Actuarial Performance of Crop Insurance Premiums, 2001-15

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According to the 2008 farm bill, the Federal Crop Insurance Program has a loss ratio objective of "not greater than 1.0." Thus, over time, crop insurance payments to farmers should not exceed total premiums. Total premiums are the sum of premiums paid by farms plus public premium subsides. This actuarial performance is examined for the last 15 crop years with complete data, or the 2001 through 2015 crops. These crops postdate the *Agricultural Risk Protection Act of 2000*, which enacted major changes in the US crop insurance program. Performance is examined for all crops as a group and individually for corn, cotton, soybeans, and wheat as well as at different coverage levels. The statutory objective, which applies only to the whole program, was achieved. However, some aberrations from a loss ratio of 1 were found at the individual crop and coverage levels. These aberrations may have meaning during the next farm bill debate.

Background: Prior to September 30, 1998, the loss ratio objective for US crop insurance was 1.1. It was reduced to 1.075 and then to 1.0 in the 2008 farm bill. In part because of this statutory obligation, RMA monitors loss ratios and adjusts them on an on-going basis.

Loss ratios are calculated for each year for all crops and then for corn, soybeans, wheat, and cotton. Figure 1 shows the yearly loss ratios for all crops. As can be seen, there is no general trend up or down in loss ratios. Three crop years have a ratio that exceeds 1, with the highest being 1.57 for 2012, the drought year. Three crop years also have a ratio less than 0.60.

The yearly loss ratios are averaged to arrive at an average loss ratio for the total program and for each crop. All average loss ratios are tested for statistical significance using the t-ratio. Statistical significance is reported only if the average loss ratio differs from 1 with 95% statistical confidence. To assess the potential impact of outliers, the t-test is also conducted by excluding the low and high crop year values. This sensitivity test does not change the significance of any loss ratio initially found to be statistically different from 1.

Source for the data used in this study is the US Department of Agriculture (USDA) Risk Management Agency (RMA), which has oversight authority for farm insurance contracts. Corn, cotton, soybeans, and


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wheat are examined individually. They account for 70% of insured acres and 77% of premium subsidies for the 2015 crop. Coverage levels range from 50% to 90% in 5% increments.

Figure 1. Loss Ratio by Crop Year, All Crop Acres, US, 2001-15 Crop Years
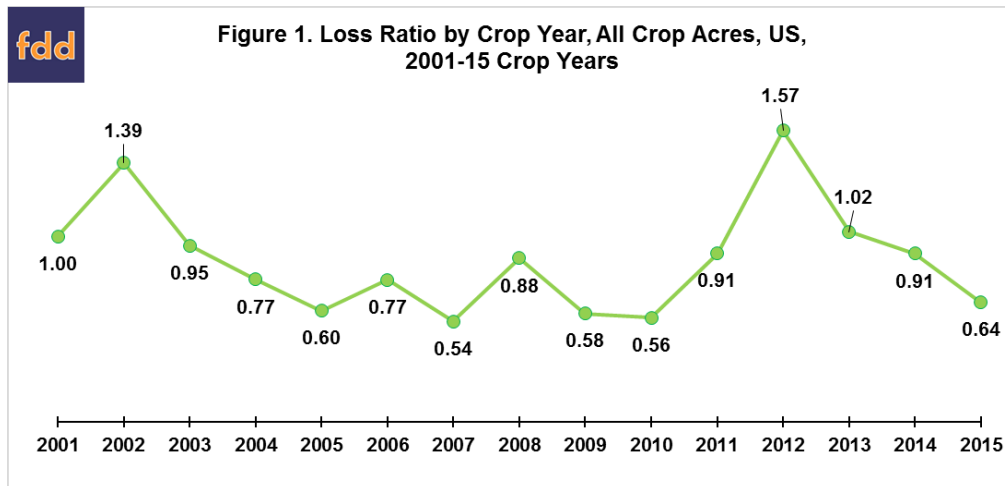
All Crops: Average annual loss ratio for all insured crop acres over the 2001-15 crops is 0.87 (see Figure 2). The ratio is less than 1 for all coverage levels except 85%. Only for 50% coverage does the loss ratio differ significantly from 1 at 95% confidence.

Figure 2. Average Annual Crop Insurance Loss Ratio by Coverage Level, All Crop Acres, U.S., 2001-15
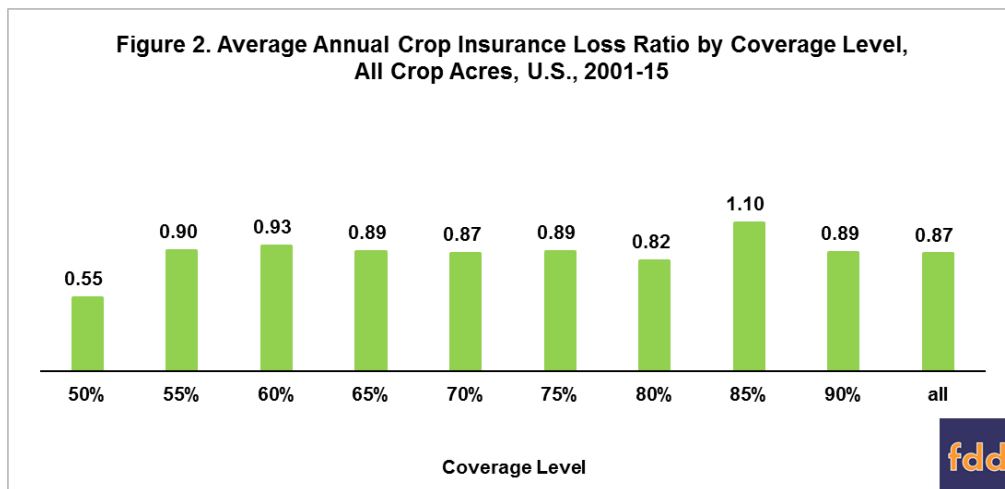
Corn: Average annual loss ratio for all insured corn acres over the 2001-15 crops was 0.85 (see Figure 3). All coverage levels have ratios less than 1. The ratios at 50% and 55% coverage are significantly less than 1 with 95% statistical confidence.

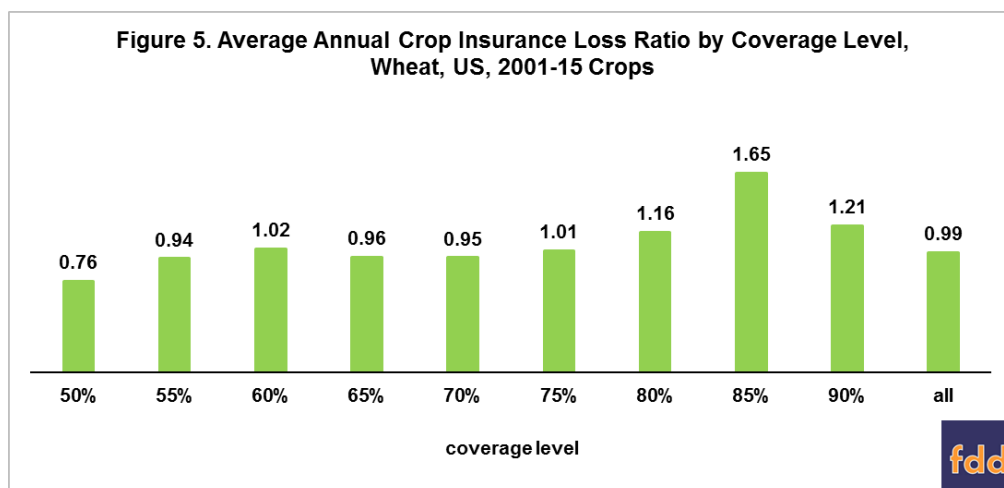**Figure 3. Average Annual Crop Insurance Loss Ratio by Coverage Level, Corn, US, 2001-15 Crops**
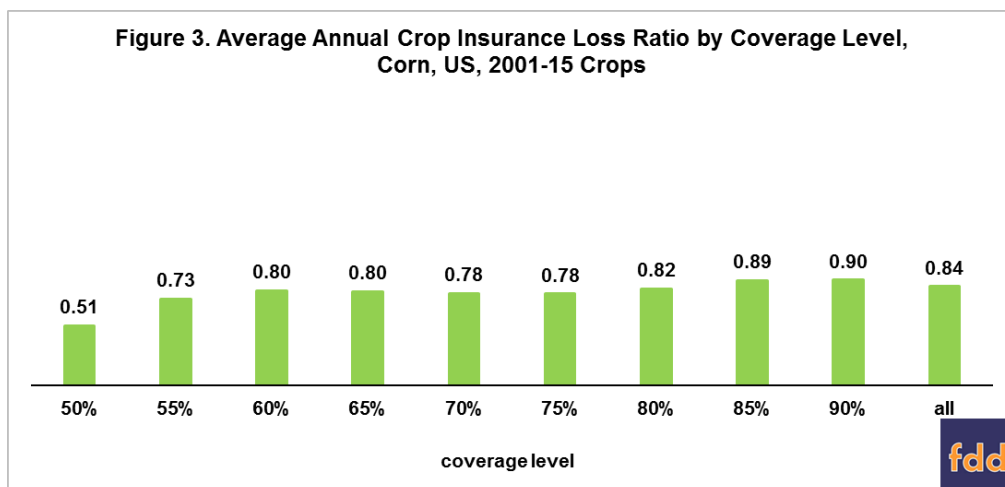
Soybeans: Average annual loss ratio for all insured soybean acres over the 2001-15 crops was 0.66 (see Figure 4). This ratio is significantly less than 1 with 95% statistical confidence. All coverage levels have ratios less than 1, with the ratios for 50% through 80% coverage less than 1 with 95% statistical confidence.

Figure 4. Average Annual Crop Insurance Loss Ratio by Coverage Level, Soybeans, US, 2001-15 Crops

Coverage level	Loss ratio
50%	0.40
55%	0.62
60%	0.68
65%	0.72
70%	0.70
75%	0.65
80%	0.64
85%	0.70
90%	0.73
all	0.66

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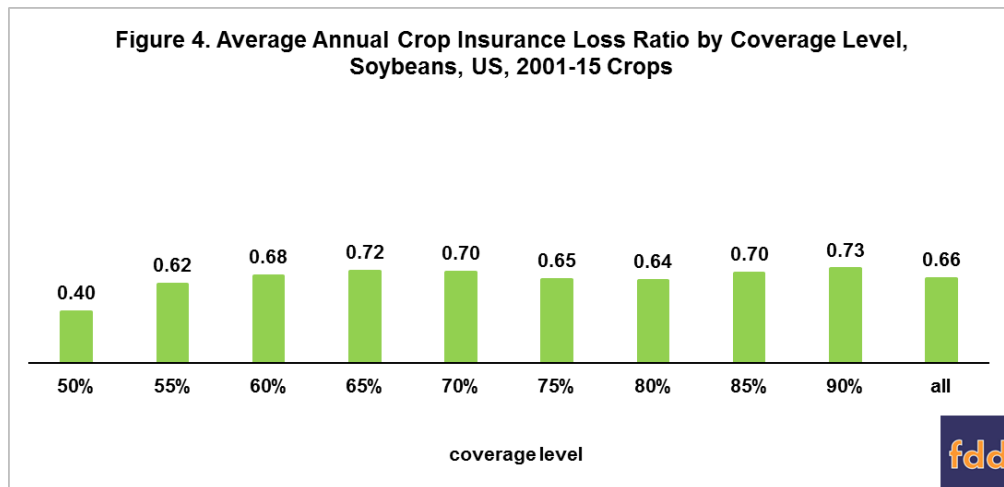
Wheat: Average annual loss ratio for all insured wheat acres over the 2001-15 crops is 0.99 (see Figure 5). Loss ratios exceed 1 for 75% and higher coverage levels. Only the ratios for 50% and 85% coverage differ significantly from 1 with 95% statistical confidence. The former is less than 1 while the latter is greater than 1.

Figure 5. Average Annual Crop Insurance Loss Ratio by Coverage Level, Wheat, US, 2001-15 Crops

Coverage level	Loss ratio
50%	0.76
55%	0.94
60%	1.02
65%	0.96
70%	0.95
75%	1.01
80%	1.16
85%	1.65
90%	1.21
all	0.99

fdd

Cotton: Average annual loss ratio for all insured cotton acres over the 2001-15 crops is 1.06 (see Figure 6), but the ratio does not differ significantly from 1 even with 50% statistical confidence. Most coverage levels have ratios that exceed 1, but only at 80% and 85% coverage does the ratio differ from 1 with 95% statistical confidence. On the other hand, the loss ratio at 50% coverage is less than 1 and differs from 1 with 95% statistical confidence. It is important to note that cotton acres enrolled at 80% and 85% coverage have historically been relatively small and show little trend over time. Combined acres at these coverage levels averaged 468,554 in 2011-15 vs. 507,986 in 2001-05.

Figure 6. Average Annual Crop Insurance Loss Ratio by Coverage Level, Cotton, US, 2001-15 Crops
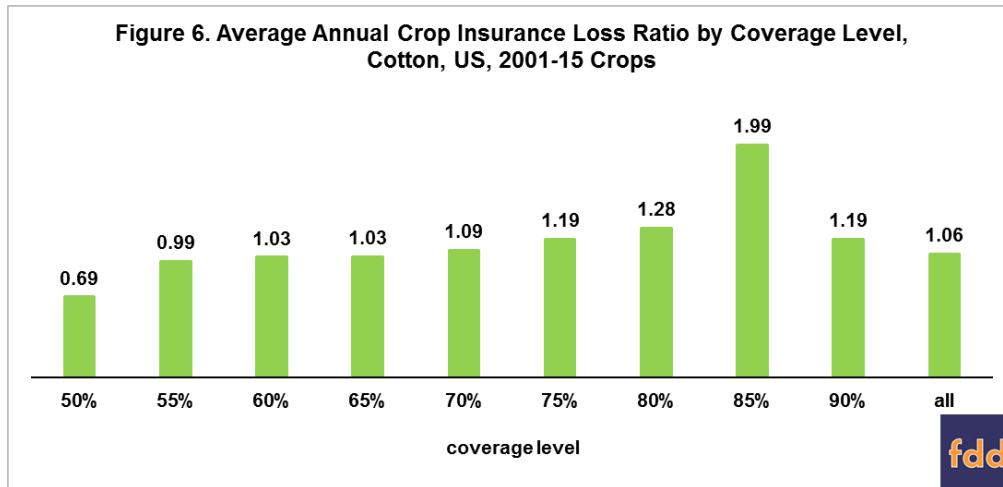
Summary Observations

- Over the 2001-2015 crop years, no indication exists that crop insurance is not meeting its statutory obligation of a loss ratio not greater than 1.0.

- The statutory obligation applies to the entire program, but no violation is found for the three crops with the largest insured acres: corn, soybeans, and wheat. While the loss ratio is greater than 1.0 for cotton, it does not differ from 1.0 at any commonly accepted level of statistical confidence.

- Even at individual coverage levels, exceptions are found only for cotton at 80% and 85% coverage and for wheat at 85% coverage. These exceptions need to be tempered because some exceptions are to be expected statistically.

- Variation in loss ratios by geographical area was not examined. This has been an issue at times.

- Evidence is found for some loss ratios being statistically less than 1.0, in particular for soybeans and at the 50% coverage level.

- In an era of farm financial challenges, loss ratios statistically below 1.0 may be a policy issue. Loss ratios can be increased by reducing insurance premiums, which would lower premiums paid by farms.

- Lower premiums reduce spending on federal premium subsidies. However, higher loss ratios also reduce the government's share of underwriting gains, offsetting at least some of the savings from lower subsidies. Assessing Federal budget impacts thus involve offsetting considerations.

- Increasing loss ratios, for example by setting a minimum target loss ratio, will reduce underwriting gains and thus reduce returns to crop insurance companies. The companies may respond by seeking to negotiate changes in the standard reinsurance agreement. These considerations lead to a policy question, "Are insurance company returns more appropriately addressed via the loss ratio or reinsurance agreement?"

- In closing, the discussions in the preceding three bullet points illustrate an important feature of almost all policy debates. Specifically, benefits and costs of a policy change vary by policy actor.

Reference and Data Source

US Department of Agriculture, Risk Management Agency (USDA-RMA). 2016. *Summary of Business Reports and Data.* December. http://www.rma.usda.gov/data/sob.html.

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