

## Chapter 7: Insuring Corn in South Dakota



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Crop insurance is an important component for managing production and economic risks. Crop insurance refers to the U.S. Department of Agriculture’s Risk Management Agency (RMA) programs that cover yield or revenue loss from multiple perils. The coverage is sold to growers and landowners by private crop insurance companies and agents, although the policies are regulated and premium rates are established by the RMA.

The purpose of this chapter is to provide an overview of the common types and levels of crop insurance used in South Dakota corn production. The cost of crop insurance can vary with changes in yield history, changes in price levels in the current year, and changes in the volatility for revenue products. An understanding of the coverage types available is important because the premium cost varies with insurance type and because the insurance coverage should be matched to commodity marketing practices. Knowledge of the coverage level is important because it may need to be adjusted to remain cost effective.

Insurance coverage for corn production was provided to 5.2 million South Dakota acres in 2015. The statewide level of liability coverage for corn production was \$2.2 billion, averaging \$426 per insured acre in protection. The liability was less than the expected value of the crop, reflecting the deductible. The total premium averaged \$73 per acre, but after subsidies the producer premium averaged \$21 per acre. The subsidy has led to a high adoption of insurance and coverage at higher levels than would otherwise be observed (O’Donoghue, 2014). The adoption of coverage in South Dakota mirrors that in the Midwest, and a majority of corn acres have been insured in South Dakota since the late 1990s.

### Available Coverage

Information about crop insurance is commonly obtained from a crop insurance agent or the RMA website<sup>1</sup>. Corn coverage details are outlined in the “Common Crop Insurance Policy,” the “Coarse Grains Crop Provisions,” and the “Commodity Exchange Price Provisions,” or CEPP. Yellow corn grown for grain on nonirrigated or dryland acres and using conventional production practices is the most common parameter used in South Dakota<sup>2</sup>. The RMA also has a fact sheet on corn for South Dakota (Billings Regional Office, 2015).

<sup>1</sup> The RMA website is [www.rma.usda.gov](http://www.rma.usda.gov).

<sup>2</sup> Other parameters are available. Corn can be insured specifically as silage. Example nontypical types include high amylase and blue corn. Irrigated acres can be specifically insured. Organic production is an insurable practice. There are also specific counties with coverage for popcorn and hybrid corn seed.

Like for other crops, growers wanting farm-level coverage have to establish a production history. Edwards (2014) provides an overview of building a yield history and choosing among units when buying coverage. Growers can use yield adjustments, where low yields for a unit can be replaced with 60% of the county transitional yield. Units can be basic, optional, enterprise or whole-farm, and the premium subsidy is tied to the unit choice and coverage level. In discussions with growers and agents, there has been a shift toward using enterprise units on corn. This observation is consistent with the average observed premium subsidy that falls between that of basic/optional units and that of enterprise units. Since 2012, many counties in South Dakota have had positive trend-adjustment factors for corn. The factor is more heavily weighted for earlier years in a grower's production history, resulting in a higher approved yield. The RMA reported that since 2012 there has been strong adoption of trend-adjusted yields in South Dakota.

The Agricultural Act of 2014 introduced other coverage options. With the yield exclusion option, a yield year may be excluded from a grower's yield history if the county yield was sufficiently low. For example, low yields (or exclusion eligible yields) were common for corn in many central, south-central and southeast South Dakota counties in 2012 given the drought conditions that year. The Supplemental Coverage Option (SCO) provides shallow-loss coverage, spanning the space between the farm-level election level of a policy and 86% of the county yield level or revenue level. However, to be eligible for the SCO, a producer's base acres for the crop also need to be enrolled in Price Loss Coverage (PLC). Based on data from the Farm Service Agency, less than 2% of the corn acres in South Dakota were enrolled in PLC. Thus, adoption of SCO has been minimal.

Several dates are critical to assure the proper coverage is selected and in effect when needed. For corn, the insurance must be purchased or changed by March 15 and the earliest planting date is April 10. The final planting dates for full coverage vary slightly. Corn for grain has a final planting date on irrigated and nonirrigated fields of May 25, except for counties in the southeast where the deadline is May 31 (Fig. 7.1). For silage corn, the final planting date is May 31 regardless of the county or irrigation practice. Silage has a price or value set by the RMA prior to the coverage deadline. After the final planting date, there is a 25-day late-planting period that provides reduced coverage. The coverage is in effect until December 10.

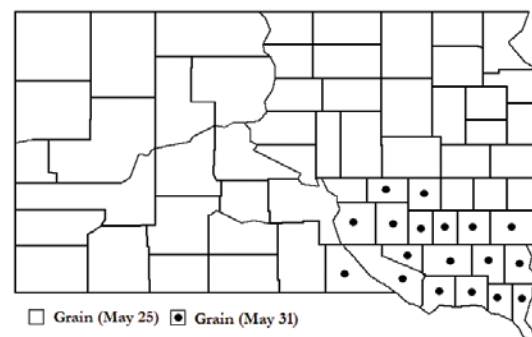


Figure 7.1 Final planting dates of corn for grain in South Dakota with full insurance coverage.

Policy dates are aligned with the marketing patterns that are reported by the National Agricultural Statistics Service (NASS). South Dakota corn planting dates generally range from April 30 through June 20, and the range of harvest dates is from September 30 through November 20. Historically, corn has been marketed in October and November following harvest.

Claims can begin after the earliest planting date. In the event of a loss, producers typically have 72 hours to notify their insurance agent of a potential claim. After the final planting date, the most commonly used policies have prevented planting provisions, covering some of the expense of not growing the insured crop. A grower may try to plant the insured crop in the late period or switch to a different crop. Growers are responsible for using good farming practices, as defined in their policy, even after a partial loss, meaning they have to continue to take care of the crop. Common reasons for insurance claims include: 1) drought, 2) natural causes (e.g., hail and wind), and 3) reduced corn quality.

### Policy Types and Coverage Levels

For corn production, the main policy types include: 1) Revenue Protection (RP), 2) Yield Protection (YP), 3) Revenue Protection with the Harvest Price Exclusion (RP-HPE) and 4) Catastrophic Risk Protection (CAT). These policy types are based on farm level yields. Area Risk Protection Insurance (ARPI) is also

available in some counties to cover county-level yield or revenue loss, but it is seldom used (Fig. 7.2). Statewide in 2015, 97% of the insured corn acres were covered by RP. The remaining acres were covered by YP, CAT, RP-HPE and ARPI.

### **Revenue Protection (RP)**

With RP, there is a fixed guarantee level and either lower yields and/or lower prices may trigger an indemnity payment. RP is designed to cover price increases and is ideal when producers use forward price contracts or hedge using futures contracts. Note that there is a 200% limit on price changes by harvest, which is a feature specific to RP. This caps the indemnity payment and could be managed by covering sales with call options.

### **Yield Protection (YP)**

With YP, a producer receives an indemnity payment at the fixed price per bushel if the resulting yield falls below the yield coverage level.

### **Harvest Price Exclusion (RP-HPE)**

RP-HPE is limited to downside revenue protection at a slightly higher cost than YP. A price decline could trigger an indemnity payment with RP-HPE when YP would not have one. RP-HPE costs less than RP and may be preferred if little forward pricing is expected.

Several counties in western South Dakota do not have grain coverage for nonirrigated acres: Butte, Custer, Fall River, Harding, Jackson, Lawrence, Meade and Pennington (Fig. 7.2). The Noninsured Crop Disaster Assistance Program (NAP) has been available in these counties with coverage for dryland grain. In the Agricultural Act of 2014 the coverage for NAP was authorized to be available with buy-up to higher yield elections and with up to 100% of the price election level (formerly capped at 55%). The cost is set at 5.25% of the liability.

### **Selecting Price Elections and Coverage Levels**

Once a policy type has been selected, a coverage level needs to be selected. With RP and RP-HPE there is no price election option; one must use 100% of the projected price. For YP, a producer can select less than 100% of the projected price. To minimize the insurance premium, a producer could use a price election that closely aligns the insured price with the expected cash price. For example, if the expected cash price is below the RMA's projected price, a price election of less than 100% may be appropriate.

Coverage level often refers to the yield coverage level or percent of the producer's production history. Across policy types, the yield coverage level must be selected and can range from 50% to 85% coverage. Between 2011 and 2015, most South Dakota corn producers selected 75% yield coverage. However, the optimal level depends on a producer's willingness to be self-insured.

There is substantial variability in how much coverage is available across counties. Specific to nonirrigated corn, the highest transition or "T" yield in 2015 was in Moody County at 156 bushels per acre and the lowest was in Todd County at 35 bushels per acre. Producers may elect yield adjustments, yield exclusions, and trend-adjusted yields. As a result, the approved yield can be much higher than T-yields. Approved yields can be backed out of county data that includes irrigated and nonirrigated acres across policy types. For example, the average approved yield in 2015 in Moody County was 178 bushels per acre for growers using RP with 75% coverage. Observed average approved yields at the county level have been 10-40% higher than T-yields in recent years.

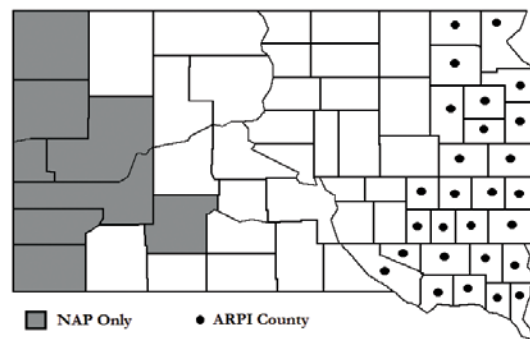


Figure 7.2 Counties in South Dakota with NAP and ARPI coverage.

## Marketing Considerations

The RMA price discovery periods use the CBOT (Chicago Board of Trade) December corn futures contract. The projected price discovery period is from February 1 to February 28. During this period, the average of the closing December corn futures contract prices is used to determine the Projected Price. The Projected Price is used in YP to determine the price level at which indemnities are paid. The Projected Price sets the minimum coverage level for RP and RP-HPE.

The harvest price discovery period is from October 1 to October 31. During this period, the average of the closing December corn futures contract prices is used to calculate the Harvest Price. The Harvest Price is combined with the actual yield to determine harvest revenue in RP-HPE. The Harvest Price is also used in RP to determine whether higher coverage is relevant at harvest. The unbiased nature of futures prices is evident based on the past 14 years (Table 7.1). The average change has been -\$0.15 per bushel, which is not statistically different from zero. Extreme moves are also evident as the price increased \$1.82 per bushel in 2012 and decreased \$1.27 per bushel in 2008.

The RP and RP-HPE insurance premiums are functions of the corn price volatility. The volatility factor, as defined and measured by the RMA in late February for corn, has changed substantially through time and has ranged from 0.18 to 0.37 (Table 7.1). Growers often respond to premium changes by adjusting yield coverage levels. For planning purposes, knowing the volatility factor is useful to project premium costs. Prior to the purchase deadline, the volatility factor can be estimated by finding the implied volatility (usually quoted as an annual percentage) of the December futures price and adjusting it by 0.8 to adjust for the insurance period. Implied volatility can be backed out of option prices or obtained from a market information provider.

Basis is the difference between the cash and future prices. Basis is not factored into the projected nor harvest prices for crop insurance. As such, the RMA prices likely exceed the expected and actual local cash prices. For reference, the statewide price received by farmers (from NASS) is shown for October along with the basis relative to the Harvest Price (Table 7.1). Basis variability is evident, ranging from -\$0.13 per bushel in 2004 to -\$1.44 per bushel in 2010, and this basis risk is not insurable. Growers should be mindful that spot price changes may not correspond with indemnity payments.

The insurance settles during a fixed or static month (October), and therefore may not always line up with crop sales. Thus, for growers hedging with futures or options, it may reduce the basis risk to use December

**Table 7.1. South Dakota corn insurance and marketing factors.**

	Projected Price (\$/bushel)	Harvest Price (\$/bushel)	Change (\$/bushel)	Volatility Factor	October Cash Price (\$/bushel)	Basis (\$/bushel)
2002	2.32	2.52	0.20	0.18	2.21	-0.31
2003	2.42	2.26	-0.16	0.20	1.95	-0.31
2004	2.83	2.05	-0.78	0.21	1.92	-0.13
2005	2.32	2.02	-0.30	0.21	1.60	-0.42
2006	2.59	3.03	0.44	0.23	2.37	-0.66
2007	4.06	3.58	-0.48	0.26	3.09	-0.49
2008	5.40	4.13	-1.27	0.30	3.99	-0.14
2009	4.04	3.72	-0.32	0.37	3.31	-0.41
2010	3.99	5.46	1.47	0.28	4.02	-1.44
2011	6.01	6.32	0.31	0.29	5.67	-0.65
2012	5.68	7.50	1.82	0.22	6.61	-0.89
2013	5.65	4.39	-1.26	0.20	4.22	-0.17
2014	4.62	3.49	-1.13	0.19	3.09	-0.40
2015	4.15	3.83	-0.32	0.21	3.37	-0.46

(Sources: USDA-RMA and USDA-NASS)

contracts and lift or roll hedges in October. For planning purposes, a five-year moving average of historical basis is reasonable. The basis during October has averaged -\$0.51 per bushel from 2010 to 2015.

### Example with Basis

There are subtle differences across product types with implications for effectiveness in managing different risks. Here is an example of the mechanics of how crop insurance works when considering basis (Table 7.2).

**Table 7.2 South Dakota corn example where Yield Protection, Revenue Protection, and Revenue Protection with the Harvest Price Exclusion are compared. The actual yield at harvest is  $Y_H$ , the harvest price is  $P_H$  and the cash price at harvest is  $C_H$ .**

Assume: Proven yield = 140 bu., Coverage level = 75%; Trigger yield = 105 bu.; Projected price = \$4.50; Cash price = \$3.75; Base guarantee = \$472.50

	A: $Y_H = 140$ ; $P_H = \$5.50$ ; $C_H = \$4.75$		
Indemnity Returns	YP \$0 \$665.00	RP \$0 \$665.00	RP-HPE \$0 \$665.00
	B: $Y_H = 90$ ; $P_H = \$4.00$ ; $C_H = \$3.25$		
Indemnity Returns	YP \$67.50 \$360.00	RP \$112.50 \$405.00	RP-HPE \$112.50 \$405.00
	C: $Y_H = 105$ ; $P_H = \$4.00$ ; $C_H = \$3.25$		
Indemnity Returns	YP \$0 \$341.25	RP \$52.50 \$393.75	RP-HPE \$52.50 \$393.75
	D: $Y_H = 90$ ; $P_H = \$5.50$ ; $C_H = \$4.74$		
Indemnity Returns	YP \$67.50 \$495.00	RP \$82.50 \$510.00	RP-HPE \$0 \$427.50

Assume a producer has an approved yield of 140 bushels per acre. The selected yield coverage level is 75%, implying that a yield below 105 bushels (140 bushels times 0.75) would trigger an indemnity (depending on the coverage type). The Projected Price is assumed to be \$4.50 per bushel. The base guarantee is thus \$472.50 per acre (105 bushels times \$4.50 per bushel). With a conservative harvest basis estimate of -\$0.75 per bushel, the expected cash price at harvest, is \$3.75 per bushel. The cash price at harvest,  $C_H$ , may reflect a basis change. If the actual yield at harvest,  $Y_H$ , equals the approved yield, there would be no indemnity payment and the expected return is \$525.00 per acre (140 bushels times \$3.75 per bushel). In general,  $\text{Returns} = (C_H \text{ times } Y_H)$  plus Indemnity, which are before production and insurance costs.

When yield and/or price are low, the Projected Price and the Harvest Price ( $P_H$ ) are needed to calculate indemnity payments. Following the method in Woodard et al. (2010) for insurance products available before the common policy, the respective indemnity calculations are as follows:

$$\text{Indemnity}_{\text{YP}} = \max[0, \text{Projected Price} \times (\text{Trigger yield} - \text{Actual yield})]$$

$$\text{Indemnity}_{\text{RP}} = \max[0, \text{Trigger yield} \times \max(\text{Projected Price}, \text{Harvest Price}) - (\text{Harvest price} \times \text{Actual yield})]$$

$$\text{Indemnity}_{\text{RP-HPE}} = \max[0, (\text{Projected Price} \times \text{Trigger yield}) - (\text{Harvest Price} \times \text{Actual yield})]$$

Indemnity payments and returns under these coverage options are shown in Table 7.2.

In scenario A, the Harvest Price is greater than the Projected Price and the yield is high enough that no indemnity payments are made. The returns are fully realized from market sales.

In scenario B, the actual yield is lower than the trigger yield (of 105 bushels per acre) and indemnity payments would occur across all insurance types.

In scenario C, the harvest price is low enough to trigger indemnity payments for the revenue protection types of insurance, but the actual yield is not sufficiently low to trigger indemnity payments for yield insurance.

In scenario D, the disparity across insurance types is evident. The actual yield is low enough to trigger an indemnity from the yield insurance. When coupled with the higher harvest price, the higher guarantee level means a larger indemnity with RP coverage. Because the projected revenue was exceeded (the higher harvest price offset the lower actual yield), there is no indemnity payment with RP-HPE.

## **Conclusions**

The Revenue Protection plan is the most frequently chosen insurance type by South Dakota corn producers. However, when selecting among Revenue Protection or other common insurance types (Yield Protection and Revenue Protection with the Harvest Price Exclusion), it is necessary to consider local details that can impact the decision of the optimal insurance product.

## **References and Additional Information**

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**A G R O W I N G I N V E S T M E N T**

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