Impact of Crop Insurance Indemnity Payments On Cash Rent and Land Values

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Abstract

This paper examined the impact of a yield protection crop insurance product on cash rents and land values for a representative farm in Indiana. The net return to land and management for scenarios that included and excluded crop insurance were very similar. Predicted cash rents and land values were not impacted by crop insurance indemnity payments.

Introduction

The magnitude of the impact of crop insurance indemnity payments on cash rents and land values often comes up as an open question in extension and research settings. For several reasons this question is not easy to answer. Crop insurance helps mitigate downside risk, but in many if not most instances, has a negative impact on net return per acre because, as expected with any insurance product, the average insurance cost is larger than the average revenue received from the product. The primary question therefore is whether the risk-adjusted net return (i.e., certainty equivalent of net return) is significantly impacted by purchasing a crop insurance product. If the difference in risk-adjusted net returns between scenarios that include and exclude crop insurance is positive, purchasing the crop insurance product puts upward pressure on both cash rents and land values.

The impact of crop insurance on cash rent and land values is particularly important in today's environment. Cash rent in northwest Indiana has increased from $137 to $282 and land values have increased from $2,816 to $8,955 during the last ten years. However, crop prices are expected to decline. Recent FAPRI estimates show a decline in corn price from $6.95 for the 2012/2013 marketing year to an average of $4.50 for the 2013/2014 through 2018/2019 marketing years (FAPRI, 2013). If crop insurance has a positive impact on cash rents and land values, the impact of the decline in crop prices will be smaller than what it would be if this was not the case.

The objective of this paper is to examine the impact of a yield protection crop insurance product on cash rents and land values for a representative farm in Indiana. Specifically, the impact of the purchase of a yield protection product is explored using net returns for a representative farm, and cash rent and land value regression equations.

Data and Methods

A representative farm in northwest Indiana has been developed for extension and research purposes. This farm produces corn and soybeans in a corn/soybean rotation. Simulated net return to land and management with and without crop insurance was computed using historical prices, yields, and costs from 1973 to 2013. For the crop insurance scenario, the representative farm was assumed to purchase the 75 percent yield protection product for full-season corn and soybeans. Dobbins et al. (2012) was used as the basis for the cost estimates in 2012. USDA input price indices were used to estimate historical costs. Yield information for White county was utilized.

Table 1 contains the average net return to land and management with and without crop insurance for the representative farm in northwest Indiana as well as average cash rent and land value information for northwest Indiana. The cash rents and land values were obtained from the annual Purdue survey. Dobbins and Cook (2013) present the most recent survey information. Both nominal and real values are presented in table 1. The average net return to land and management between the two scenarios is very similar. Crop insurance indemnity payments were incurred for corn in 1983, 1988, 1991, and 2012; and for soybeans in 1988 and 2003. In nominal dollars, the average crop insurance indemnity payments for the corn and soybeans were $4.11 and $0.33 per acre. In contrast, the average government payment per acre, in nominal dollars, over the study period was approximately $23 per acre and average market revenue for corn and soybeans, in nominal dollars, was approximately $397 and $303 per acre, respectively. Obviously, crop insurance indemnity payments were on average a very small percentage of revenue for the representative farm. It is also interesting to note that in two of the three years (1986, 1991, and 2005) with the lowest net returns, crop insurance indemnity payments for corn

and soybeans were zero. In 1991, the corn indemnity payment was only $23 per acre. The primary reason for low net returns in 1986 and 2005 was low crop prices. Though revenue protection products are not analyzed in this paper, a 75% revenue protection product would have resulted in a small crop insurance indemnity payment for corn ($2 per acre) and no payment for soybeans in 1986, and no payments for either crop in 2005.

The net return information with and without crop insurance was used to compute the certainty equivalent of net return to land and management (i.e., risk adjusted net return). Risk aversion coefficients used to compute the certainty equivalents represent slightly, moderately, and strongly risk adverse preferences. Thus, there were three sets of certainty equivalents or risk adjusted net returns for the representative farm. Relative risk aversion coefficients used to represent slightly, moderately, and strongly risk averse preferences were r=1, r=3, and r=5, respectively.

Stochastic dominance was also used to compare the net return to land and management with and without the inclusion of crop insurance. Specifically, first degree, second degree, and stochastic dominance with respect to a function was utilized (Goh et al., 1989; Hardaker et al., 2004).

Net return to land and management was incorporated into cash rent and land value regressions to examine the impact of crop insurance on cash rents and land values. Featherstone and Baker (1988) was used to develop the cash rent and land value regression model specifications. The cash rent and land value equations were specified as follows:

(1) $CR_t = a_1 + b_{11} NR_{t-1} + b_{12} CR_{t-1} + e_{11}$

(2) $LV_t = a_2 + b_{21} CR_t + b_{22} LV_{t-1} + b_{23} LV_{t-2} + e_{21}$

where CR is cash rent, NR is net return to land and management, and LV is land value. The net return to land and management in equation (1) was represented by net return to land and management without crop insurance from 1973 to 1995 and net return to land and management with crop insurance from 1996 to 2013. This specification of net returns reflects the fact that crop insurance has become a much more common risk management tool since the 1996 Farm Bill. Equations (1) and (2) represent a recursive system. Cash rent is determined by lagged net return and lagged cash rent. Land value is then determined from cash rent.

Estimated cash rent and land value equations were used along with the net return to land and management with and without crop insurance to compute predicted cash rents and land values for the two net return scenarios. T-tests were used to determine whether the respective sets of cash rents and land values were significantly different.

Results and Discussion

Table 2 presents the certainty equivalent of net return to land and management for the representative farm with and without the inclusion of crop insurance. For all levels of risk aversion, the values for the net return scenarios are very similar. To determine whether one of net return distributions dominates the other net return distribution, stochastic dominance was utilized. Both crop insurance scenarios were part of the first degree and second degree stochastic dominance efficient sets. The stochastic dominance with respect to a function results indicated that the net return scenario without crop insurance dominated for a range of risk aversion coefficients representing slightly risk averse preferences. For the range of the risk aversion coefficients representing moderately and strongly risk averse preferences, both net return scenarios were in the stochastic dominance efficient sets.

The next step was to analysis the impact of crop insurance on cash rents and land values. Table 3 presents estimated cash rent and land value equations. All of the variables had the expected signs and were significant at the 1 percent level except for the cash rent variable in the land equation which had the expected sign, but was not significant. The equations in table 3 were used to predict what cash rents and land values would have been under scenarios that excluded and included crop insurance. Figures 1 and 2 present the predicted cash rents and land values, respectively. Obviously, there is not much difference in cash rents or land values between the two net return scenarios. Differences in cash rents ranged from $0.48 in 2004 to $6.48 in 1984 while differences in land values ranged from $1.20 in 1990 and 2000 to $16.52 in 1984. Given these small differences, not surprisingly, t-test results indicated that the cash rents and land values for the two scenarios were not significantly different.

Concluding Comments

Given the recent large increases in cash rents and land values, an examination of the impact of crop insurance indemnity payments on cash rents and land values is a timely and relevant topic. Research that examines the linkage between crop insurance products, cash rents, and land values is sparse.

Net return to land and management, cash rents, and land values for a representative farm in northwest Indiana were used to examine the linkage between crop insurance indemnity payments, cash rents, and land values. Two primary results were found. First, the net return to land and management for scenarios that included crop insurance and excluded crop insurance were very similar. Second, predicted cash rents and land values for the two net return to land scenarios were not significantly different.

It is important to note that the representative farm discussed in this paper comes from a county with strong corn and soybean yields. Only 4 (2) of the 41 years used to simulate net

returns exhibited crop insurance indemnity payments for corn (soybeans). It is also important to note that the only the yield protection crop insurance product was analyzed in this paper. Future work will involve an examination of the revenue protection crop insurance products for the northwest Indiana representative farm as well as examinations of the impact of crop insurance on representative farms in north central and southwest Indiana.

References

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Table 1. Average Net Returns, Cash Rents, and Land Values, Northwest Indiana.

Item	Average
Nominal Dollars	
Net Return to Land and Management without Crop Insurance	177.86
Net Return to Land and Management with Crop Insurance	177.76
Cash Rent	126.27
Land Values	2,538
Real 2012 Dollars	
Net Return to Land and Management without Crop Insurance	289.74
Net Return to Land and Management with Crop Insurance	289.23
Cash Rent	200.18
Land Value	3,771

Table 2. Certainty Equivalent of Net Return to Land and Management, Northwest Indiana.

Item	Value
Without Crop Insurance	
Risk Neutral	289.74
Slightly Risk Averse	262.70
Moderately Risk Averse	215.19
Strongly Risk Averse	181.23
With Crop Insurance	
Risk Neutral	289.23
Slightly Risk Averse	262.26
Moderately Risk Averse	214.81
Strongly Risk Averse	180.80

Table 3. Estimated Cash Rent and Land Value Equations, Northwest Indiana.

Item	Parameter Estimate	T-Ratio
Cash Rent Equation		
Intercept	10.647	1.424
Lagged Net Return	0.158	7.091
Lagged Cash Rent	0.735	14.802
Land Value Equation		
Intercept	-133.299	-0.401
Cash Rent	2.365	0.949
Lagged Land Value	1.523	9.447
Twice Lagged Land Value	-0.597	-3.593

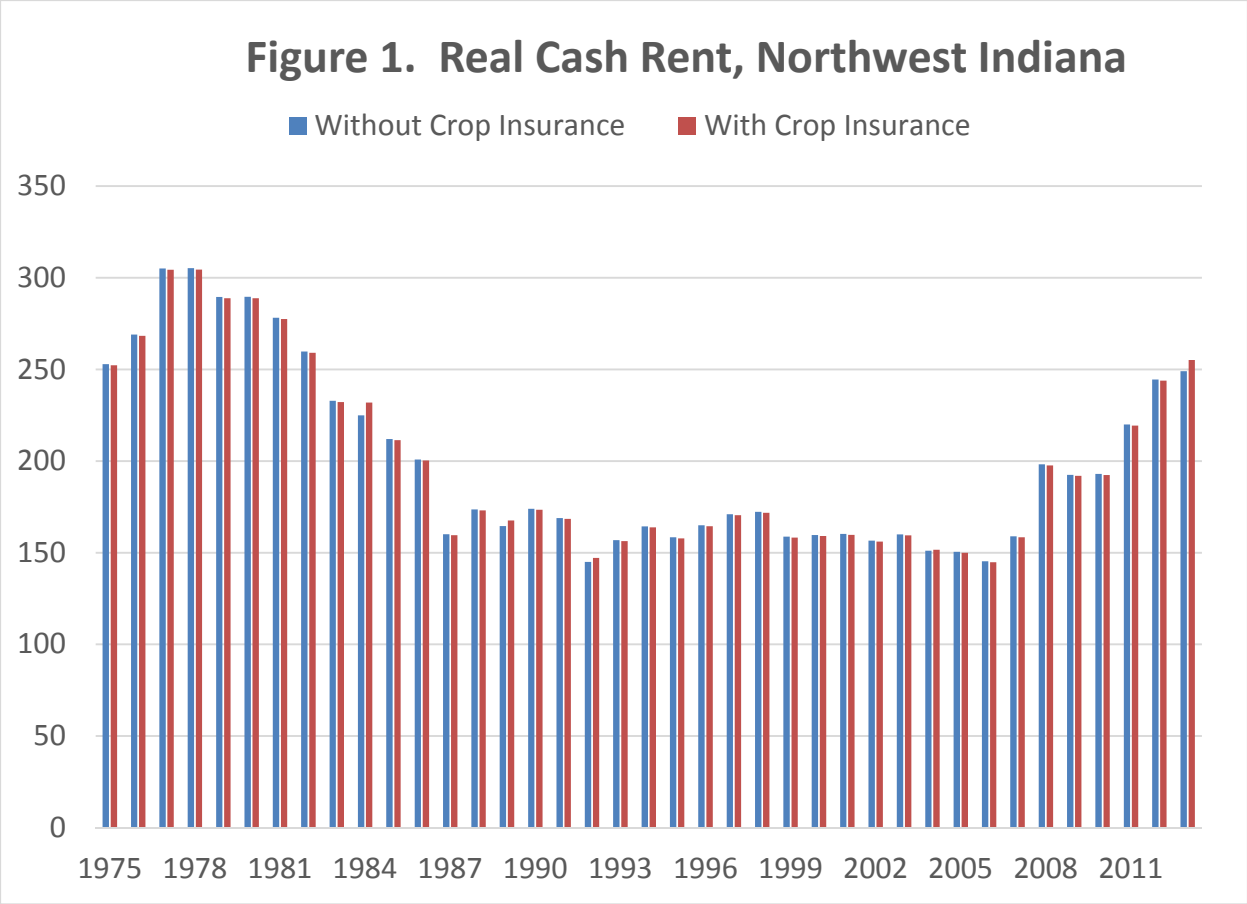
Figure 1. Real Cash Rent, Northwest Indiana
Without Crop Insurance
With Crop Insurance
350
300
250
200
150
100
50
0
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011

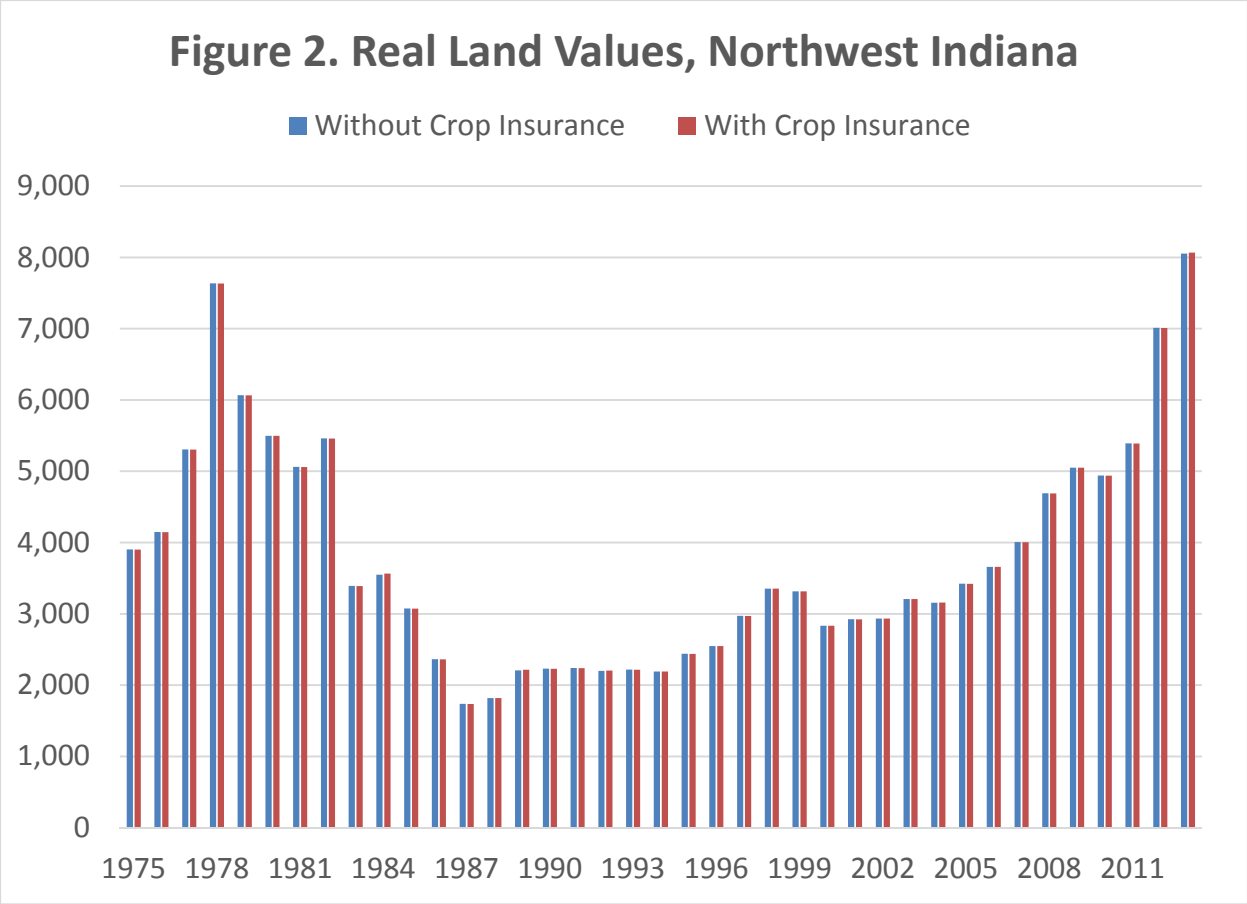
Figure 2. Real Land Values, Northwest Indiana
Without Crop Insurance
With Crop Insurance
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
2011