenue Coverage (CRC) in to a single Common Crop Insurance Policy (CCIP). CCIP provides three types of coverages that include; 1. Yield Protection (YP), 2. Revenue Protection (RP), and 3. Revenue Protection with the Harvest Price Exclusion (RP-HPE).

Corn and soybean farmers who do not cancel or change their crop insurance coverage will have their prior year’s coverage rolled in to the equivalent CCIP coverage. Those farmers with APH, aka MPCl, will have their coverage rolled to Yield Protection (YP) at the same percentage coverage level. Those farmers with CRC or RA with the Harvest Price Option will have their coverage rolled to Revenue Protection (RP) at the same percentage coverage level. Farmers with RA and no Harvest Price Option or IP will have their coverage rolled to Revenue Protection with the Harvest Price Exclusion (RP-HPE) at the same percentage coverage level.

RMA adopted a definition for enterprise units similar to CRC that is based on the number of planted acres (also includes total liability and other measurements in the rating) versus RA’s definition that was based on the number of sections (or equivalent) with planted acres. For some farmers, the RA definition provided a larger enterprise discount that will no longer be

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available. But that may also be true for CRC insureds too because, while similar, the enterprise discounts now includes additional variables besides total planted acres. The other major change is the YP contract will use the same price election as the revenue products. This is a major change because in the past the APH contract often had a lower price election than revenue insurance. This will make it easier for farmers to compare coverage across insurance types. So now the question becomes should one purchase the YP with a lower premium cost but the same price election as the revenue products?

**Endorsements and Definitions.** RMA's new Common Crop Insurance Policy (CCIP) effectively uses the Yield Protection (YP) contract as the base contract. The YP contract plus the harvest price and revenue endorsements is equal to the Revenue Protection (RP) contract. Farmers are allowed to delete the harvest price and create the Revenue Protection with the Harvest Price Exclusion (RP-HPE) contract that equals YP plus the revenue endorsement only. Notice farmers are not allowed to eliminate the revenue endorsement and retain the harvest price endorsement.

The yield protection under CCIP is the same in all three contracts, YP, RP, and RP-HPE. Most of the CCIP premium pays for the yield protection share of the contract. This is obvious when one compares the payout from all three contracts under different price and yield scenarios. Because the yield guarantees are the same, then the harvest price and revenue endorsements cover the price risk to create revenue products.

The harvest price endorsement is a yield adjusted Asian call option and the revenue endorsement is a yield adjusted Asian put option. The yield adjusted Asian options have some fundamental differences from the options traded in Chicago, Kansas City, and Minneapolis. The yield adjusted Asian options are settled on a monthly average closing futures price (October average closing prices of the CME December, 2011 corn contract for most states) versus a spot market settlement price. The Asian option has no exercise rights, and they are adjusted for yield. However the largest difference is between Board traded puts and the yield adjusted Asian "put" in Revenue Protection is this put will take on negative values if there are insurable yield losses and higher prices. The revenue endorsement has some characteristics that are closer to a hedge than an option. Farmers can eliminate any possibility of negative values for the revenue endorsement if they also purchase the harvest price. **The purchase of RP will eliminate any negative values for the Asian put option that is only possible with the RP-HPE.**

Because the options traded on the exchanges have a fixed yield of 5,000 bushels is the reason they are more expensive than those options adjusted for yield. The government provides about a 50% premium cost share, so even if one doubles the premium for the yield adjusted Asian options, the premiums on corn are less than 2 cents per guaranteed bushel (less than 4 cents without government cost share) versus about a 70-80 cent premium for December CME corn options.

**Example Farm Calculations.** A corn farm was created with the following values to compare the differences in indemnity payments for YP, RP, and RP-HPE, under different price and yield scenarios.

The example corn farm has the following values:

APH proven Yield	173.3
Coverage Level	75%
Guaranteed Bushels	130 bu.
Base (Planting) Price <sup>1</sup>	\$6.01
Maximum Price	\$12.02
Coverage	\$781.30

<sup>1</sup>The base price for Corn Belt states is the average of closing prices of the December 2011 CME corn contract for the trading days from February 1, 2011 through February 28, 2011. The example used the 2011 \$6.01 price election.

This grower's yield guarantee would equal 75% coverage times 173.3 bushel APH equals a 130 bushel guarantee (figure 1). A YP contract would require an insurable yield loss to trigger payments. For this example farm, it will require a yield below 130 bushels. If this corn farmer has a yield of 100 bushels, it would generate a yield loss of 30 bushels below the 130 bushel guarantee times a \$6.01 price election equals the indemnity payment of \$180.30 (table 1). Notice that neither increasing nor decreasing prices have any impact on the YP indemnity payments. For this corn farmer the indemnity payment is \$180.30, whether the current market price is \$4.51 or \$8.01.

Moral hazard becomes a concern with YP when prices are low, e.g. a \$6.01 harvest price that will not affect the indemnity payment. However, the YP insurance contract will pay \$6.01 for each indemnity bushel. Farmers that have already suffered a 25% yield loss, then have an economic incentive to lose the rest of the crop. These economic incentives can cause a difficult loss adjustment because some farmers may argue the "ground is too muddy" to harvest. The moral hazard is less with revenue insurance products because if prices decline, farmers will be paid for the price loss even if they don't have a yield loss. Growers also need to remember that a low yield will show up in their future lower APH and cause a rate increase. Also a good experience discount appears to be under consideration but no details. There is no guarantee that a good experience discount will be offered but if farmers are "generating" losses, they would not receive any good experience discount. Finally, if it is clear that harvest could have been completed, RMA/insurance company may deny the claim.

**Comparison of YP and RP.** Because the price elections are the same the comparison is straight forward. The harvest price endorsement will turn YP in to yield replacement coverage. This feature assures farmers who forward price corn and other grains using forward contracts, hedge to arrive, puts, windows, etc. will either have bushels or enough dollars to replace those guaranteed bushels at current market value to offset those marketing positions.

Effectively RMA is adding a yield adjusted Asian call and a yield adjusted Asian put to the YP contract to create a yield replacement contract combined with a revenue insurance contract, titled Revenue Protection (RP). The Asian call option (harvest price) attaches at zero yield (figure 1). If the market were to increase from \$6 to \$7, the CME \$6 call would be worth \$1 plus time value, irrespective of yield. The harvest price is worth a dollar only at zero yield and has no time value. If the yield increases the harvest price loses value and

expires worthless if the yield is greater than the guaranteed bushels (130 bushels in this example).

Table 2 shows the value of the harvest price “call” at different yields and prices. The only point on the yield curve where the harvest price “Asian call” equals the value of a CME call is at zero yield and when the option expires with no time value remaining (figure 1). For example if a CME call were purchased on the guaranteed bushels the call would be worth \$130 or 130 bushels times \$1. Because CME options trade in 5,000 bushel increments, it is unlikely that farmers can exactly match the guaranteed bushels in their YP contract. Of course this is not the total indemnity payment, because farmers are also paid for the yield loss or the same payment as provided by YP.

The Asian put option (Harvest Price Exclusion) attaches at the guaranteed bushels (figure 1). If the market were to decrease from \$6 to \$5, the CME \$6 put would be worth a \$1 plus time value, irrespective of yield. The “Asian put” in revenue insurance is worth a dollar only at the guaranteed bushels (130 bushels in this example) and has no time value. If the yield decreases the “Asian put” in revenue insurance will lose value and will be worthless at zero yield. Table 3 shows the payout from the yield adjusted Asian put in RP-HPE under different yields and prices. The underlying yield guarantee in YP will pay the entire loss. At zero yield the YP and RP-HPE will pay the same, even though the premium for RP-HPE is higher than the YP premium in nearly all cases. The “yield adjusted Asian put” in revenue insurance will also lose value when yields increase above the bushels guaranteed and if yields are high enough the “yield adjusted Asian put” will also expire worthless.

A CME put option will expire worthless at expiration if prices increase. The “yield adjusted Asian put” in revenue insurance will take on **negative values** when yields are below the guaranteed bushels and prices increase. Because the “yield adjusted Asian put” will take on negative values when prices increase and yields are below the guaranteed bushels, is the reason that YP will pay more than RP-HPE under this scenario. If farmers don’t exclude the harvest price, then when yields are below the guaranteed bushels and prices increase the harvest price will kick in with higher payments. Farmers effectively receive the yield adjusted Asian option that pays the most, either the “put” or the “call”.

Table 4 shows the payments of RP that has included the harvest price under different yields and price scenarios. Effectively RP is the YP coverage plus it includes both the yield adjusted Asian put and call. If the harvest price were to equal the base price (a very unlikely outcome) then both yield adjusted Asian options would expire worthless, and YP, RP and RP-HPE would all pay identical indemnity payments. When farmers compare the difference in payments under different price and yield scenarios, then it is clear that RP-HPE equals YP payment plus any payment for the yield adjusted Asian put that can also take on negative values. RP equals the YP payment plus the yield adjusted Asian option that has the greatest value. Clearly the revenue insurance has more risk protection than YP or RP-HPE, but is the harvest price in RP worth the extra premium?

**Revenue and harvest price endorsements are “cheap”.** Clearly an option purchased from the CME has more value than the revenue endorsement (“put”) and harvest price

endorsement (“call”). Currently an at the money CME corn option is costing about 70-80 cents a bushel. If one were to buy both a call and a put it would cost about \$1.60 per bushel (not recommended).

RP-HPE has a “put” cost per bushel equal to RP-HPE premium minus YP premium divided by guaranteed bushels. For example, RP-HPE premium = \$7.13 minus YP premium = \$7.23 equals a difference of -\$0.10 divided by 130 bu. = -0.1 cents per guaranteed bushel. Effectively RMA is paying the grower to take the put (If this Iowa example had been at 80% coverage, the put premium would have been positive).

RP has a “call” cost per bushel equal to RP premium minus RP-HPE premium divided by guaranteed bushels. For example, RP premium = \$11.89 minus RP-HPE premium = \$7.13 equals a difference of \$4.76 divided by 130 bu. = 3.7 cents per guaranteed bushel.

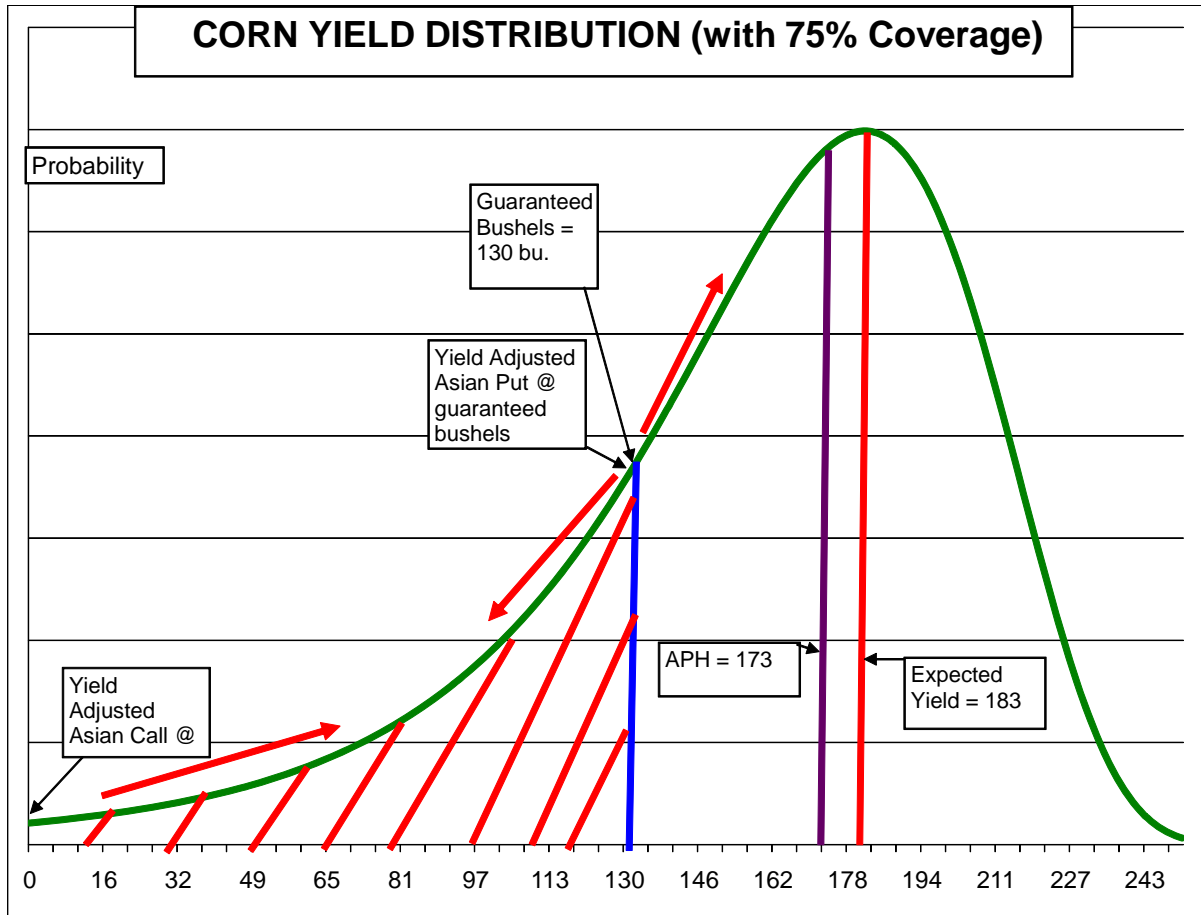
Many farmers receive both options for less than 4 cents per bushel, while a single CME option would cost about 70-80 cents. Farmers need to remember if they elect the Harvest Price Exclusion then the revenue endorsement guarantee may take on negative values. Because RP includes both yield adjusted Asian options, RP payments will depend on the level of yield produced because in nearly all cases prices will either increase or decrease and will cause one of the Asian options to be in the money.

The yield protection is the “expensive” part of revenue insurance contracts. Iowa corn farmers would likely expect corn market prices to increase if their crop fails but that is not true for Kansas corn farmers. Also farmers who forward price their grain will benefit from buying the harvest price. This will guarantee the expected corn bushels at their current market replacement value. This effectively expands the marketing window from 9 months or more before harvest to 9 months after harvest. Because basis is often weak at harvest, there has been a real advantage to having on farm storage as a part of the total risk management plan. However, farmers must first purchase the revenue endorsement (RP-HPE) before RMA will allow farmers to purchase the harvest price (RP).

The revenue endorsement does not require an insurable yield loss to trigger payments. It only requires prices to decline and there is no longer any limit on the downside price protection. The 2008 soybean contract paid on the revenue endorsement (Asian put) with yields greater than farmers’ APH. This is unlikely to occur but it has happened. Even if one has already priced their new crop so they have no downside price risks, the revenue endorsement is still a “low cost” method to add additional price protection.

Revenue insurance was never intended to replace a good marketing plan. Once farmers plant their crop they have no choice but to sell it; one cannot store it forever! Adding the revenue endorsement and harvest price to create Revenue Protection, provides “low cost” price protection when compared with premiums for market traded options. RP will reduce the risk of forward marketing grain and will likely improve access to credit for financing an aggressive marketing plan.

**Figure 1. The attachment points on the yield curve for crop insurance yield coverage, yield adjusted Asian Put, and a yield adjusted Asian call.**



**Table 1. The YP indemnity payments for a corn farm with a \$6.01 price election, a 173.3 bushel APH, and 75% coverage under different price and yield scenarios.**

Hvst Price	4.51	5.01	5.51	<b>6.01</b>	6.51	7.01	7.51	8.01
Yield								
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>130</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
115	90.15	90.15	90.15	90.15	90.15	90.15	90.15	90.15
100	180.30	180.30	180.30	180.30	180.30	180.30	180.30	180.30
85	270.45	270.45	270.45	270.45	270.45	270.45	270.45	270.45
70	360.60	360.60	360.60	360.60	360.60	360.60	360.60	360.60
55	450.75	450.75	450.75	450.75	450.75	450.75	450.75	450.75
40	540.90	540.90	540.90	540.90	540.90	540.90	540.90	540.90
25	631.05	631.05	631.05	631.05	631.05	631.05	631.05	631.05
10	721.20	721.20	721.20	721.20	721.20	721.20	721.20	721.20
0	781.30	781.30	781.30	781.30	781.30	781.30	781.30	781.30

**Table 2. The additional indemnity payments generated from the yield adjusted Asian call in the Revenue Protection contract for a corn farm with a \$6.01 price election, a 173.3 bushel APH, and 75% coverage under different price and yield scenarios.**

Hvst Price	4.51	5.01	5.51	<b>6.01</b>	6.51	7.01	7.51	8.01
Yield								
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>130</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	0.00	0.00	0.00	<b>7.50</b>	<b>15.00</b>	<b>22.50</b>	<b>30.00</b>
100	0.00	0.00	0.00	0.00	<b>15.00</b>	<b>30.00</b>	<b>45.00</b>	<b>60.00</b>
85	0.00	0.00	0.00	0.00	<b>22.50</b>	<b>45.00</b>	<b>67.50</b>	<b>90.00</b>
70	0.00	0.00	0.00	0.00	<b>30.00</b>	<b>60.00</b>	<b>90.00</b>	<b>120.00</b>
55	0.00	0.00	0.00	0.00	<b>37.50</b>	<b>75.00</b>	<b>112.50</b>	<b>150.00</b>
40	0.00	0.00	0.00	0.00	<b>45.00</b>	<b>90.00</b>	<b>135.00</b>	<b>180.00</b>
25	0.00	0.00	0.00	0.00	<b>52.50</b>	<b>105.00</b>	<b>157.50</b>	<b>210.00</b>
10	0.00	0.00	0.00	0.00	<b>60.00</b>	<b>120.00</b>	<b>180.00</b>	<b>240.00</b>
0	0.00	0.00	0.00	0.00	<b>65.00</b>	<b>130.00</b>	<b>195.00</b>	<b>260.00</b>

**Table 3. The additional indemnity payments generated from the yield adjusted Asian put in the Revenue Protection with Harvest Price Exclusion contract for a corn farm with a \$6.01 price election, a 173.3 bushel APH, and 75% coverage under different price and yield scenarios.**

Hvst Price	4.51	5.01	5.51	<b>6.01</b>	6.51	7.01	7.51	8.01
Yield								
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	59.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
145	127.35	54.85	0.00	0.00	0.00	0.00	0.00	0.00
<b>130</b>	195.00	130.00	65.00	0.00	0.00	0.00	0.00	0.00
115	172.50	115.00	57.50	0.00	(57.50)	(90.15)	(90.15)	(90.15)
100	150.00	100.00	50.00	0.00	(50.00)	(100.00)	(150.00)	(180.30)
85	127.50	85.00	42.50	0.00	(42.50)	(85.00)	(127.50)	(170.00)
70	105.00	70.00	35.00	0.00	(35.00)	(70.00)	(105.00)	(140.00)
55	82.50	55.00	27.50	0.00	(27.50)	(55.00)	(82.50)	(110.00)
40	60.00	40.00	20.00	0.00	(20.00)	(40.00)	(60.00)	(80.00)
25	37.50	25.00	12.50	0.00	(12.50)	(25.00)	(37.50)	(50.00)
10	15.00	10.00	5.00	0.00	(5.00)	(10.00)	(15.00)	(20.00)
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

**Table 4. The total indemnity payments generated from the Revenue Protection contract for a corn farm with a \$6.01 price election, a 173.3 bushel APH, and 75% coverage under different price and yield scenarios.**

Hvst Price	4.51	5.01	5.51	<b>6.01</b>	6.51	7.01	7.51	8.01
Yield								
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	59.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
145	127.35	54.85	0.00	0.00	0.00	0.00	0.00	0.00
<b>130</b>	195.00	130.00	65.00	0.00	0.00	0.00	0.00	0.00
115	262.65	205.15	147.65	90.15	32.65	0.00	0.00	0.00
100	330.30	280.30	230.30	180.30	130.30	80.30	30.30	0.00
85	397.95	355.45	312.95	270.45	227.95	185.45	142.95	100.45
70	465.60	430.60	395.60	360.60	325.60	290.60	255.60	220.60
55	533.25	505.75	478.25	450.75	423.25	395.75	368.25	340.75
40	600.90	580.90	560.90	540.90	520.90	500.90	480.90	460.90
25	668.55	656.05	643.55	631.05	618.55	606.05	593.55	581.05
10	736.20	731.20	726.20	721.20	716.20	711.20	706.20	701.20
0	781.30	781.30	781.30	781.30	781.30	781.30	781.30	781.30