Crop Insurance, Disaster Payments, and Incentives for Land Use Change in Agriculture: A Preliminary Assessment

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The potential environmental impacts of commodity support programs — commodity programs, crop insurance, and disaster payments— continue to receive attention from a wide variety of groups, including Federal and local government, nongovernmental organizations, and the popular press. One facet of this issue is the growing concern about the effect of farm programs on agricultural land use. Environmentalists, wildlife groups, and some livestock interests are particularly concerned about the conversion of native grasslands to crop production (GAO). Annual rates of grassland conversion of 2 percent have been measured in some areas of the Northern Plains (Stephens, et al.). Native grasslands are important habitat for a number of threatened or at-risk species and, once lost, cannot be easily re-established.

Farm program payments are often cited as a contributing factor in the conversion of grassland for crop production (Morgan). Commodity programs, crop insurance, and disaster payments compensate farmers when prices and/or yields are low. Over time these payments increase the average return to, and reduce the risk of, crop production. While a significant share of commodity payments are decoupled from production—producers cannot increase payments by producing more—some Federal farm program benefits continue to depend on production. Converting grassland to cropland will not change direct or counter-cyclical payments, which depend on only past production measured in specific base periods. Marketing loan benefits, crop insurance indemnities, and some disaster payment, however, do depend on current production and, with some limits, can increase when “new land” is added to a farm through conversion of grassland to cropland. Of course, policies that increase commodity demand and commodity prices—such as renewable fuels mandates (e.g., ethanol or bio-diesel)—can also encourage producers to shift land into crop production.

Because of high prices, driven in part by bio-fuel mandates, Marketing Loan Benefits are not really an issue at this time. MLBs effectively set a fixed floor under the price farmers receive for program commodities (e.g., corn, wheat, soybeans, cotton). Because these payments are based on overall production, program crops grown on new land would be eligible to receive them. However, payments are made only when price drops below a pre-determined loan rate. Because current and projected prices are high relative to commodity loan rates, the prospect of a marketing loan benefit in the foreseeable future is remote for most program crops. Current corn ($3.90 on April 10, 2009) and wheat ($6.44) are well above respective loan rates ($1.95 and $2.75).

Past research on the land use effect of farm programs has focused largely on crop insurance (e.g., Goodwin *et al*; Wu; Lubowski *et al.*). Depending on the study, subsidized crop insurance may have increased land in crop production by 1-3 million acres nationally. Each of these studies, however, use data from the 1990s or earlier periods, predating the large increase in crop insurance premium subsidies enacted in the Agricultural Risk Protections Act of 2000. Higher subsidies increased crop insurance participation (Dismukes and Vandeveer). By 2002, 80 percent of eligible acreage was covered and most producers (insured at 65 or 70 percent coverage) paid less than half of the full premium.

The Risk Management Agency, which sets the terms under which Federal crop insurance is provided, limits crop insurance coverage on new land by requiring at least one year of production history (i.e., crop insurance is not generally available in the first year of production on new land) and otherwise limiting a producer's crop insurance "yield" or APH on land in the first several years of production. Limiting the APH reduces both the likelihood that crop insurance indemnities will be received and the size of indemnities that are received. We refer to these rules as the RMA "new land" provisions.

Concern about the effect of crop insurance on grasslands in the Prairie Pothole Region (PPR)—an area of the Northern Plains that encompasses parts of five states—prompted Congress to legislate an additional limitation on the availability of crop insurance on new land. Enacted as part of the 2008 farm act, the "Sodsaver" provision could deny crop insurance on new land for a period of five years. Implementation, however, is at the discretion of PPR Governors—who must take action before Sodsaver will apply to producers in their state.

Further complicating the picture is a new disaster program—also part of the 2008 farm act—which effectively serves as a free supplement to crop insurance. Supplemental Revenue Assistance (SURE) is a whole farm program that provides supplemental payments to farmers who purchase Federal crop insurance[1] and are located in a "disaster county" (a county declared by the Secretary of Agriculture to have suffered weather-related production losses of 50 percent or more) or a contiguous county. For insurable crops—which are predominant in the PPR—SURE payments can be made only to producer's who have purchased crop insurance with the level of payment increasing with the level of insurance coverage (expressed as a percent of expected yield or revenue).

[1] Producers of non-insurable crops can also be eligible for SURE. We ignore these crops because most land in the PPR is planted to insurable crops.

Being a free supplement to crop insurance, SURE could increase the potential impact of crop insurance on land use decisions, particularly in regions where high yield variability could result in frequent disaster declarations.

We will estimate the effect of crop insurance and SURE payments on expected returns to crop production (corn and wheat) and the variability of those returns for seven representative farms in the PPR. Each of these farms represents a North Dakota or South Dakota county where grassland to cropland conversion was particularly high in 2005-06 according to data collected by the Farm Service Agency (Table 1). For each of these representative farms, we consider three scenarios. As a benchmark, we estimate the effect of crop insurance indemnities and SURE payment crop revenue when the purchase of crop insurance on new land is not restricted in any way (i.e., assuming the RMA new land provisions and Sodsaver provision are not in force). Second, we consider the status quo—crop insurance indemnities and SURE payments on new land with the current RMA "new land" provisions in place. Finally, we consider the effect of the Sodsaver provision on crop insurance and SURE payments.

Evidence on the relative contributions of crop insurance and the new disaster (SURE) payments to overall crop revenue could shed light on the role of farm programs in land conversions. Our hypothesis is that the more these payments increase mean returns and decrease the variance of returns to crop production, the larger their potential role in the conversion of grassland cropland.

Farm Programs, New Land, and Crop Revenue in the PPR

To analyze the role of crop insurance and SURE in overall crop revenues we develop a joint distribution of crop yields and crop prices for our seven counties. Using these distributions, we estimate expected crop revenue, the variability of crop revenue, and the effect of crop insurance and SURE for each of our three scenarios. In the next section, we describe our derivation of yield and price distributions. In this section, we discuss (1) calculation of crop insurance indemnities, (2) the effect of RMA new land provisions and the sodsaver provision on those indemnities, (3) calculation of SURE payments, and (4) crop revenues under each of our three scenarios.

Crop Insurance. Crop insurance is widely purchased in the Prairie Pothole Region (PPR). The most popular product in the PPR is Revenue Assurance (RA) with 70 percent coverage, accounting for 32 percent of insured corn acreage and 29 percent of insured wheat acreage (RMA). Overall, RA accounts for 74 percent of insured corn acreage (70 and 75 percent are the most popular coverage levels) and 44 percent of insured wheat acreage, almost all of it insured at 65, 70, or 75 percent coverage.

Under the base price option, an RA indemnity is paid when realized revenue (realized price times actual yield) falls below the guarantee, which equals the RA base price multiplied by the producer's APH yield and the coverage level. The per-acre indemnity is:

$$I(\theta p_i^b \bar{y}_i - p_i\, y_i) = \theta p_i^b \bar{y}_i - p_i\, y_i \quad when \quad \theta p_i^b \bar{y}_i - p_i\, y_i > 0$$

$$I(\theta p_i^b \bar{y}_i - p_i\, y_i) = 0 \quad otherwise$$

Where θ is the coverage level, p_i^b is the RA base price for crop i, $\bar{y}_i$ is the producer's actual production history (APH) yield, p_i is the realized price, and y_i is the actual yield.

Crop insurance premiums are heavily subsidized. At 70 percent coverage, 59 percent of the full premium is paid by the government. If premiums are actuarially fair, the net return to producers, over time, would equal 59 percent of indemnities.[2] Over a ten-year period, for example, the net present value of crop insurance purchase on crop *i* would be:

$$\sum_{t=0}^{9} \delta_t s(\theta) I(\theta p_{it}^{b} \bar{y}_{it} - p_{it} y_{it})$$

where $\delta_t = (1+r)^{-t}$, r is the discount rate, and $s(\theta)$=.59 for θ=.70.

RMA new land provisions. Production history is critical to crop insurance premium rating for both yield and revenue products. "New land" is problematic because it has no production history. In general, the purchase of crop insurance requires at least one year's cropping history,[3] while premium rating requires a minimum of four yields. On land with less than four years of cropping history, transitional or "T" yield can be used to fill the history. For land with one year of actual history, the other three yields are equal to 80 percent of the county transitional or "T" yields for the three years prior to land conversion. If land is cropped for the first time in year t, and the producer purchases crop insurance in year t+1, the producer's APH yield evolves as follows:

[2] A number of authors have argued that premium rates are not actuarially fair and that some producers benefit from asymmetric information while others are charged higher than fair premiums (see Just *et al*. (1999) and Makki and Somwaru (2001)). RMA data shows that crop insurance losses are persistent in the Northern Plains (Glauber), suggesting that our estimates of the crop insurance subsidy may be, on average, conservative.

[3] Insurance could be provided by written agreement although RMA is not obligated to provide coverage through written agreements.

$$\bar{y}_{t+1} = (0.80(y_{t-1}^T + y_{t-2}^T + y_{t-3}^T) + y_t)/4$$
$$\bar{y}_{t+2} = (0.80(y_{t-1}^T + y_{t-2}^T) + y_t + y_{t+1})/4$$
$$\bar{y}_{t+3} = (0.80\, y_{t-1}^T + y_t + y_{t+1} + y_{t+2})/4$$
$$\bar{y}_{t+s} = s^{-1}\sum_{k=t}^{t+s-1} y_k \quad 4 \le s \le 10$$
$$\bar{y}_{t+s} = 0.1\sum_{k=t+s-10}^{t+s-1} y_k \quad s > 10$$

where y_{t-1}^T is the "T" yield for time t-1, and so on. Similar rules govern the calculation of T yields for producers who defer crop insurance purchase until the third or fourth year of production. For simplicity, we assume producers will purchase crop insurance as soon as possible (without a written agreement).

Sodsaver. If implemented, Sodsaver would deny crop insurance coverage on new land that was converted from native sod, for a period of five years. The five year hiatus would give producers time to develop a sufficient cropping history to avoid RMA's new land provisions once crop insurance becomes available on the additional land. At this time, however, none of the PPR Governors has chosen to implemented sodsaver.

SURE payments. Because SURE payments are contingent on the purchase of crop insurance (when available) the RMA new land and Sodsaver provisions also affect SURE payments. The SURE payment guarantee, when these payments are triggered, depends on the level of crop insurance coverage selected by producers. The level of the SURE payments, once a disaster has been declared, depends on overall (farm-level) crop revenue, crop insurance indemnities, and commodity program payments. (We do not consider prevented planting, ad hoc disaster aid, or non-insured crops.) The SURE payment, D, is equal to:

$$D = \max(0.60(G - R^T),0)$$

Where G is the SURE guarantee and R^T is total farm revenue. The guarantee for insured crops is based largely on crop insurance prices, yields, and coverage:

$$G = \min\left(1.2\sum_i (a_i \theta p_i^b \bar{y}_i),\ 0.90\sum_i a_i p_i^b \max(\bar{y}_i\ , y_i^C)\right)$$

where a_i is planted acreage of crop i (or acreage where planting was prevented) and y_i^C is the producer's counter-cyclical payment program yield. Note that the guarantee is based on the crop insurance guarantee, $a_i \theta p_i^b \bar{y}_i$, with depends on the coverage level selected by the producer and the APH yield.

Total farm revenue includes market revenue, commodity program payments, and crop insurance indemnities:

$$R^T = \sum_i a_i \left(p_i y_i + I(\theta p_i^b \bar{y}_i - p_i\ y_i) + MLB_i\right) + 0.15DP + CCP$$

where MLB_i is the per-acre marketing loan benefit, DP is the producer's total (farm-level) direct payment, CCP is the total counter-cyclical payment, and MLB is the total marketing loan benefit. Finally, payments can be made only to producers who are located in counties where a disaster has been declared, counties contiguous to disaster counties, or to producers located anywhere who have experienced production 50 percent or more below normal levels.

The SURE payment on new land will be equal to the change in the guarantee less the change in total farm revenue. The per-acre change in the guarantee will be:

$$\Delta G = 1.2\sum_i \theta p_i^b \bar{y}_i \quad \text{or} \quad \Delta G = 0.90\sum_i p_i^b \max(\bar{y}_i\ , y_i^C)$$

depending on whether the revenue guarantee formula yields a number that is above or below 90 percent of expected revenue. The APH yield would be subject to the RMA new land provisions. The per-acre change in total farm revenue would be:

$$R^{T} = \sum_{i} \left(p_i y_i + I(\theta p_i^b \bar{y}_i - p_i\, y_i) + MLB_i \right).$$

In years without crop insurance coverage (under either RMA's new land provisions or Sodsaver) the SURE payment on new land would be zero.

Putting it all together: Crop revenue under three scenarios. Because RMA's new land and Sodsaver provisions would play out over a number of years, we consider the potential effect of these alternative policies over 10 years. Using crop yield and price distributions developed in the next section, we calculate the net present value of overall revenue and the standard deviation of NPV for each of three scenarios. In the first scenario, we assume that crop insurance and SURE payments can be received without restriction. In this scenario, county average expected yields are used as the APH yield for the representative farm in each county.

$$R^{NR} = \sum_{t=0}^{9} \sum_{i} \delta_t a_{it} \left(p_{it} y_{it} + s(\theta) I(\theta p_{it}^b \bar{y}_{it} - p_{it} y_{it}) + D_t \right)$$

Second, we consider crop revenue with the RMA new land provisions in force, but in the absence of sodsaver. The producer's revenue on each acre of *new* land during the first ten years of production includes market returns and the possibility of crop insurance indemnities and SURE payments after the initial year (year 0):

$$R^{NL} = \sum_{t=0}^{9} \sum_{i} \delta_t a_{it} p_{it} y_{it} + \sum_{t=1}^{9} \sum_{i} \delta_t \left(a_{it} s(\theta) I(\theta p_{it}^b \bar{y}_{it} - p_{it} y_{it}) + D_t \right).$$

where the APH yield evolves as described above. Finally, with Sodsaver in place, revenue on new land revenue over a 10 year period would include only market revenue for the first five years, and

$$R^{SS} = \sum_{t=0}^{9}\sum_{i}\delta_t a_{it} p_{it} y_{it} + \sum_{t=5}^{9}\sum_{i}\delta_t \left(a_{it} s(\theta) I(\theta p_{it}^{b} \bar{y}_{it} - p_{it} y_{it}) + D_t\right)$$

We estimate the distribution of R (mean and standard deviation) using price and yield distributions, as described in the next section. For the sake of comparison, we also estimate the mean and standard deviation of the net present value of market revenue.[4]

Modeling Yield and Price Distributions

We model the joint distribution of yields and prices for corn and spring wheat then use the joint distribution to estimate the distribution of crop revenue under the three different policy regimes outlined above. Yield-price relationships are determined at the national level as fluctuations in overall production affects in commodity markets. Variations in national crop yields, however, may or may not be correlated with local yield variations. Dry weather is the Corn Belt, for example, will have a larger impact on national average corn yields than dry weather occurring in another part of the country where comparatively little corn is produced. So, county and national yield may be well correlated in the Corn Belt but show little if any correlation in regions where less corn is grown.

The realized national average yield for crop *i* (corn or spring wheat) at time *t*, y_{it} , is transformed to the yield deviation ΔY_{it} according to $\Delta Y_{it} = {(Y_{it} - E(Y_{it}))}/{E(Y_{it})}$. To

[4] In a future version of this work we plan to adopt an alternative to NPV which is more appropriate when considering uncertain returns over time.

generate a yield distribution for crop *i* at time *s* using historic yield shocks, historic yields must be detrended to reflect technical change between time *t* and *s*, i.e., Y_{it} is detrended as:

(2) $Y_{it}^{d} = E(Y_{is})(\Delta Y_{it} + 1), \forall$ *i* counties, *t* periods, $t \neq s$.

Expected yields, $E(Y_{it})$, are estimated by regressing average yields on a linear trend using data for 1975-2008. It is convenient to specify the yield deviate as the deviation of detrended yield from expected yield in the base year, which we denote as ΔY_{it}^{d}.

Realized harvest prices, P_{it}, are also transformed into deviation form: ΔP_{it} = $\left(P_{it} - E(P_{it})\right) / E(P_{it})$ where $E(P_{it})$ is pre-season expect price. For each crop, we follow RMA definitions of the expected and realized prices. For the realized price of corn, for example, we use the average of the daily October prices of the December CBOT corn future in period *t*. For the expected price, $E(P_t)$, we use the average of the daily February prices of the December Chicago Board of Trade corn future. For continuously cropped wheat, the realized price is obtained by averaging the closing prices in August for the Minneapolis Grain Exchange (MGE) September wheat futures contract. The expected (base) price for wheat is calculated as the simple average of the closing daily prices in February for the MGE September futures contract. We calculated these prices using daily futures market data for 1975 to 2007.

The relationship between ΔP_{it} and ΔY_{it}^{d} is econometrically estimated. We assume that ΔP_{it} can only be partially explained by ΔY_{it}^{d}, and that the uncertainty in this relationship can be incorporated into the empirical distribution. We do so by specifying ΔP_{it} as

(3) $\Delta P_{it} = g\left(\Delta Y_{it}^{d}, z_{it}\right) + \varepsilon_{it}$

where z_{it} is a vector of other variables that may explain the price deviation and ε_{it} is the error term. We expect that $d\Delta P_{it} / d\Delta Y_{it}^{d} < 0$, i.e., the greater the realization of national average yield over the expected level, the more likely harvest time price will be lower than expected price.

We jointly estimate the distributions of $\Delta \hat{P}_{it}$ and ΔY_{it}^{d} by repeated estimation of Equation (3) using a bootstrap procedure. Specifically, a pairs bootstrap approach is used in a joint resampling methodology that involves drawing *i.i.d.* observations with replacement from the original data set (e.g., Yatchew). The bootstrap data-generating mechanism is to create replications by treating the existing data set of size *T* as a population from which samples of size *T* are extracted. Variation in estimates results from the fact that upon selection, each data point is replaced within the population.

Crop insurance indemnities, SURE payments, and marketing loan benefits depend on farm level yields, which we represent using county-level yields with standard deviations inflated to reflect farm-level conditions, as previous researchers have done (e.g., Schnitkey *et al.*). We detrend county level yield data, reported by NASS, for non-irrigated corn and non-irrigated, continuously cropped spring wheat:

$$Y_{it}^{Cd} = E\left(Y_{i}^{C}\right)\left(\Delta Y_{it}^{C} + 1\right)$$

where *C* indexes the county. Once detrended, these county-level yields are also expressed as deviations from the trend: ΔY_{it}^{Cd}. Using methods similar to those of Coble *et al.* (2007), we inflate the standard deviation of county yield to approximate that of a "representative" farm. We choose a constant, α, such that standard deviation of

$$Y_{it}^{Fd} = E(Y_i^F)(\alpha_C \Delta Y_{it}^{Cd} + 1)$$

equals the standard deviation implied by crop insurance premiums where $E(Y_i^F)$ = $E(Y_i^C)$. Using $E(Y_i^F)$ we estimate the non-subsidized APH premium for 65 percent coverage using the RMA on-line premium calculator (http://www.rma.usda.gov/tools/premcalc.html) and the premium subsidy rate for 65 percent coverage. We use a search procedure to identify the value of α_C that makes the expected indemnity for yield-based insurance equal to the RMA premium. For each value of α_C a bootstrap procedure is used to generate a distribution of yields and the expected indemnity.

County-level yield distributions must be generated in a way that maintains underlying correlations across crop yields within counties and with national average yields and market prices. To do so, we generate the county yield distributions in a nonparametric fashion by appealing to a spatial version of the block-bootstrap (e.g., Lahiri), as applied to the county yield histories over $t = 1,\ldots,T$. When crop yields (e.g., corn and spring wheat yields) within a county are correlated, using a standard bootstrap and drawing each ΔY_{it}^{Fd} randomly and with replacement from each yield history will generate incorrect estimates of payments because a standard bootstrap assumes that the between-crop correlation of yields equals 0. In the block-bootstrap approach, we make random draws of the entire yield vector, thereby maintaining the spatial relationship between the yields. We replicate the historic correlation of price and yield deviates by maintaining the year-to-year relationships when conducting the bootstrap procedures for generating $\Delta\hat{P}_{it}$, ΔY_{it}^{d}, ΔY_{it}^{Cd}, and ΔY_{it}^{Fd}, $i=1\ldots I$ which are then used to calculate simulated yields and prices.

Simulation Results

Figure 1 shows the 10-year net present value (NPV) of expected net crop insurance indemnities (indemnities less the producer premium) and expected SURE payments when crop insurance purchase is not restricted. The SURE payment is relatively modest—net crop insurance indemnities make up a large majority of expected payments from these two programs—more than 80 percent in most counties—although their relative size varies from 78 percent in Beadle County to 89 percent in Stutsman County. As shown above, the SURE guarantee is (at most) 20 percent larger than the crop insurance guarantee, but only for the purpose of triggering a payment. The actual SURE payment is (at most) 60 percent of the additional guarantee, leading an effective increase in the guarantee of (at most) of about 12 percent. Moreover, SURE payments are made only in years when disasters occur, further reducing their overall size, over time. The fact that SURE payments are not made on a crop specific basis, as are crop insurance indemnities, tends to reduce the SURE payment relative to overall crop insurance indemnities.

Figure 2 shows the combined NPV of net crop insurance and SURE payments, over a ten year period, for three our scenarios: (1) no restriction on the purchase of crop insurance, (2) crop insurance "new land" provisions in force, and (3) sodsaver in force. Figure 3 shows the same values as a percentage of market revenue. When crop insurance can be purchased without restriction, the expected net present value of crop insurance exceeds $100 per acre in each of our 7 counties, and ranges from just over $100 per acre (Stutsman County) to more than $200 per acre (Beadle County). Net crop insurance indemnities and SURE payment range from 4.4 percent to almost 8.3 percent of market revenue (Figure 3) and will obviously be a much larger share of expected net return to crop production.

Under the RMA new land provisions, net indemnities are reduced to 70-80 percent of their unrestricted value in each county. Loss of the crop insurance indemnity in the first year automatically reduces expected net indemnities to no more than 87 percent of their unrestricted NPV. Because we expected the full value of crop insurance in years 4 through 9, discounted at 7 percent, the lower bound on expected return under the new land provision is about 50 percent. Our estimates fall toward the high end of the range, despite reduced APH yields in the first three years of crop insurance purchase. Because T-yields are relatively high (roughly equal to county average yields in many counties) and farm-level crop yields are highly volatile (Table 2), new land provisions have a relatively modest impact on indemnities and SURE payments. For both corn and wheat, standard deviations, adjusted for farm level conditions, are roughly 50 percent of average yields in most of the seven counties included in our analysis.[5]

Because Sodsaver denies crop insurance coverage for a full five years and, by extension, would also deny SURE payments over the same period, it would have a large effect on crop insurance indemnities and SURE payments compared to the RMA new land provisions. Assuming a 7 percent discount rate, the net present value of expected net indemnities and SURE payments would be limited to just over 40 percent of their

[5] Only minor adjustments were made to county level standard deviations for wheat. For wheat, adjustment factors ranged from 1.06 to 1.6. For corn, adjustments were larger, ranged from 2.73 to 3.24. Nonetheless, the relationship between mean and standard is quite similar for corn and wheat.

unrestricted 10-year NPV. Land that had been farmed for five years prior to crop insurance purchase would have sufficient production history to make the new land provisions moot.

The effect of crop insurance and SURE payments on the standard deviation of revenue (i.e., the variability of the 10-year NPV) reflects previous results in the sense that crop insurance would have a larger effect on overall variation. When crop insurance purchase is not restricted, net crop insurance indemnities and SURE payments would reduce standard deviations by 19 to 24 percent, with 1.5 to 3.5 percent attributable to SURE payments, depending on the county. Figure 4 shows the standard deviations, as a percentage of expected market revenue, for market returns and for market returns with crop insurance and SURE payments for our three policy scenarios. Mirroring previous results, the new land provision has a smaller effect on standard deviation than does the sodsaver provision. This outcome is not surprising given the relative size of the expected payments.

Results so far are for average land in each county. It is reasonable to expect, however, that new breakings are more likely to occur on lower productivity land. To investigate this possibility, we reduced the average yield in each county by 10 percent then re-estimated the models. While mean yields dropped by 10 percent, standard deviations also went down (as the standard deviation inflation factors were re-estimated), but only slightly—no more than 5 percent in any case. So, the lower expected yield may result in larger expected crop insurance indemnities.

With lower yields, the NPV of expected market returns dropped by about 10 percent in each county, as would be expected. Net crop insurance indemnities and SURE payments, however, do not necessarily decline. Figure 5 shows the absolute change in per acre returns to crop insurance and SURE, for our no limit, new land, and sodsaver scenarios between the average land and lower productivity cases. In each case, the change is positive for the new land provision and larger than the no-limit or sodsaver change when these changes are also positive. Because transitional yields are fixed at the county level (the same for all producers with a county, regardless of site-specific yield potential), the effect of the new land provision on crop insurance indemnities is declines as the expected yield declines.

Figure 6 shows the difference in crop insurance and SURE returns, as a percentage of market revenue for the no-limit, new land, and sodsaver scenarios. Because market revenue declines by 10 percent for the lower quality land, the relative change is positive for each county and scenario combination. Nonetheless, relative changes are modest, less than one percent of market revenue in all cases.

Conclusion

Our results show that SURE payments would supplement crop insurance indemnities, increasing expected returns and reducing the variability of returns over time. These changes could make a difference in land use decisions, although we cannot quantify that difference at this time. However, SURE payments are modest relative to net crop insurance indemnities because SURE payments are realized only in years when disasters are declared and depend on whole-farm loss rather than crop-specific losses.

Our results also show that RMA's new land provisions can reduce the effect of crop insurance and SURE on expected revenue and the variability of revenue, but the effectiveness of these provisions depend on the relationship between county T yields and the productivity of the land being converted. The lower the average expected yield on the new land, the less effective the new land provisions will be, given that T yields are fixed at the county level. The Y-yield effect, however, appears to be small especially in relation to expected revenue.

Sodsaver would be significantly more effective than the RMA new land provisions in reducing the effect of net crop insurance indemnities and SURE payments on expected revenue and the variability of those revenues. While we cannot quantify the land use effect of crop insurance and SURE, the sodsaver provisions would almost surely be more effective at reducing these effects when compared to the new land provisions.

References

Coble, K., R. Dismukes, and S. Thomas. "Policy Implications of Crop Yield and Revenue Variability at Differing Levels of Disaggregation." Paper presented at the American Agricultural Economics Association Annual Meeting, Portland, Oregon, July 29-August 1, 2007.

Dismukes, R. and M. Vandeveer. "U.S. Crop Insurance: Premiums, Subsidies, & Participation." *Agricultural Outlook.* 287(December 2001): 21-24.

General Accounting Office (GAO). *Agricultural Conservation: Farm Program Payments Are an Important Factor in Landowners' Decisions to Convert Grassland to Cropland* (GAO report 07-1054, September 2007)

Goodwin, Barry K., Monte L. Vandeveer, and John L. Deal. 2004. "An Empirical Analysis of Acreage Effects of Participation in the Federal Crop Insurance Program," *American Journal of Agricultural Economics*, 86(4): 1058-1077.

Glauber, J.W. "Crop Insurance Reconsidered." *Amer. J. Agr. Econ.* 86(Number 5, 2003): 1179-1195.

Just, R.E., L. Calvin, and J. Quiggen. "Adverse Selection in Crop Insurance: Actuarial and Asymmetric Information Incentives." *Amer. J. Agr. Econ.* 81(November 1999): 834-849.

Lahiri, S. "Theoretical Comparison of Block Bootstrap Methods," *Annals of Statistics* 27 (1999):386-404.

Lubowski, Ruben, Shawn Bucholtz, Roger Claassen, Michael J. Roberts, Joseph C. Cooper, Anna Gueorguieva, and Robert Johansson. *Environmental Effects of*

Agricultural Land-Use Change: The Role of Economics and Policy. Economic Research Report No. (ERR-25) 82 pp, August 2006.

Makki, S. and A. Somwaru. "Evidence of Adverse Selection in Crop Insurance Markets." *The Journal of Risk and Insurance*. 68(4): 685-708.

Morgan, Dan. "Subsidies Spur Crops on Fragile Habitat." *Washington Post*, December 2, 2008, page A3.

Risk Management Agency (RMA). *Summary of Business Data*. http://www.rma.usda.gov/data/sob.html

Schnitkey, Gary D., Bruce J. Sherrick, and Scott Irwin. "Evaluation of Risk Reductions Associated with Multi-Peril Crop Insurance Products." *Agricultural Finance Review*, Spring, 2003, pp. 1-21.

Stephens, Scott, Johann Walker, Darin Blunck, Aneetha Jayaraman, and Dave Naugle. *Grassland Conversion in the Missouri Coteau of North and South Dakota, 1984 – 2003*. September 2006.

Wu, JunJie. "Crop Insurance, Acreage Decisions, and Nonpoint-Source Pollution." *Amer. J. Agr. Econ.* 81 (May 1999): 305-320.

Yatchew, A. "Nonparametric Regression Techniques in Economics," *J. Econ. Lit.*, Vol. XXXVI (June 1998): 669-721.

Table 1. New Breakings, 2005-06, for Selected Counties in North and South Dakota

County	New Breakings 2005	New Breakings 2006	Total New Breakings	Percent of State-Wide New Breakings
North Dakota				
Stutsman	NA	1,971	1,971	9.57
South Dakota				
Beadle	2,055	2,101	4,156	4.05
Edmuns	3,845	4,361	8,207	8.00
Faulk	2,831	2,170	5,001	4.88
Hand	5,040	2,748	7,788	7.59
Hyde	2,835	1,501	4,336	4.23
Sully	1,867	3,943	5,810	5.66
North Dakota Total (2006)			20,592	9.57
South Dakota Total (2005 and 2006)			102,571	34.41

Source: Farm Service Agency

Table 2. Average Yields, T Yields, and Standard Deviation of Yields

	Corn			Wheat		
County	Average Yield (10 years)	County T Yield (2009)	Standard Deviation	Average Yield (10 years)	County T Yield (2009)	Standard Deviation
North Dakota						
Stutsman	98	81	50	35	34	18
South Dakota						
Beadle	93	94	50	33	38	19
Edmuns	103	99	52	40	39	21
Faulk	104	100	57	42	41	23
Hand	81	80	52	36	34	23
Hyde	72	68	50	33	32	25
Sully	71	71	41	33	31	23

Sources: ERS analysis of NASS data, Risk Management Agency

Figure 1. Net Present Value of Crop Insurance Indemnities (Less Premium) and SURE Payments

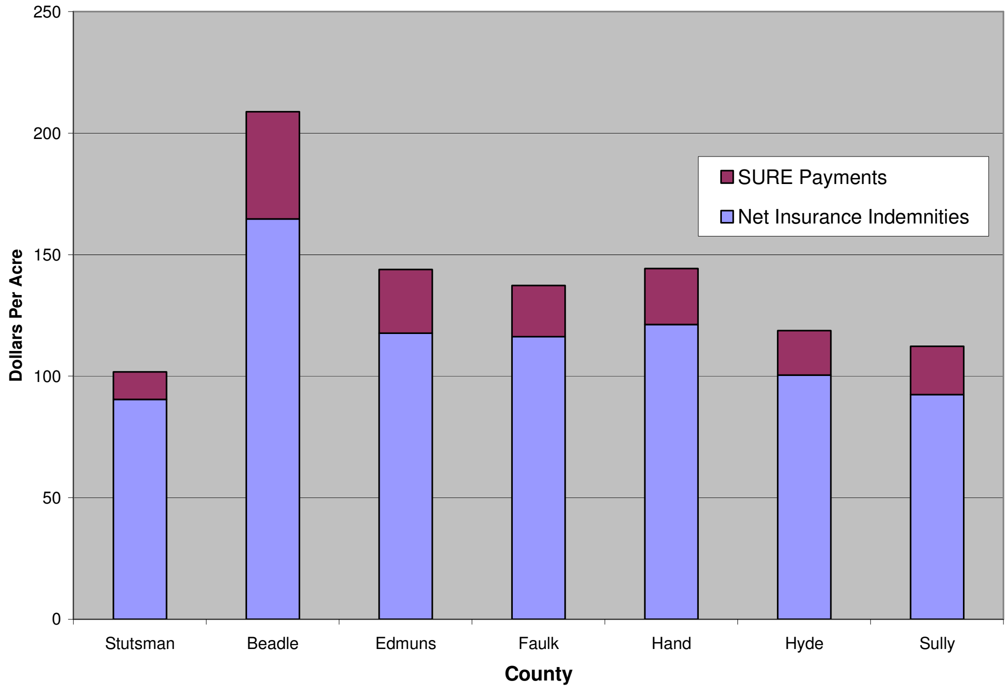

Figure 2. NPV of Expected Net Return to Crop Insurance and SURE Payments Under New Land and Sodsaver Provisions

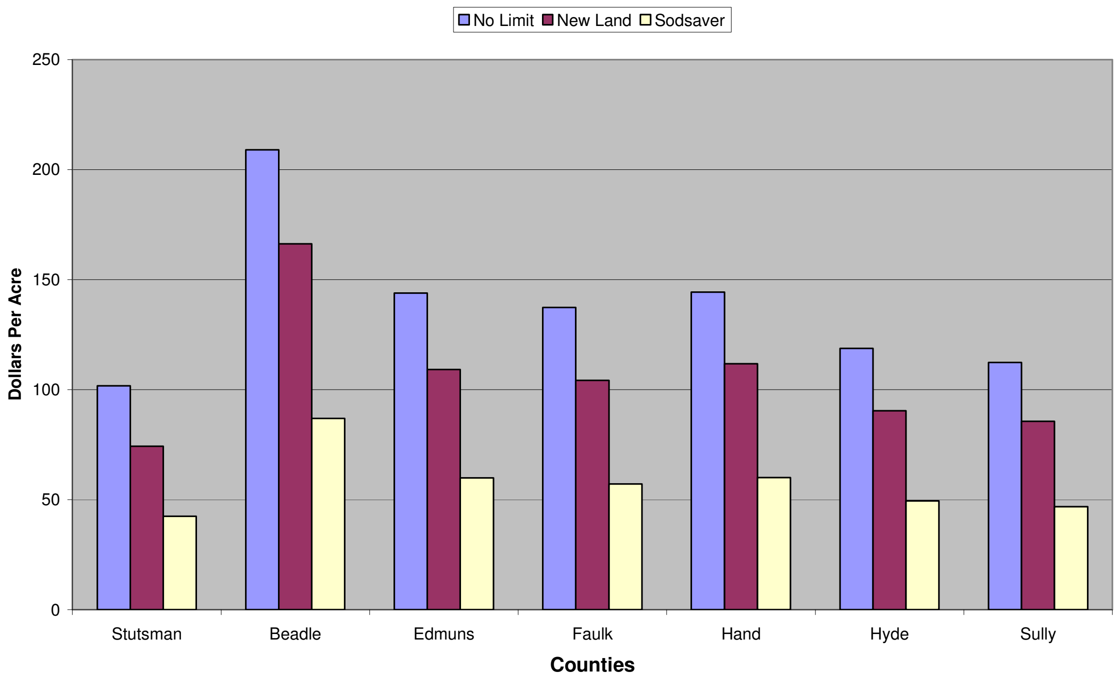

Figure 3. NPV of Expected Net Return to Crop Insurance and SURE Payments, as a Percentage of Market Revenue, Under New Land and Sodsaver Provisions

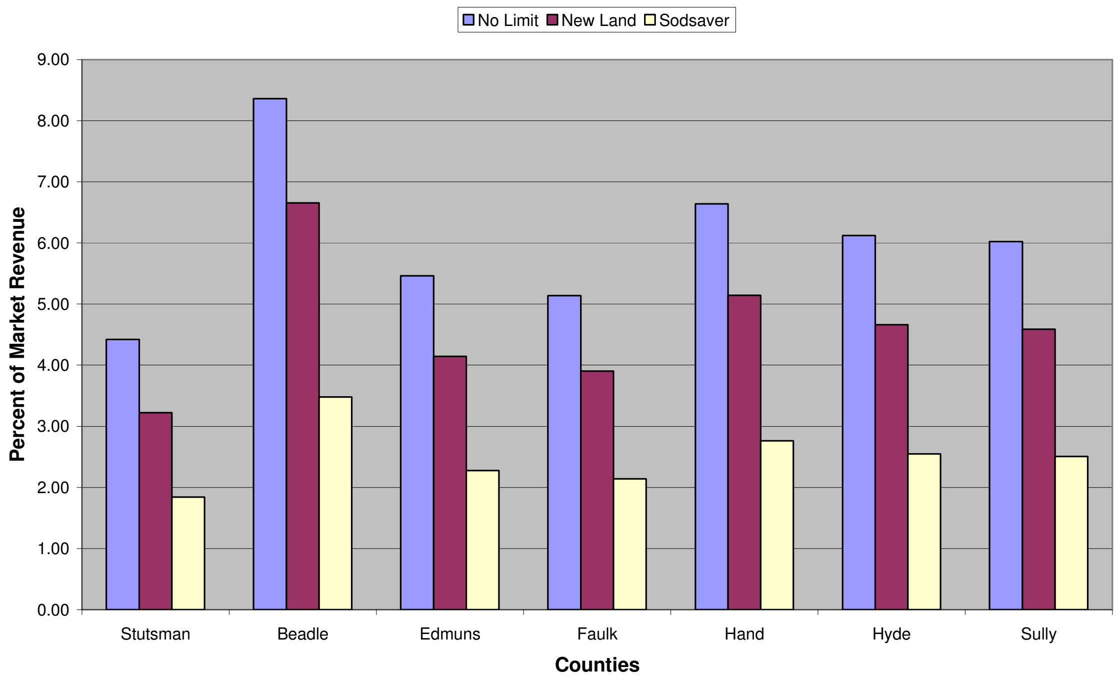

Figure 4. Standard Deviation of Crop Revenue as a Percentage of Market Revenue

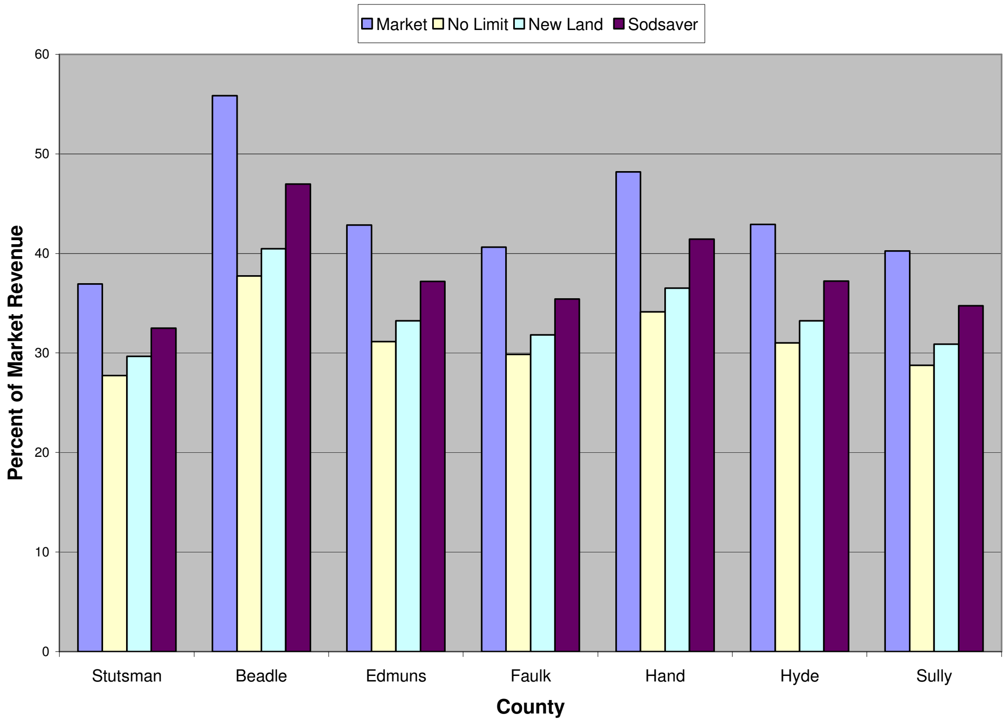

Figure 5. Change in NPV of Expected Return to Crop Insurance and SURE, 10 Percent Lower Productivity

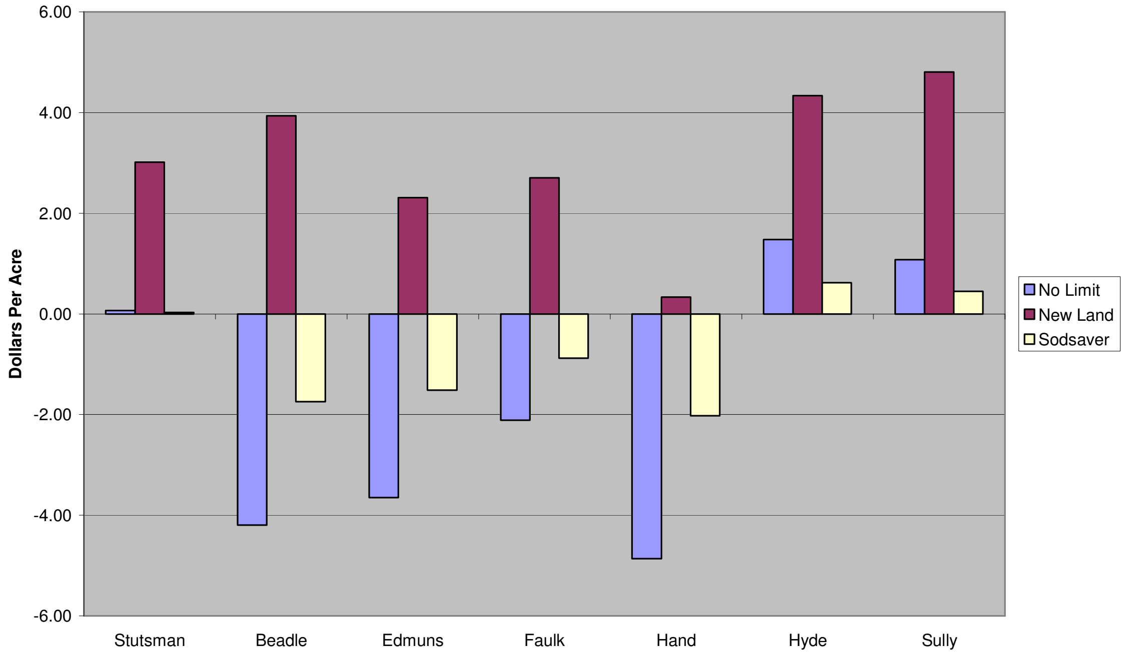

Figure 6. Change in NPV of Expected Return to Crop Insurance and SURE as a Percentage of Market Revenue, 10 Percent Lower Productivity