Crop Insurance and the Environment: A Brief Review of Agricultural Economics Literature on the Land Use Effects of Crop Insurance

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Issue: The 2012 Farm Bill discussion has raised questions about the effect of public support for crop insurance on the environment, particularly land use. This note reviews agricultural economics literature (listed at the end) regarding land use effects of the crop insurance (CI) program.

Perspective: Claassen et al. (2011) provide comprehensive information on land shift patterns based on the USDA’s Natural Resources Conservation Service’s 2007 National Resources Inventory. Between 1997 and 2007, 39 million acres of U.S. cropland were converted to grassland (pasture, hay, range or Conservation Reserve Program (CRP)); meanwhile 23.7 million acres of grassland were converted to cropland, which resulted in net total of 16.5 million acres of cropland returning to grassland over the period.

In contrast with the overall U.S. pattern, the Northern Plains region (Kansas, Nebraska, North Dakota, and South Dakota) had a net conversion of grassland to cropland during this time period. Particularly, a net total of 680,000 acres (about 0.8 percent of 1997 range acres) was converted from rangeland to cropland, which accounted for 57 percent of overall U.S. rangeland-to-cropland conversion. Despite about 3 percent of U.S. cropland (about 10 million acres) in 1997 being moved to hay and pasture, the net change in the Northern Plains was about zero (i.e., the movement from hay and pasture land to cropland and vice versa offset each other). In terms of CRP activities, Northern Plains states were in line with the national trend and moved a net total of 1.8 million acres from cropland to the CRP.

Key Literature: Walters et al. (2012), Claassen et al. (2011) and Miao, Feng and Hennessy (2011) are the most comprehensive and recent studies looking into crop insurance and land use issues. Previous studies include Young, Vandeveer, Schnepf (2001); Goodwin, Vandeveer, Deal (2004), Lubowski et al. (2006); Stubbs (2007); GAO (2007); and Carrizo, Claassen, Cooper (2009). Claassen et al. (2011) and Miao, Feng and Hennessy (2011) use a combination of econometric and simulation techniques and improve upon previous literature by focusing on marginal land (a critical portion of the Northern Plains which includes a large share of the Prairie Pothole Region) by distinguishing among converted grassland types, and by using field-level data rather than county-level data. Walters et al. (2012) use an econometric analysis and based on farm-level data in two regions with homogenous land (Iowa and North Dakota) and two regions with relatively more heterogeneous land (Eastern Washington and Eastern Colorado). Their findings are in line with the previous literature, which is that the effect of subsidized crop insurance in bringing the marginal land into cultivation is statistically significant but small, less than 1 percent. Furthermore, Walters et al. (2012) find that crop insurance is as often beneficial as adverse depending on crop and location.

The aforementioned studies also point out that crop insurance is only one of a number of factors that have contributed to expanded plantings. These factors include the growing need to feed the U.S. and world populations, whose rising incomes and growing numbers have expanded the
demand for food; increased use of crops for energy production, which has required more land in
production to maintain food production; record-high prices of major crops, which is the
dominant incentive to expand production; technology changes, which have resulted in varieties
of major field crops that are better suited to production in more western and southern areas;
technology changes that have facilitated planting and cultural practices, including larger and
more powerful equipment, GPS systems, etc. In particular, Miao, Feng and Hennessy (2011)
estimate the effect of crop prices to be much greater than crop insurance subsidies on the
conversion of marginal land. They find a 5-percent decrease in the premium subsidy rate for crop
insurance results in 0.6 percent of insured cropland being converted to non-crop land. Whereas a
5-percent decrease in crop prices results in 1.01 percent of insured cropland being converted to
non-crop land.

Beyond the small expansionary effect on grassland-to-cropland conversions, CI has offsetting
effects on cultivated land in the form of lower use of other risk reduction strategies, such as
intense chemical use. Empirical results in the Great Plains suggest farmers purchasing crop
insurance use less chemical inputs (Smith and Goodwin, 1996). Similar results were obtained in
Babcock and Hennessy (1996) for Iowa corn. Smith and Goodwin (1996) and Babcock and
Hennessy (1996) refuted the counter results in the earlier study by Horowitz and Lichtenberg
(1993). Smith and Goodwin (1996) concluded that environmental consequences should not be
the basis for efforts to persuade lawmakers to end the CI program. Another study by Wu (1999)
focused on the Central Nebraska Basin in 1991. This study recognized the findings in Babcock
and Hennessy (1996) and Smith and Goodwin (1996) and yet finds farmers change crop mix,
switching to corn from hay and pasture, concluding the net effect of CI would be increased soil
erosion and chemical use. However, the claim of soil erosion is refuted later by Goodwin and
Smith (2003) who find that crop insurance has almost no effect on soil erosion. Moreover,
Mishra, Nimon and El-Osta (2003) find that revenue insurance (similar to earlier findings on
yield insurance) reduces the fertilizer applications in winter wheat production. Finally, Sumner,
Alston and Glauber (2011) mention the crop mix effect found in Wu (1999) and yet point out
that designing and implementing government crop insurance without potential production
distortions would be very difficult.

**Conclusion:** Studies of the effect of crop insurance on the environment suggest that the risk
reduction provided by crop insurance is associated with increased planted acreage of some crops
in some areas but that the effect on the conversion of grassland to cropland is generally fairly
small. In addition, crop insurance substitutes for other risk reduction strategies, such as fertilizer
and pesticide use which have been associated with environmental degradation. While studies
suggest the overall effects on land and input use are small, they may be more significant in local
areas. Further, the role of crop insurance using premium discounts to incentivize the use of
biotech crops, which may substitute for land expansion and chemical use, has not been explored.
As coverage of crop insurance has expanded and crop prices have set new record highs in recent
years, more research is merited on the relative roles of crop insurance, market prices and other
factors in explaining land and input use in agriculture.

One should expect that the effect of insurance would be to help maintain, expand, and increase
the efficiency of the farm production infrastructure by improving access to credit and promoting
on-farm investment. In addition to keeping farms in business and resilient in the aftermath of
natural disasters (and that alone may mean higher production than otherwise), increased production is a desirable effect of insurance—an outcome that is good for U.S. and global food consumers and low-income people. In contrast to the minimal land use effects attributable to crop insurance, it is much more likely the case that the record-high prices of major crops remain the dominant incentive in expanding agricultural production.

References:


