



# A Primer on Crop Insurance



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**F**undamentally, risk management on a farm is aimed at smoothing out the income or profit stream over time. This is accomplished by accepting lower incomes or profits during good times in exchange for higher incomes or profits during bad times.

Crop insurance is an important tool for risk management. This paper describes comprehensively the details of how crop insurance works. Because crop insurance uses futures market prices in some important ways, the paper also briefly reviews how futures markets operate.

### What is crop insurance?

Crop insurance is a risk management tool which, like any kind of insurance, provides a compensatory payment when

something bad happens. It therefore has the potential to smooth out income streams or profit streams: Farmers pay into the insurance pool in good years and bad years alike, and receive a payment in bad years. The payments a farmer makes into the insurance pool are known as *premiums* and the payments the farmer receives from the pool are known as *indemnity payments*. About 65% of the crop insurance premium cost is paid by the federal government.

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will not cover other types of insurance such as *margin insurance and whole farm insurance*.

In understanding any kind of crop insurance, we need answers to three questions:

- What is being insured? That is, what are we trying to protect against? As the last paragraph implies, it might be low crop yields, low crop revenues, low margins, or low whole farm revenue.
- What is the trigger for an indemnity payment? That is, how low do crop yields (crop revenues, margins, etc.) need to fall in order to trigger an indemnity payment?
- What is the size of the indemnity payment when it occurs? (It is influenced by the level of coverage that you select at time of enrollment.)

### Yield Insurance

For most field crops, yield insurance can be purchased on a crop-by-crop and county-by-county basis.. For example, a farmer who grows corn, wheat, and soybeans could choose to insure yields of one, two, or all three of those crop on a county-by-county basis. The farmer identifies tracts of land as “insurance units.” An insurance unit identifies the tracts or fields of the insured crop which will be considered to calculate a claim for indemnity.

*The farmer decides what level of loss (compared to the average historical yield) to insure against, a decision known as “yield election” or “level of coverage” and can be any percentage between 50 and 85.*

A typical decision to buy yield insurance would follow these steps:

- The farmer decides to buy insurance for a particular crop grown in a particular county, and contacts a local crop insurance agent for detailed choices for their farm(s).
- The farmer provides information about past yield. The level of insured yield is expressed as a percentage of the farmer’s “normal” or average yield. The calculation of average yield is based on a 4- to 10-year history of actual yields, known as the



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Actual Production History yield, or APH yield.

- The farmer decides what level of loss (compared to the average historical yield) to insure against. This decision is known as “yield election” or “level of coverage” and can be any percentage between 50 and 85 (in increments of 5, so, 50, 55, 60, and so on to 85), are possible choices. This selection determines the low yield point that triggers an indemnity.
- The farmer decides on a price level at which yield shortfalls will be compensated. This decision is known as “price election.” The price election is a percentage (chosen by the farmer) of the “base price.” The base price or indemnity price is the expected harvest price at the time the insurance is purchased (prior to planting). This is measured by futures prices. For example, the base price for corn is the average of daily closing prices for the December corn futures contract during the month of February. For soybeans, the November soybean futures contract is used, and the average of prices for that contract during the month of February is the base price. The farmer then chooses a percentage between 60 and 100%, in increments of 5% based on how much protection is needed when a disaster occurs.

*Example 1.* As an example, suppose a farmer has decided to buy yield insurance for corn. His APH yield is 120 bushels per acre. He chooses a coverage level or yield

election of 80%. Therefore he will receive an indemnity payment if corn yields fall below 96 bushels per acre ( $120 \times 80\% = 96$ ). During the month of February, December futures contracts are trading at \$5 on average. The farmer has chosen a price election of 90%, so indemnity payments will be based on a price of \$4.50 ( $\$5 \times 90\% = \$4.50$ ). The farmer grows his crop and observes his yield at harvest. If the yield is above the insured yield of 96 bushels per acre, then no indemnity payment is made. But if the yield falls below 96 bushels per acre, then an indemnity payment is made. So if the actual harvest yield is 86 bushels per acre – 10 bushels below the insured yield – the farmer would receive an indemnity payment of  $10 \times \$4.50 = \$45$  per insured acre.

Of course, if the farmer had chosen a higher price option, his indemnity payments would be higher. And if the farmer had chosen a higher yield option, his indemnity payments would be higher. But in either of these cases, the cost of the insurance (the premium the farmer pays) would be higher.

### Revenue Insurance

Revenue insurance is an alternative to yield insurance. It comes in two forms: with and without “harvest price exclusion.” The slightly simpler form is “revenue insurance (protection) with harvest price exclusion” (RP-HPE for short) so we start our explanation with that.

- As with yield insurance, the process begins with the farmer making a decision to insure a crop and providing information for calculating the APH yield.
- For RP-HPE, the expected (per acre) revenue for the crop is calculated by multiplying the farmer’s APH yield by the expected harvest price. The expected harvest price is the price of a post-harvest-month futures contract in a month prior to planting. For example, for corn, the expected price is the average of December futures prices during the month of February.
- The farmer chooses a coverage level between 50 and 85% (in 5% increments).
- An indemnity is paid if “actual revenue” per acre falls below the covered revenue. Actual revenue is calculated by multiplying actual yield by actual harvest price. The “actual” harvest price is the price of a post-harvest month futures contract at the time of harvest. For example, for corn, the actual price

is the average of December futures prices during the month of October.

*Example 2.* Following the same example as above for corn, the farmer’s APH is 120 and the expected price (December futures price during February) is \$5. The expected revenue is therefore \$600 ( $120 \times \$5$ ). If the farmer chooses 80% coverage, the insured revenue is \$480 ( $\$600 \times 80\%$ ). If the farmer’s actual yield is 86 bushels per acre, and if harvest price (December futures price during October) is \$5, the farmer’s actual yield is \$430, and the indemnity payment would be  $\$480 - \$430 = \$50$  per acre. In this case since harvest price was exactly what was expected at planting, the revenue insurance is really protecting against low yields, because actual prices at harvest are exactly where they were expected to be at planting.

*Example 2A.* However if harvest price is lower than expected – if, for example, it is \$4 rather than the \$5 expected at planting, actual revenue is \$344 ( $86 \times \$4 = 344$ ) and the indemnity payment would be \$116 ( $\$480 - \$344$ ). This illustrates how RP-HPE revenue insurance also protects against prices which are lower than expected.

*Example 2B.* On the other hand, a harvest price higher than expected at planting can counterbalance the impact of low yield. If harvest price in this example was \$5.60 rather than the expected \$5, actual revenue would be \$481.60 ( $86 \times 5.60$ ) and since this is higher than the insured revenue of \$480, no indemnity payment would be made under an RP-HPE policy.

### Revenue Insurance Without Harvest Price Exclusion

Revenue insurance can also be purchased so that it retains its protection against low yields even when harvest prices are higher than expected at planting. (This is referred to as revenue protection or RP insurance.) With this type of insurance the expected (per acre) revenue for the crop is calculated by multiplying the farmer’s APH yield by the higher of (a) the expected harvest price and (b) the actual harvest price. As explained earlier, the expected harvest price is the price of post-harvest month futures contract in a month prior to planting. For example, for corn, the expected price is the average of December futures prices during the month of February. The “actual” harvest price is the price of a post-harvest month futures contract at the time of harvest. For example, for corn, the actual price is the average of



**When actual price is higher than expected price, RP provides protection against low yields.**

December futures prices during the month of October.

*Example 2 and 2A.* When the actual harvest price is at or below the expected price at planting, RP insurance works exactly like RP-HPE insurance, protecting against low yields and lower than expected prices (\$50 per acre indemnity payment in example 2 and \$116 per acre indemnity payment in example 2A).

*Example 2B.* But when actual price is higher than expected price, RP does provide protection against low yields. In this example, yields are 86 bushels per acre, expected price was \$5, and **actual price is a higher than expected \$5.60**, and chosen coverage level is 80%. With RP insurance, the insured level of revenue is calculated using the higher \$5.60 price instead of the expected \$5, so the revenue level that triggers indemnities is  $120 \times 5.60 \times 80\% = 537.60$ . The actual revenue of \$481.60 ( $86 \times 5.60$ ) is below that trigger, so the policy would pay a per-acre indemnity of \$56 ( $537.60 - 481.60$ ).

Since RP insurance provides indemnity payments in some circumstances where RP-HPE insurance does not, RP insurance is more expensive; the insurance premiums are higher for RP than for RP-HPE, other things being equal.

### **A Brief Review of Futures Markets**

The earlier descriptions show how crop insurance uses futures market prices in calculating indemnity payments. A futures contract is an agreement to exchange a commodity at a future date for a specific price. A person who takes the “long position” (“buys the contract”)

on a December corn futures contract at \$5 has made a commitment to buy corn in December for \$5. A person who takes the “short position” (“sells the contract”) has made a commitment to sell corn in December for \$5.

Since there are many buyers and sellers, the price of a futures contract is a good indicator of the average opinion about what the price will be in the month the contract expires (the “delivery month”). If in February, the price of a December futures contract is \$5, that means the opinion of traders is the price in December will be \$5. If many traders thought the price would be higher than \$5 in December, they would want to take a short position (so that they could buy at the bargain price of \$5, which would bid the price up). If many traders thought the price would be lower than \$5 in December, they would rush to take a long position which would bid the price down. This explains why we refer to the February price of December futures (more generally the pre-planting price of a post-harvest futures contract) as the “expected” harvest price at planting.

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Of course in February there is a lot of uncertainty about the growing conditions during the year, and therefore about prices after harvest. But as the year goes on, traders learn more and more (this is a good or bad weather year, trade prospects are good or bad, etc.) and the price of a December futures contract goes up and down, but by fall, as the crop conditions become known with certainty, the futures contract converges to the actual spot market price. So the price of December futures contracts during the month of October is pretty close to the actual spot price in December. This explains why we refer to the October price of December futures (more generally the harvest price of a post-harvest futures contract) as the “actual” price at harvest.

If the futures price falls over the course of the growing season, those who have a contract to sell at the (early in the season) high price can sell the contract itself for a profit. If the futures price rises over the course of the growing season, those who have a contract to buy at the (early in the season) low price can sell the futures contract for a profit.

This discussion may make it clear how trading in futures markets can be part of a risk management plan. At planting time, a farmer faces two main risks: the risk that the crop will be poor (low yields), and the risk that price will be low. We discussed how revenue insurance can deal with both of these risks. But it is also possible to deal with yield risk using yield insurance (collecting an indemnity payment when yields are poor) and to deal with price risk using futures market (acquiring a futures contract which increases in value if the price drops during the growing season). The most complete risk management plan is to have crop insurance to reduce the impact of low yield and revenue on lost bushels and a futures marketing contract to protect the price of bushels produced.



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### **Determining Actual Production History**

The APH which serves as the basis for crop insurance is described as the 4-10 year history of yields on the farm. That is true, as far as it goes. But many additional questions arise: How are yields documented? What if the documentation is missing? What if there are years when the crop was not grown? The answers to these and other questions create the possibility that determining APH is quite a complicated set of calculations. Some of these answers can be found in this paper from Iowa State University Extension <http://www.extension.iastate.edu/agdm/crops/html/a1-55.html>. But for specific answers pertaining to a particular set of circumstances, a crop insurance agent should be consulted.

### **Decisions About Insurance Units**

Another potentially complicated decision concerns how to identify insurance units. An insurance unit is a parcel of land of the insured crop for which a separate loss claim may be determined. The size of the unit may influence the amount and frequency of loss and therefore affects the insurance premium. Farmers can combine land they own with land they rent or share-crop into single enterprise units, depending on location. Here too the regulations are quite complex, and are described briefly in this paper by Iowa State University Extension <http://www.extension.iastate.edu/agdm/crops/html/a1-55.html>. Farmers may also be permitted to combine tracts planted in different crops into a “whole farm unit” which can qualify for premium discounts.

For specific answers pertaining to a particular set of circumstances, consult a crop insurance agent. To find a local agent, please see <http://www.rma.usda.gov/tools/agent.html>. ■

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