



Sorghum Crop Insurance

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There are four major types of crop insurance: 1) self-insurance, 2) catastrophic, 3) multi-peril, and 4) crop revenue coverage/revenue assurance. The lowest cost among these is self insurance, and the most expensive is crop revenue coverage.

Minimum total income may be used to compare the relative benefits of the various types of crop insurance. Other management factors that may be considered are premiums and coverage level. Calculating the total return per acre at various production levels allows a comparison of different types of crop insurance. A profit function shows the relationship between yield per acre and income.

For the following analysis, it is assumed that expected yield and actual production history (APH) were 31 cwt/acre. The central Oklahoma sorghum loan rate of \$3.20 is used as the expected price. APH is calculated by dividing production (proven by receipts for buyers) by the number of acres planted. Additional information on calculating the APH may be obtained from any crop insurance agent.

Price Levels

When comparing crop insurance coverage, there are four major prices to consider: cash price, market price, base price, and harvest price. The only unknown price will be the expected cash price. Each type of insurance has fixed prices. For the 2001 sorghum crop, the market price was \$3.21/cwt (\$1.80/bu), the base price was \$4.17/cwt (\$2.34/bu), and the harvest price was \$4.17/cwt. (Harvest price is estimated.)

The cash price is used to calculate the return from selling production. Catastrophic (CAT) and multi-peril crop insurance (MPCI) payments are based on the market price. Crop revenue coverage (CRC) payments are based on the base price or harvest price, whichever is higher. Both the market price and base price are established during signup. The harvest price is based on the futures market closing price during harvest.

Self-Insurance

Being self-insured is the least expensive and most risky type of insurance (Figure 1). A producer self-insures by not buying any type of insurance.

Expected total return with yields of 31 cwt/acre at \$3.20 is about \$99/acre (31 cwt x \$3.20). The payoff function shown in Figure 1 shows that without insurance, total returns can be zero. As yield increases, total returns increase.

Catastrophe

For \$100 per crop per farm, producers may insure production at 50 percent of the average production history (APH). In this case, CAT insures against yield loss below 15.5 cwt/acre (31 x 0.50). Insurance payments are based on 55 percent of the established market price and loss of production below 15.5 cwt/acre.

Total return for production above 15.5 cwt/acre is yield times price (i.e., 31 cwt x \$3.20 = \$99). For production less than 15.5 cwt/acre, total return is yield times price plus the insurance payment (Figure 2). The insurance payment is calculated by subtracting production from 15.5 cwt/acre and multiplying by 55 percent of the market price (\$ 1.77).

If production were 10 cwt/acre, total return would be \$42 (10 cwt x \$3.20 + 5.5 cwt x \$1.77). If production were zero, total return would be \$27 (15.5 cwt x \$ 1.77).

Catastrophic insurance provides a minimum total return of \$42/acre compared to a minimum total return of zero if no insurance is purchased.

Multi-Peril Crop Insurance

MPCI allows producers to raise the yield coverage in five-percent increments between 55 percent and 85 percent. Government subsidies are highest for the 65 percent and 70 percent coverage levels. In this example, the 65 percent coverage level is used. For the 2001 sorghum crop with a 31 cwt/acre APH, the premium was \$2.58/acre (Figure 3).

Payments for yield loss are based on the market price (\$3.21 for the 2001 crop). At the 65 percent coverage, insurance payments will be made for production less than 20.15 cwt/acre (31 cwt x 0.65). If the 70 percent level were purchased, payments would be for production below 21.7 cwt/acre (31 cwt x 0.7).

For the 2001 sorghum crop on a farm with an APH of 31 cwt/acre, MPCI with 65 percent coverage would cost \$2.58/acre. If production were 10 cwt/acre, the total return would be \$62 (10 cwt x \$3.20 + (10.15 cwt x \$3.21) - \$2.58). This is \$32 from production and \$30 from insurance. The minimum total return with zero yield would be \$62 (20.15 cwt x \$3.21) - \$2.58).

Crop Revenue Coverage

Crop revenue coverage insures against both low yields and low prices (Figure 4). Insurance payments are triggered by total return going below an insured level. The level of insured return is calculated by multiplying the APH by the percentage coverage and the base price or harvest price, whichever is higher. The payment is determined by subtracting the product of yield per acre times the harvest price from the insured income level. Insured income is calculated by multiplying the higher of the base price or harvest price times the insured yield.

For the 2001 sorghum crop with an APH of 31 cwt/acre, the base price was \$4.17/cwt, the harvest price (estimated) was \$3.20/cwt, and the loan rate was \$3.20. The premium for 65 percent coverage was \$4.08/acre. The minimum gross return with zero yield would be \$80 (20.15 cwt x \$4.17 - \$4.08).

If production were 10 cwt/acre, the total return would be \$70 (10 cwt x \$3.20 + \$42 - \$4.08); (\$42 = (20.15 cwt x \$4.17) - (10 cwt x \$4.17)). Sorghum production income in this example is \$32, and the income from insurance would be \$38 after the premium is subtracted.

Coverage Comparison

Three important things to consider when comparing crop insurance coverage are minimum return, premium, and probability of using the insurance policy. The first two—premium and minimum return—are the most important. A comparison is shown in Table 1.

If the crop is a total loss, total return with self-insurance is zero, \$27/acre with CAT, \$62/acre with MPCl, and \$80/acre with CRC. CAT coverage starts when yield goes below 50 percent of APH (15.5 cwt/acre in this example), 65 percent MPCl coverage starts when yield goes below 65 percent of APH (21.2 cwt/acre), and CRC coverage at 65 percent goes into effect when yield goes below 20 cwt/acre if the sorghum price is \$3.20. (See Figure 5) With CRC, the effective yield coverage level declines as the sorghum price goes up.

Given this analysis, CRC provides the highest income support and has the highest probability of paying off. However, CRC's income advantage over MPCl will change with a different market price/ base price relationship. For the 2001 sorghum crop, the base price of \$4.17 was higher than the market price of \$3.21, and this price relationship favored CRC. This will not always be the situation.

Table 1. Comparison of Self, Catastrophic, Multi-Peril & Crop Revenue Coverage Insurance.

Insurance	Total Return With Zero Yield (65% Coverage)	Premium/Acre
Self	\$ 0	\$ 0
CAT	\$27	\$100/crop
Multi-Peril	\$62	\$ 2.58
CRC	\$80	\$ 4.08

Figure 1. Profit Function: No Insurance

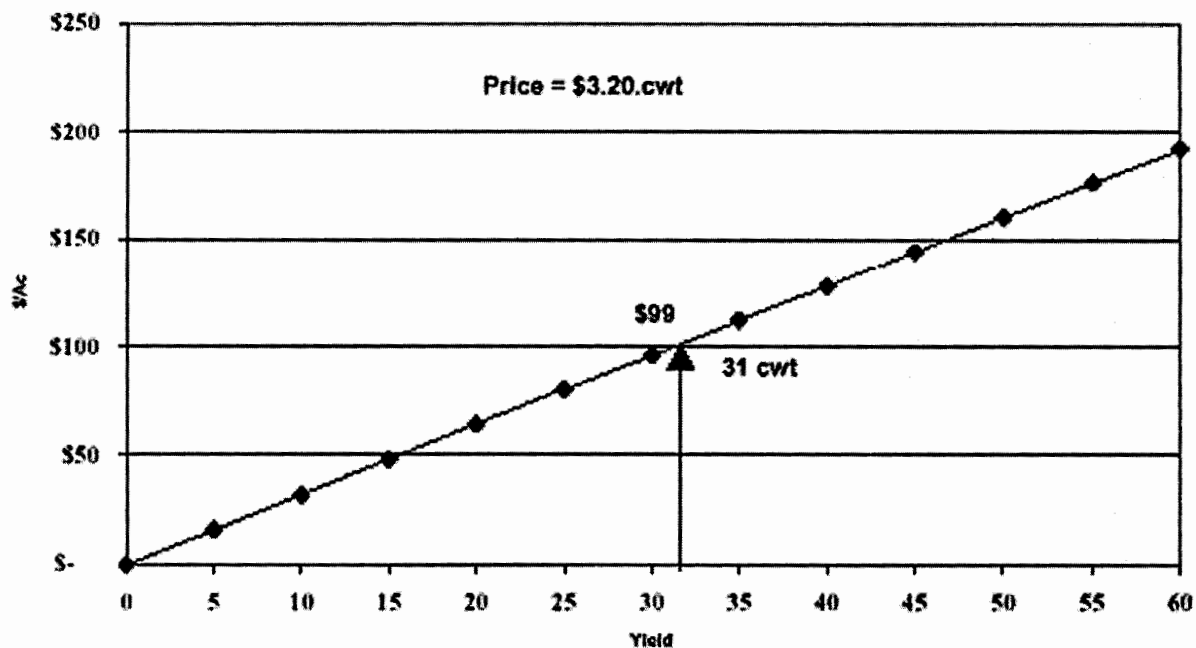


Figure 2. Payoff Function: Self Insured vs. Catastrophic

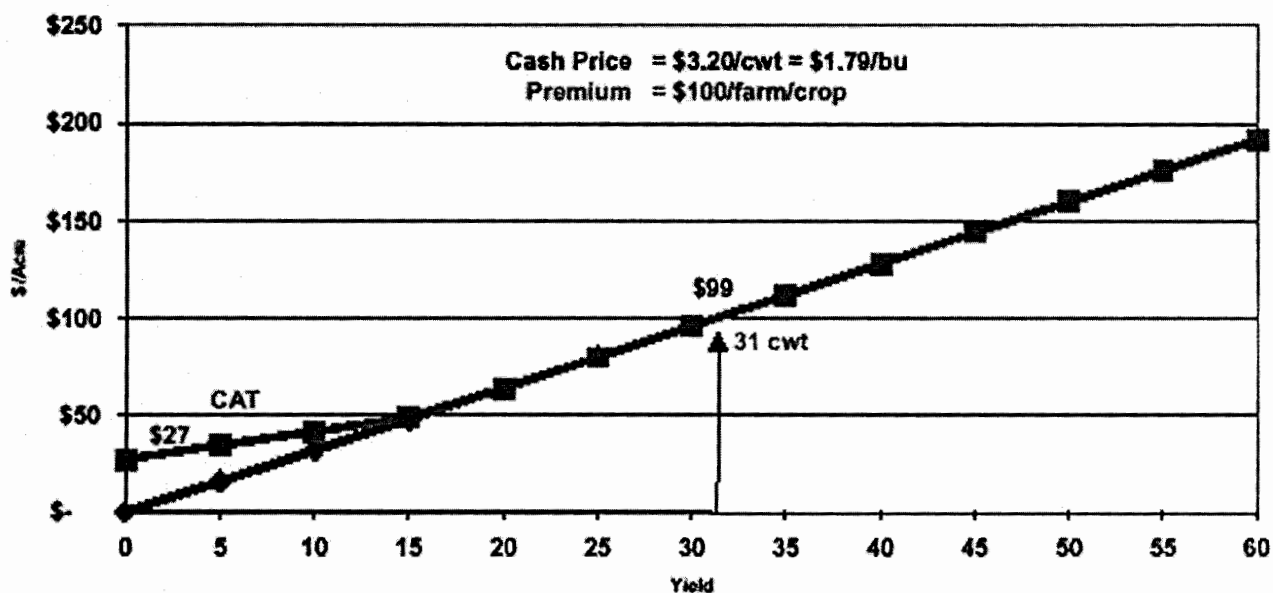


Figure 3. Profit Function: Catastrophic vs. Multi-Peril Crop Insurance

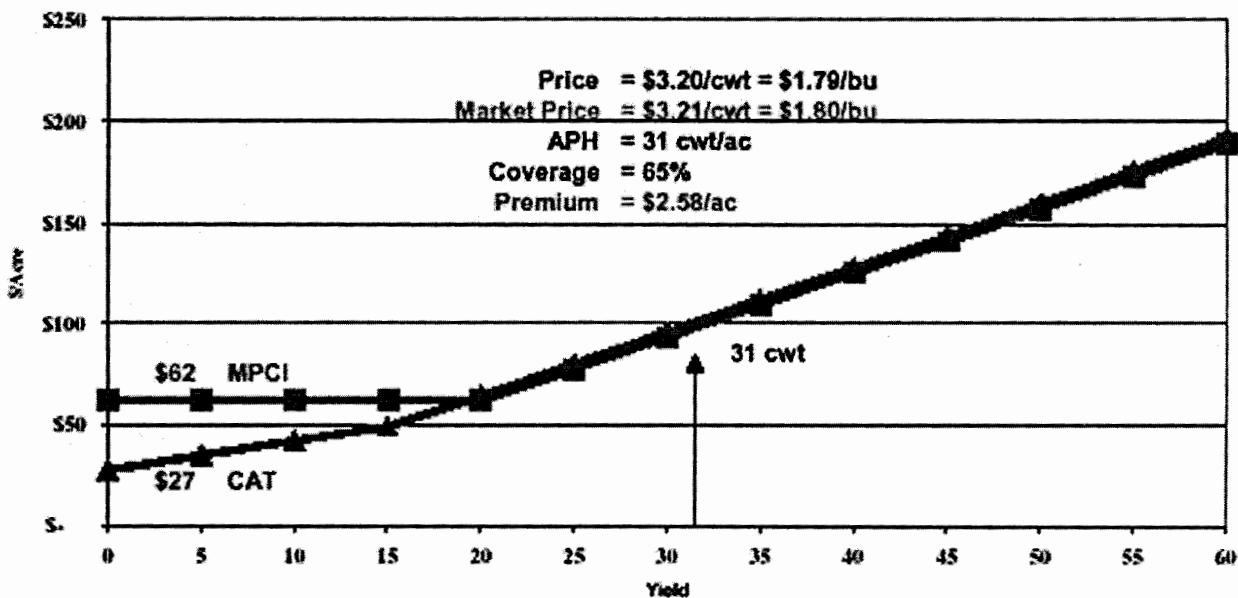


Figure 4. Profit Functions: Crop Revenue Coverage

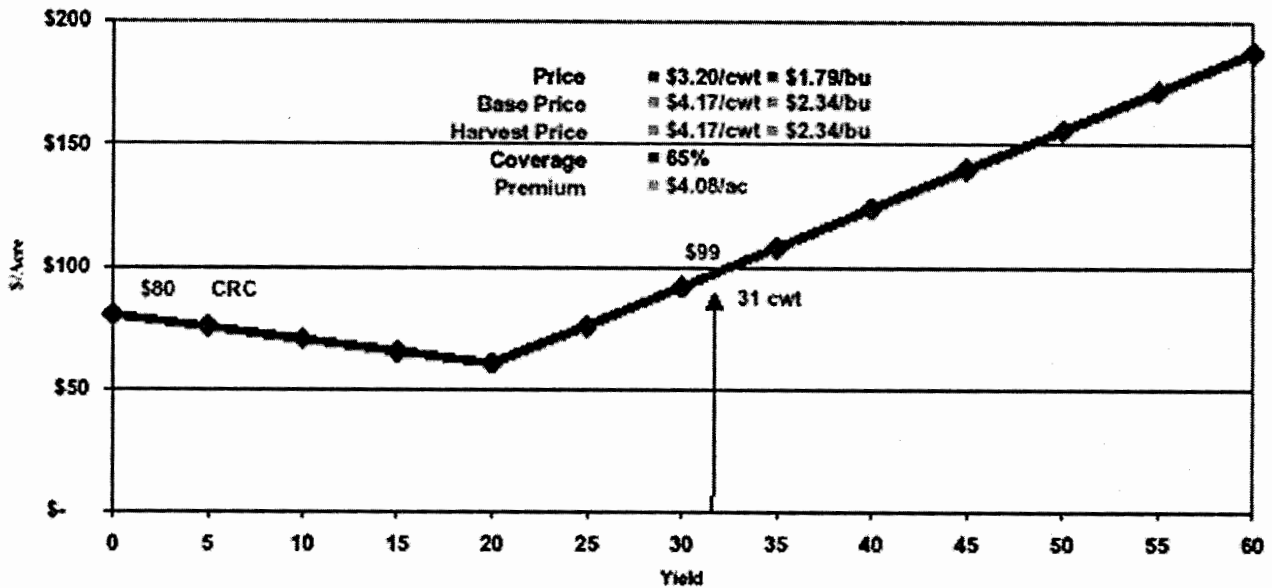
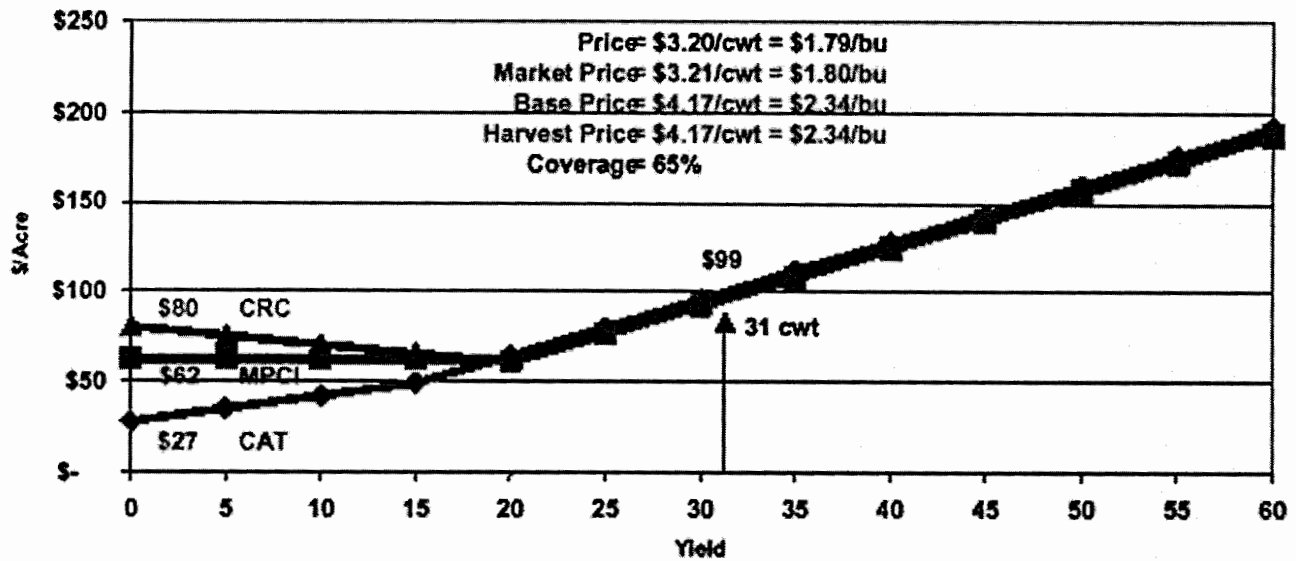


Figure 5. Profit Function: Catastrophic, Multi-Peril & Crop Revenue Coverage



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