Soil Matters: How the Federal Crop Insurance Program should be reformed to encourage low-risk farming methods with high-reward environmental outcomes

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Soil Matters

American farmers are increasingly turning to the Federal Crop Insurance Program (FCIP) to manage weather-related risks, including crop loss. However, the formula used to set FCIP premiums rewards production methods with negative environmental consequences and misses an important opportunity to encourage farmers to invest in soil health as a risk management strategy. The soil-building management practices discussed in this paper have been shown to simultaneously counteract negative environmental consequences and reduce the risk of crop losses, in both the near term and the long term. NRDC encourages the FCIP to offer a pilot program that reduces premiums for farmers who adopt soil-building management practices. A pilot program for these management practices would benefit producers and make the FCIP more financially sound, particularly because it would equip farmers to become more resilient to climate change.

The weather has been tough on American farmers over the last few years. The 2012 growing season was the hottest, driest in decades, with more than 80 percent of agricultural lands nationwide experiencing drought. (U.S. Department of Agriculture Economic Research Service 2013) During the 2013 planting season, drenching rains delayed or prevented farmers from planting their crops in many regions, and drowned newly planted seeds in others. (Elgion 2013) Despite an inconveniently wet spring, by late summer, some regions were yet again nearing drought conditions. (Lukaitis 2013)

Unfortunately, the FCIP is creating destructive incentives for farmers, even as it is intended to help farmers manage their existing risks. As described in this article, FCIP premiums are set using a formula that ignores how important healthy soil is to farmers'

risk management portfolios, while simultaneously encouraging farmers to make risky production decisions. Partially as a result of this flawed formula, the FCIP has created brittle farming operations that lack resilience and a spiral of ever-increasing taxpayer-subsidized indemnities.

In 2011, the FCIP paid out a record-breaking $10.8 billion in crop insurance indemnities to farmers. (U.S. Department of Agriculture Risk Management Agency 2012 *RMA Indemnities (as of 7/23/2012)*) That record lasted less than a year. Indemnities for the 2012 crop year topped $17.4 billion, (U.S. Department of Agriculture Risk Management Agency 2013 *RMA Indemnities (as of 7/08/2013)*) with drought alone accounting for nearly $13 billion in losses. (U.S. Department of Agriculture Risk Management Agency 2012 *Cause of Loss Historical Data Files*) From 2001 to 2010, indemnities averaged just $4.1 billion a year, making the recent numbers even more striking. (U.S. Department of Agriculture Risk Management Agency 2013 *Summary of Business Reports and Data*) By ignoring how on-farm management affects farmers' ability to withstand weather events like the recent droughts and floods, the FCIP has become a crutch on which farmers will increasingly be forced to lean while taxpayers pick up the ever-growing bill.

To avoid this scenario, the FCIP could empower farmers to use their farm management skills to become more resilient to extreme weather conditions. The FCIP could offer lower premiums to farmers who lessen their risk of crop loss by investing in technically sound management practices that both reduce the risk of loss in the near term and build soil health and increase productive capacity in the long term. Although

increasing premiums for farmers who make risky production choices would also achieve beneficial environmental and actuarial results, this article focuses on a provision of the Federal Crop Insurance Act that specifically allows crop insurance companies to lower premium rates.

In the short term, encouraging soil-building practices that increase soil moisture, improve water infiltration, and combat pest pressures will help decrease yield fluctuation due to unfavorable weather in a given year. In the long term, farmers who invest in soil health will increase their fields' yield potential and be better prepared to face the challenge of a changing climate, in which extreme weather events are predicted to be more frequent and intense. Because these practices reduce the risk of crop loss, the FCIP can and should encourage them through an actuarially sound premium reduction.

History and Structure of the Federal Crop Insurance Program

The FCIP is the primary policy tool that farmers use to manage agricultural risk today. Congress created the program in 1938 in response to the devastation farmers faced from the Dust Bowl, though it was not widely used until increased subsidies were implemented in the 1990s. (Shields 2010)

The FCIP is a public-private partnership between the U.S. Department of Agriculture's Risk Management Agency (RMA) and 18 private insurance companies. The federal government subsidizes farmer-insured, as well as the private companies that sell and service the policies. Both the government and the private companies share in the underwriting risk, and policy rates are noncompetitively set by the RMA. In 2012, the FCIP covered more than 282 million acres, representing roughly 70 percent of the

nation's total cropland. (U.S. Department of Agriculture Risk Management Agency 2013 *Summary of Business Reports and Data*)

The FCIP offers a triple layer of subsidies to farmers: subsidies of the premiums paid by farmers, subsidies for the administrative and operating expenses of the private insurance companies that sell and service the policies, and subsidies of a portion of the private insurance companies' losses.

On average, approximately 60 percent of each FCIP premium is subsidized by the federal government. (7 USCA § 1508) The subsidized crop insurance premiums are tiered according to how much insurance an individual farmer buys. "Catastrophic coverage" only indemnifies losses of 50 percent or more of a farmer's productive value (the equivalent of a 50 percent deductible) and is fully subsidized by the federal government. (7 USCA § 1508) Farmers may "buy up" beyond catastrophic coverage, indemnifying up to 85 percent of their typical production value (the equivalent of a 15 percent deductible). (7 USCA § 1508) Depending on the level of coverage a farmer buys, the FCIP subsidizes between 67 percent and 38 percent of the market value of the additional "buy up" coverage. (7 USCA § 1508)

The Standard Reinsurance Agreement (SRA) between the RMA and the private companies sets the subsidies paid to the private companies that manage the FCIP for "administrative and operating expenses." (7 USCA § 1508) The SRA provides different levels of administrative and operating expenses for different types of policies, but the typical subsidy is 18.5 percent of the farmer-paid portion of the premium. (U.S.

Department of Agriculture Risk Management Agency 2013 *Standard Reinsurance Agreement*)

The SRA also governs the risk-sharing agreement between the private companies and the RMA. (7 USCA § 1508) In general, the higher the loss, the less risk retained by the private company.(7 USCA § 1508) Once the private insurance providers have written their entire "book of business" for the year, they determine which individual policies they wish to retain the premium and liability for, and which policies they intend to cede completely to the federal government. (U.S. Department of Agriculture Risk Management Agency 2013 *Standard Reinsurance Agreement*) The private companies are required to keep 20 percent of the policies they consider to be high risk, and at least 35 percent of their entire book of business in each state. (U.S. Department of Agriculture Risk Management Agency 2013 *Standard Reinsurance Agreement*) The underwriting gains and losses from the retained policies are further shared with the federal government at different rates that depend on the loss ratio in each state. (U.S. Department of Agriculture Risk Management Agency 2013 *Standard Reinsurance Agreement*) Companies whose indemnities are slightly below the amount of premiums they have brought in can keep up to 97.5 percent of the underwriting gain in certain states. (U.S. Department of Agriculture Risk Management Agency 2013 *Standard Reinsurance Agreement*) Once all gains and losses from the year have been calculated, the private companies transfer 6.5 percent of their total underwriting gains or losses to the federal government through a settlement payment. (U.S. Department of Agriculture Risk Management Agency 2013 *Standard Reinsurance Agreement*)

FCIP premiums are set by the RMA using a formula designed to match premiums to the amount of losses. (7 USCA § 1508) When setting premiums to achieve this target loss ratio of 1, the RMA uses a historical "loss cost" method. (Coble, et al. 2010) The loss cost method requires RMA to average individual loss rates across individual exposure experiences to create county-level aggregate base rates. (Woodard, Sherrick and Schnitkey 2011) RMA then uses county base rates to calculate how premiums should be set for varying degrees of coverage. RMA therefore looks at the past to set premiums in the present—a process known as "loss cost ratemaking".

The Federal Crop Insurance Program Needs Reform

There are two major problems with the current structure of the FCIP: The formula the RMA uses to set premium rates attracts high-risk producers, and the structure of the program incentivizes production choices that damage natural resources and increase the risk of crop loss. These problems are called "adverse selection" and "moral hazard" in the insurance world. In light of the fact that the FCIP costs taxpayers more than $14 billion a year when all subsidies are totaled, its current structure should be reformed to more efficiently use taxpayer dollars, to encourage risk-mitigating practices, and to better protect our nation's natural resources. (U.S. Department of Agriculture Risk Management Agency 2012 *Fiscal Year Government Cost of Federal Crop Insurance*)

Loss Cost Ratemaking Attracts Risky Producers and Discourages Low-Risk Producers

Because loss cost ratemaking relies only on historical data, it depends on a constant relationship between yield and indemnities in order to remain actuarially fair; if either insured value or risk of loss (the two variables in the loss cost ratio) changes more

quickly than the other, loss cost ratemaking will set inaccurate premiums. This means that if farm yields trend upward but the risk of loss remains unchanged, loss cost ratemaking would cause farmers to overpay for insurance. For example, if a farmer wants to insure a corn yield of 100 bushels per acre, and his approved yield is 125 bushels per acre based on his 10-year actual production history, he must buy 80 percent coverage. If that same farmer improved his practices so that in recent years he actually produced 150 bushels per acre, his earlier, lower yields will drag down his average yield. If the farmer now actually produces 150 bushels per acre in a typical year, but his approved yield is only 125 bushels per acre, purchasing 80 percent coverage will only cover 67 percent of his expected current yield.

Conversely, if farming practices increase the risk of loss over time, loss cost ratemaking would set premiums too low. (Ramieriz, Carpio and Rejesus 2011) Indeed, studies have shown that loss cost ratemaking overcharges low-risk producers and undercharges high-risk producers. (Woodard, Sherrick and Schnitkey 2011) Although RMA recently offered farmers an option to purchase a "yield adjustment" for certain policies in certain areas, this *ad hoc* adjustment does not address the systemic issues with loss cost ratemaking, nor does it deal with the problem of farmers whose risky behavior causes them to be undercharged for their insurance. (U.S. Department of Agriculture Risk Management Agency 2011) As a result, this underwriting technique attracts high-risk farmers and discourages low-risk farmers, (Walters, et al. 2012) and will continue to lead to increased levels of taxpayer-subsidized indemnities (U.S. Government

Accountability Office 2007) and program costs over time. (Ramieriz, Carpio and Rejesus 2011)

Loss Cost Ratemaking Incentivizes Risky Practices that Damage Natural Resources

Because rates are noncompetitively set by the RMA, there are very few market signals that private insurance companies can send to farmers to make risk-reducing choices. This stands in contrast to, for example, private home insurance companies that may offer discounts to policyholders whose houses are equipped with alarm systems to encourage more homeowners to invest in alarms. (Liberty Mutual Insurance 2013) In fact, the FCIP actually tends to encourage farmers to make riskier choices, (McLeman and Smit 2006) such as planting crops on fields that are not well suited to agricultural production, (Wu 1999) because farmers who do so pay disproportionately low premium rates compared with farmers who make risk-reducing management decisions, as described above. (Miao, Feng and Hennessy 2012) When land that is not well suited for major commodity crops is shifted into production, it can increase erosion, chemical inputs, and other negative environmental impacts. (Wu 1999, Walters, et al. 2012)

Improved Soil Health Can Counteract Actuarial and Environmental Problems

Farm management practices that build soil health also reduce the environmental impacts of agriculture and reduce the risk of crop loss, particularly during years with unfavorable weather. The benefits of these management practices make them well suited to counteract the actuarial and environmental problems inherent in the Federal Crop Insurance Program. No-till farming, cover cropping, and efficient irrigation are three examples of soil-building practices that simultaneously improve environmental outcomes and

decrease the risk of crop loss, particularly by increasing soil's capacity to provide water to growing crops.

No-till farmers plant their crops directly into the stubble left from the previous year's crop. The stubble acts like a garden mulch and helps soil retain more moisture by trapping snow, decreasing evaporation from the top layer of soil, and improving water infiltration to plant root systems. (Osteen, Gottleib and Vasavada 2012) The increased soil moisture provided by no-till planting offers farmers a hedge against erratic rainfall and declining irrigation supplies, benefitting both farmers who irrigate (U.S. Department of Agriculture Economic Research Service 2010) and those who do not. (Stone and Schlegel 2010) No-till offers a variety of additional agronomic and environmental benefits as well, including erosion reduction (Zhang 2012) and increased biodiversity. (Galle, et al. 2009) Some of no-till's benefits accrue immediately, such as the erosion and soil moisture benefits that result from increased residue coverage. (Stubbs, Kennedy and Schillinger 2004) Over time, no-till improves soil health, restores beneficial soil biota, and increases a field's capacity to grow high-yield crops. (Toliver, et al. 2011) By contrast, removing more than 25 percent of crop residues decreases long-term soil productivity. (Wiggans, et al. 2012)

Cover crops are non-commodity crops that are planted with the primary purpose of improving the soil ecosystem. Like no-till management, cover cropping increases water infiltration and storage, helping to provide water to growing commodity crops and decreasing the need for irrigation. (H. Blanco-Canqui 2011) Although cover crops themselves require water to grow, (De Bruin, Porter and Jordan 2005) when they are

properly selected and managed, the net water available for commodity crops tends to increase due to cover crops' ability to increase infiltration and reduce surface evaporation. (H. Blanco-Canqui 2011) Indeed, cover crops can be most helpful during drought years. (Williams and Weil 2004) Cover crops provide a variety of additional agronomic benefits as well, such as weed suppression, (Nord, et al. 2011) increased soil fertility, (Snapp, et al. 2005) reduced erosion, (H. Blanco-Canqui 2011) increased habitat for beneficial insects, (Snapp, et al. 2005) and reduced input requirements. (Andraski and Bundy 2005) Like no-till farming, cover crops can both increase yields in the short term (Blanco-Canqui, Claasen and Presley 2012) and increase yield potential and stability over time. (Snapp, et al. 2005) Despite cover crops' agronomic benefits, only about 7 percent of U.S. row crop farmers planted cover crops in 2012. (Conservation Technology Information Center and U.S. Department of Agriculture North Central Sustainable Agriculture Research and Education 2013) Slow adoption of cover crop technologies is likely attributable to farmers' unfamiliarity with cover cropping, as well as the increased time and labor cover cropping requires. (Conservation Technology Information Center and U.S. Department of Agriculture North Central Sustainable Agriculture Research and Education 2013)

Farmers who irrigate often apply water using a fixed schedule or make adjustments based on the "look and feel" of their soil. (U.S. Department of Agriculture National Agricultural Statistics Service 2007) Irrigators who actively assess soil moisture and time their applications accordingly tend to be more efficient in their water use than their peers. (University of Nebraska- Lincoln 2013) Farmers who schedule irrigation

according to readings from soil moisture monitors and the evapotranspiration rate of crops can improve their yields while using less water. (Ko and Piccinni 2009) Not only does this reduce farmers' costs in the short term, (Irmak, et al. 2010) but conserved water is potentially banked for future, drier years.

These soil-building management practices—no-till, cover cropping, and efficient irrigation management—are three key techniques that farmers can use, alone or in combination, to protect both natural resources and their bottom lines. Unfortunately, even though these practices reduce financial risk and improve environmental outcomes, the loss cost formula used to set premiums under the FCIP prevents farmers who employ these methods from receiving the actuarial benefits of their actions.

The Federal Crop Insurance Program should Incentivize Risk-Reducing and Environmentally Beneficial Practices through a Pilot Program

According to the law that governs the FCIP, insurance companies may propose to the RMA "pilot programs" that reduce premium rates below those set with the loss cost formula if certain conditions are met. (7 USCA § 1523) A pilot program could be used to provide more actuarially fair premiums to low-risk farmers and encourage adoption of risk-reducing management practices by lowering premium rates for farmers who adopt such practices. The law requires that two primary conditions be met in order for the RMA to implement a pilot premium rate reduction: The reduction must be actuarially sound, and it must be in the best interest of the producers. If a pilot premium reduction performs well for the first four years, RMA may expand the pilot for as long as it deems appropriate. (7 USCA § 1523) A premium reduction for farmers who use risk-reducing

management practices would be both actuarially sound and in the best interest of producers.

Premium Reductions for Risk-Reducing Practices would be Actuarially Sound

Under the FCIP, "actuarially sound" means meeting the target loss ratio of 1. (7 USCA § 1508) A premium reduction for risk-reducing management practices could be structured to match premiums with indemnities. For example, in 2010, corn farmers who used no-till were 30 percent less likely than their conventional-tilling peers to receive an indemnity payment under the FCIP, as shown in figure 1. (U.S. Department of Agriculture Economic Research Service 2010) The reduced indemnities resulting from total conversion to no-till can be estimated by calculating the difference between current failures under conventional tillage and projected failures under no-till as follows:

$$(16{,}832{,}794\ insured\ conventional\ till\ [CT] acres\ \times 0.8258\ CT indemnity\ rate$$
$$-\ 16{,}832{,}796\ CT\ acres\ \times 0.05699\ No\ Till\ [NT] indemnity\ rate)$$
$$+\ (19{,}639{,}280\ insured\ mulch\ till\ [MT] acres\ \times 0.09202\ MT\ indemnity\ rate$$
$$-\ 19{,}639{,}280\ MT\ acres\ \times\ 0.05699\ NT\ indemnity\ rate)$$
$$+\ (16{,}635{,}367\ insured\ reduced\ till\ [RT] acres\ \times 0.09087\ RT\ indemnity\ rate$$
$$-\ 16.634{,}367\ RT\ acres\ \times 0.05699\ NT\ indemnity\ rate\ )$$
$$+\ (3{,}691{,}508\ insured\ acres\ with\ undetermined\ tillage\ methods\ [UD]$$
$$\times 0.08090\ average\ insured\ acres\ indemity\ rate\ -\ 3{,}691{,}508\ UD\ acres$$
$$\times 0.05699\ NT\ indemnity\ rate)$$
$$=\ 1{,}770{,}585\ acres\ that\ failed\ under\ previous\ tillage\ methods\ but\ would\ be\ expected\ not\ to\ fail\ under\ 100\ percent\ NT$$

The reduced indemnities due to the reduction in failing acres can be estimated by multiplying the formerly failing acres by the average per-acre indemnity payment as follows:

$$1{,}770{,}585\ formerly\ failing\ acres\ \times \$126.67\ per\ acre$$
$$= \$224{,}285{,}415\ in\ reduced\ indemnities$$

If all farmers who used methods other than no-till had instead used the no-till technique, approximately $224 million in indemnities could potentially have been avoided. (Federal Crop Insurance Corporation 2010)

Similarly, in 2012, cover crops could have potentially helped avoid significant drought-related indemnity payments. Corn farmers in states that were most impacted by the 2012 drought—Illinois, Iowa, Nebraska, and Kansas— received nearly $4 billion in indemnities due to drought loss. (U.S. Department of Agriculture Risk Management Agency 2012 *Cause of Loss Historical Data Files*) Although even cover cropping corn farmers experienced average yields that were lower than historic yields in those states during the dry 2012 growing year, cover cropping yields were still more than 79 percent of typical yields; cover cropped fields yielded an average of 122 bushels of corn per acre in these states, while non-cover cropped fields yielded only 106 bushels of corn per acre on average. (Conservation Technology Information Center and U.S. Department of Agriculture North Central Sustainable Agriculture Research and Education 2013) Ten-year historic corn yields for this area averaged 150.5 bushels per acre, which can serve as a proxy for Actual Production History. (U.S. Department of Agriculture National Agricultural Statistics Service 2012) Assuming an average crop insurance coverage level

of 75 percent, (Westhoff 2010) or 113 bushels per acre based on average 10-year historical production, indemnity payments were likely not triggered for many of the cover cropping farmers. Yields from corn farms that did not have cover crops were much lower—only 68 percent of average historic yields in this area. (U.S. Department of Agriculture National Agricultural Statistics Service 2012) Again, assuming an average crop insurance coverage level of 75 percent, (Westhoff 2010) it is plausible that a significant portion of the almost $4 billion in drought-related indemnities paid out in these states went to corn farmers who did not use cover crops, as shown in figure 2.

Finally, in 2012, irrigation supply failures accounted for more than $14.7 million in indemnity payments. (U.S. Department of Agriculture Risk Management Agency 2012 *Cause of Loss Historical Data Files*) Farmers who use efficient irrigation management practices, such as soil moisture monitoring and irrigation scheduling, can keep their yields high even while they reduce the amount of water they apply to their crops. In a 2009 University of Nebraska demonstration, corn farmers who used soil moisture monitors to schedule irrigation were able to reduce the amount of water they applied to their corn by 15 percent without impacting their yields. (University of Nebraska Extension 2009) This reduction in overall irrigation water required due to better irrigation management could potentially help farmers avoid some of the supply constraints that cause indemnified losses during dry years like 2012.

Premium reductions pay for themselves; the avoided indemnities created by risk-reducing management practices like no-till, cover cropping, and irrigation management allow plenty of room to offer significant premium reductions to farmers who use these

soil-building practices. Over time, these practices will also reduce the need for and size of the FCIP. Offering a premium reduction for farmers who use such management practices is actuarially sound; it encourages farmers to adopt less risky production methods that achieve more stable yields, lower indemnity rates, and lower costs for the FCIP.

Premium Reductions for Risk-Reducing Management Practices would be in the Best Interest of Producers

There are obvious short-term benefits to producers who adopt risk-reducing management practices. As described above, techniques such as no-till, cover cropping, and efficient irrigation improve soil's ability to filter, hold, and retain water, benefiting farmers by increasing yields in the near term.

In addition, these practices increase farmers' resilience to the growing challenges posed by climate change. Scientific experts, including leading agronomic organizations and U.S. Department of Agriculture (USDA) researchers, expect climate change to result in more frequent droughts, more intense precipitation events, greater water requirements for growing crops, and more significant pest problems for American farmers. (Working Group Representing the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America 2011, Walthall, et al. 2012) Some of the areas that can expect to be hit hardest by climate change are also some of the nation's most agriculturally productive. (Roy, et al. 2010)

A recent comprehensive USDA report on the effects of climate change on U.S. agriculture pointed to conservation tillage, cover crops, efficient irrigation, and other soil-building management practices as key strategies in adapting to the intense rainfall and

severe drought episodes that are expected to accompany climate change. (Walthall, et al. 2012) As the USDA recognizes, these management practices benefit producers, especially when long-term climate change scenarios are considered, and therefore satisfy the second requirement for pilot programs.

Conclusion

Farmers are increasingly turning to the subsidized FCIP to manage the risks of farming. However, the view of risk management adopted by the FCIP is too narrow; it ignores the role that healthy soils play in building resilience to agricultural risks, including extreme weather events. Soil-building practices such as no-till, cover cropping, and efficient irrigation can simultaneously help farmers reduce the risk of crop loss and improve agriculture's environmental outcomes. The FCIP should recognize the benefits of these practices by piloting a premium reduction for farmers who reduce their risk of crop loss through on-farm stewardship. This more holistic view of risk management would be good for farmers, good for taxpayers, and good for the environment.

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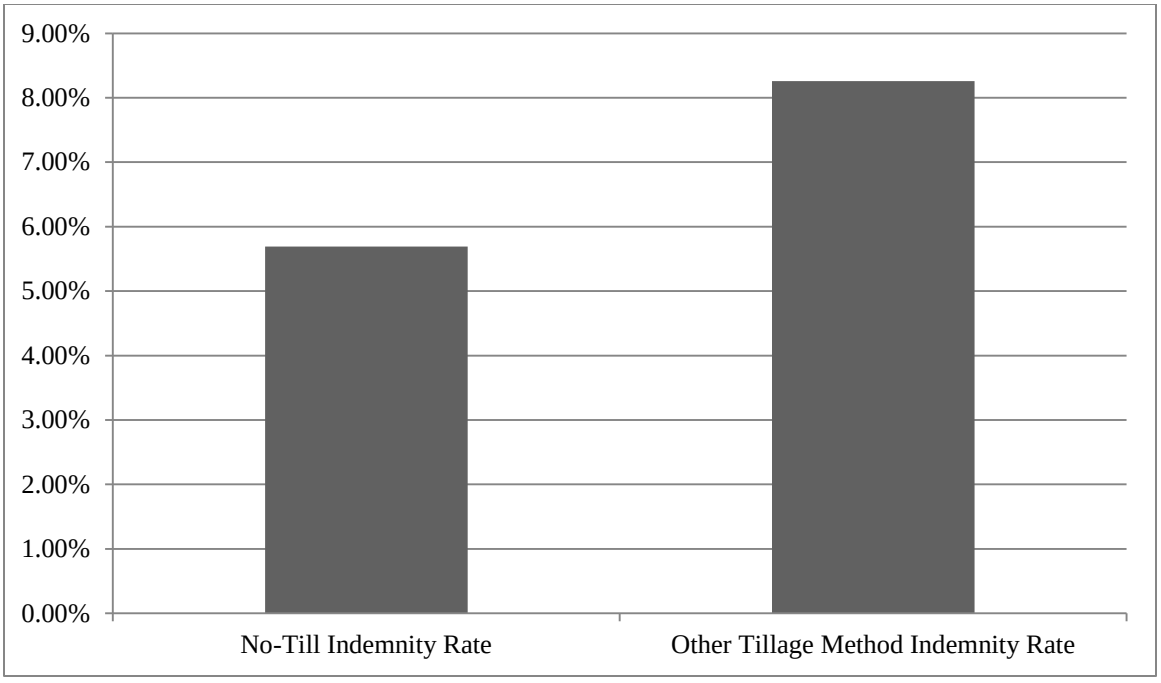

Figure 1. No-till's indemnity rate compared to other tillage methods' indemnity rate on U.S. corn acres, 2010

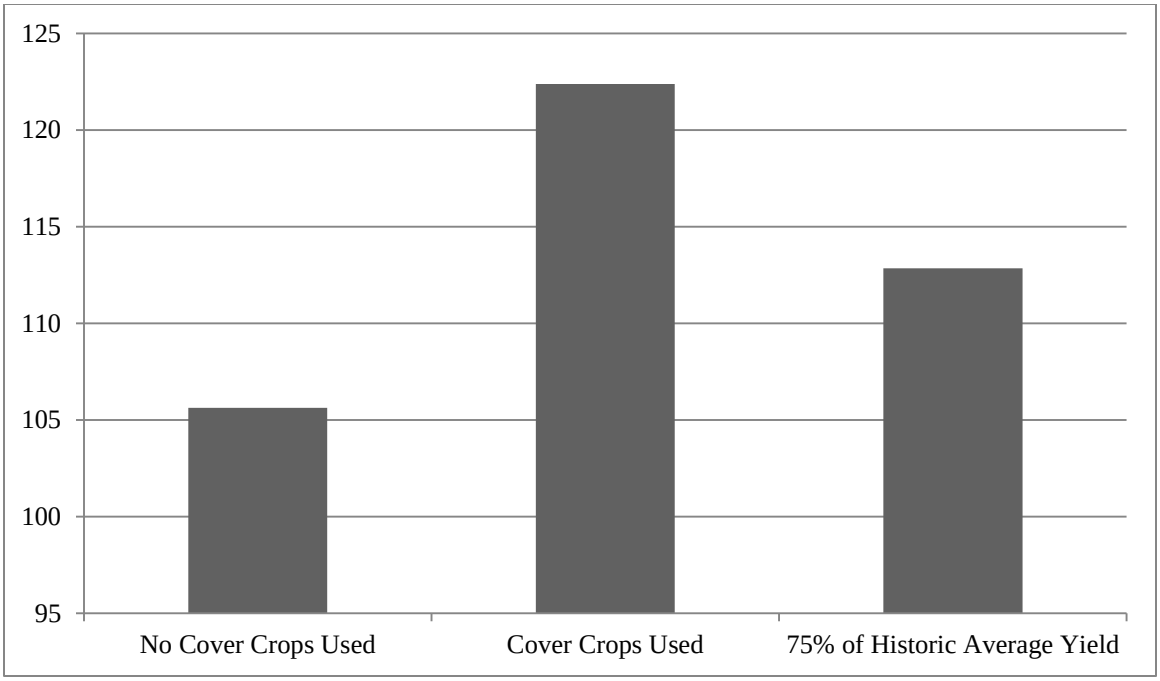

Figure 2. Average 2012 corn yields in bushels per acre for the top four drought-affected states (IA, IL, KS, NE) compared to 75% of 10-year historic average corn yield for those same states (used as a proxy for determining indemnity-triggering yield)