Price Analysis, Risk Assessment, and Insurance for Organic Crops

by Ariel Singerman, Chad E. Hart, and Sergio Lence

Executive Summary

In recent years, the organic sector has grown steadily and significantly. However, little economic research has been performed on risk management in organic agriculture, likely because of the lack of available data. This lack of data may also be why the creation of the current crop insurance policy for organic farmers has been so ad hoc.

The Agricultural Risk Protection Act of 2000 recognized organic farming as a "good farming practice," making federal crop insurance coverage available for organic crops, and taking into account the idiosyncrasies of the organic production system. In addition to the production risks covered for conventional producers, organic farmers who sign up for coverage are compensated for production losses from damage due to insects, disease, and/or weeds. However, the incorporation of organic production into the crop insurance rating structure has been limited. Organic producers are charged an arbitrary 5% premium surcharge over conventional crop insurance. The actuarial fairness of this premium is, at least, questionable. In addition, in the case of crop failure, organic farmers receive compensation based on the prices of conventionally produced crops. Thus, price premiums that organic producers are able to obtain in the market are not compensated for under the current insurance policy structure.

The Food, Conservation and Energy Act of 2008, which amends part of the Federal Crop Insurance Act, was written to investigate some of these claims, requiring the U.S. Department of Agriculture to examine the currently offered federal crop insurance coverage for organic crops as described in the organic policy provisions of the Act (Title XII). Such provisions established the need to review, among other things, the underwriting risk and loss experience of organic crops; determine whether significant, consistent, or systematic variations in loss history exist between organic and nonorganic production; and modify the coverage for organic crops in accordance with the results.

Here we present the major findings of three analyses we performed on key elements of the insurance of organic crops—prices, yields, and revenue—in an effort to contribute to the design of an organic crop insurance policy that covers organic producers according to their idiosyncratic risks.

Keywords: crop insurance, organic agriculture.

Price Analysis, Risk Assessment, and Insurance for Organic Crops

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Over the past decade, organic agriculture has experienced steady and significant growth (Organic Trade Association 2009). However, little economic research has been performed on risk management in organic agriculture, likely because of the lack of available data. The lack of data may also be why the creation of the current crop insurance policy for organic farmers has been so ad hoc.

Recently the Risk Management Agency (RMA) updated organic crop insurance coverage. This update was forced by the 2008 farm bill, as Congress had specifically required that RMA examine the currently offered federal crop insurance coverage for organic crops; review the underwriting risk and loss experience of organic crops; determine whether significant, consistent, or systematic variations in loss history exist between organic and nonorganic production; and modify the coverage for organic crops in accordance with the results.

In this policy brief, we summarize the major findings of three analyses performed on key elements of the insurance of organic crops—prices, yields, and revenue—in an effort to contribute to the design of an organic crop insurance policy that covers organic producers according to their idiosyncratic risks.

Organic Crop Prices
Organic crops often receive a price premium in comparison to conventionally grown crops. Born (2005, p. 1) noted that "prices for organic grains and oilseeds were about double the conventional prices from 1995 to 2003." Such "doubling" in organic crop prices is a commonly held belief in the organic agriculture sector. But, does that "doubling" depict the true existing relationship between the conventional and organic grain and oilseed markets? Is there any other relationship that links those conventional and organic markets, or are they not really related to each other?

One would expect organic crop prices to closely follow conventional ones in the United States, not only because of the thinness of organic markets but also because organic crops account for a very small share of cropland. In 2008, only 0.57% of U.S. cropland was planted with organic crops. Although organic corn and soybeans are among the main U.S. organic crops in terms of acreage, they respectively account for only 0.21% and 0.20% of the total cropland devoted to such crops (USDA-ERS 2008).

In addition, one might expect organic crops to sell at a premium because there is evidence that some consumers strongly prefer them over their conventional counterparts (see Loureiro, McCluskey, and Mittelhammer 2001). Organic price premiums are also expected because organic production involves additional risks (Klonsky and Greene 2005) that help explain the lower yields (Porter 2003; Delate and Cambardella 2004). McBride and Greene (2008) also found that organic production involves higher costs. Therefore, price premiums act as a major incentive in encouraging conventional producers and processors to switch to organic agriculture, by making the potential returns from organic cropping systems at least as profitable as conventional ones.

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As an example, Figure 1 displays the organic and conventional corn and soybean spot prices in Minneapolis from October 2004 to July 2009. The first noticeable feature in Figure 1 is the piecewise linear shape of the organic prices, with organic products having a constant price for several weeks before a price change or jump occurs. It is evident that organic prices do not follow the same distribution as conventional prices and are better characterized by a jump process.
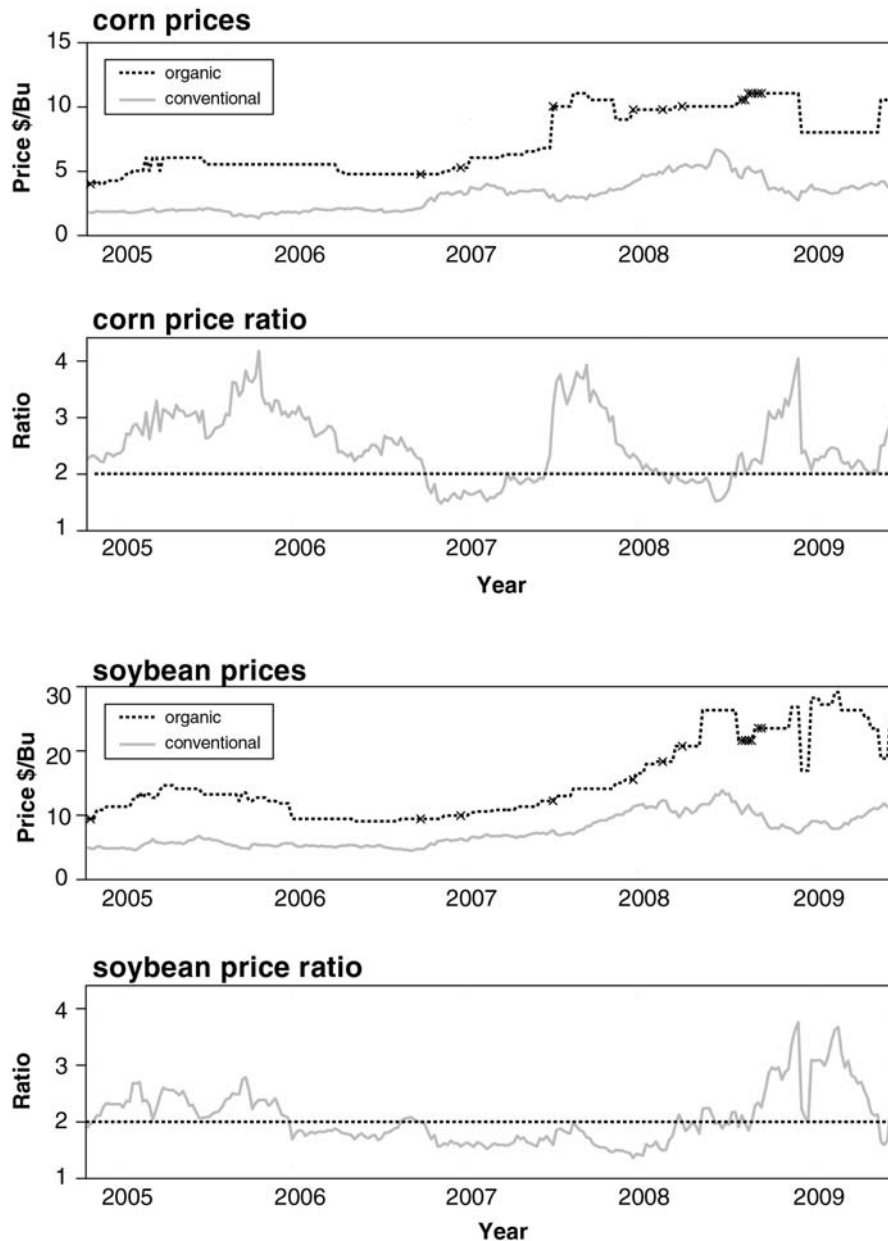
Note: The crosses denote missing observations in the original series.

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Figure 1. Organic and conventional prices and ratios for soybeans and corn in Minneapolis, October 2004–July 2009

Their step-shape pricing pattern is likely to be associated with the relative thinness of the organic markets and the impact of contracting on them. As shown in the lower plots of both panels, the relationship between the organic and conventional prices throughout the period analyzed has been oscillating around two; as mentioned earlier, this doubling of conventional crop prices to price organic crops is considered the rule of thumb for pricing in the organic sector.

An extensive analysis of the data found no evidence of a long-run relationship between organic and conventional prices. Thus, the "doubling" (or any other multiplicative) hypothesis that endorses that organic crop prices are obtained by multiplying conventional prices by a fixed factor is not supported by the data. Since this doubling factor is widely accepted in the industry, this may come as a surprise. On one hand, one might think that organic crop prices would reflect the additional cost of this method of production, making organic crops a "premium" commodity compared with their conventional counterparts, and allowing therefore for some degree of substitutability between them. In this regard, a close association between organic and conventional prices is more likely to be observed if the two types of crops are highly substitutable in production or consumption. On the other hand, for some purposes organic and conventional crops cannot really be considered close substitutes, if substitutes at all. For example, for livestock to be considered organic, it must be fed with organic products.

Nonetheless, it could be argued that some degree of substitutability could exist even in this latter context if the producer switches his livestock to conventional feed, making it nonorganic livestock. But such substitution is limited to a one-time event, since regulations state that "livestock or edible livestock products that are removed from an organic operation and subsequently managed on a nonorganic operation may be not sold, labeled or represented as organically produced." Therefore, producers could switch their livestock to conventional, but after that they could no longer switch it back to organic without going through recertification.

Another dimension to the study consisted of analyzing whether organic prices in different locations are related to each other in the long run, to assess how idiosyncratic organic markets are. We found evidence of spatial price cointegration among organic markets. Overall, spatial cointegration in organic markets seems weaker than that present in conventional markets, suggesting that local market forces may exert a stronger effect on the determination of local prices for organic crops than for conventional ones. Departures from the long-term relationships across organic markets do not seem to increase the probability of price changes; however, whenever price changes do occur, they tend to restore such long-term relationships.

The results also suggest that organic prices are as volatile as conventional ones, that the premiums paid for organic crops exhibit substantial variability, and that existing futures and derivatives markets do not provide effective tools for managing price risks in the organic sector.

Organic Yields
Many studies have compared organic versus conventional production (Badgley et al. 2007; Delate et al. 2003; Pimentel et al. 2005; Mäder et al. 2002; Delate and Cambardella 2004; Porter 2003). Some authors have reported that organic and conventional yields are equivalent. Importantly, though, after an extensive literature review, we found a noticeable lack of rigorous studies focusing on the difference in

production risks of organic versus conventional crops on actual farms. The majority of the studies in the literature rely on yields obtained on (smaller) experimental plots where weeds can be more easily controlled than is the case for entire farms. This implies that, to the best of our knowledge, currently there is no basis for quantitatively determining the differential production risk associated with organics and, therefore, whether the insurance premiums currently charged to organic producers are actuarially fair.

Using survey farm-level data collected from organic corn and soybean producers in three midwestern states (Iowa, Minnesota, and Wisconsin), we found that corn and soybean production under organic management attains about 70% of the yield of that of conventional crops. Organic oat yields are about the same as conventional ones. The finding of a lower yield level for organic corn and soybeans on its own does not allow one to infer that organic crops are riskier.

However, the finding has definite implications for organic crop insurance. Under the current insurance structure, the base premium rate for crop insurance includes a comparison of the producer's historical average yield (known as the Actual Production History [APH] yield) and a reference yield that is determined at the county level. This reference yield does not account for organic production practices and is predominantly based on conventionally produced crops. Under the formulas used in the premium rate calculation, the lower yields from organic production would result in organic producers being charged higher premium rates, basically without regard to their idiosyncratic yield distributions. Figure 2 displays the different yield distributions for Iowa organic and conventional corn and soybean producers.

As many producers utilize revenue insurance, the price examination discussed earlier also has implications for crop insurance. As a consequence of organic crops receiving higher prices, producers of organic corn and oats obtained 80% higher revenue on average per acre than their conventional counterparts, and the organic soybean producers obtained about 60% higher revenue. Yet such price and revenue differences are not reflected in the crop insurance coverage that organic producers can obtain.

The differences in yield levels and variability between organic and conventional producers, along with the substantial price premiums that organic farmers obtain, indicate that RMA needs to evaluate the differences between organic and conventional production on a nationwide basis and modify the current organic farming insurance policy accordingly to provide a more actuarially fair coverage to organic producers.

Organic Revenue Insurance
RMA has begun to modify organic crop insurance in response to the 2008 farm bill. The agency contracted research for the development of a pricing methodology that would improve the crop insurance policy for organic crops. A pilot program is in effect for the crop year 2011, by which a separate price election is established for a few certified organic crops. For 2011, the prices of organic corn and soybeans for insurance purposes are the prices of their conventional counterparts multiplied by 1.788 and 1.794, respectively. These multipliers are based on the minimum ratios of organic to conventional prices observed from January 2007 through September 2009. In this way, the pilot program links the price determination of organic crop prices to their conventional counterparts by a fixed percentage, which will influence the payouts of both yield and revenue protection products for organic crops. But the impact will be greater in the latter case.
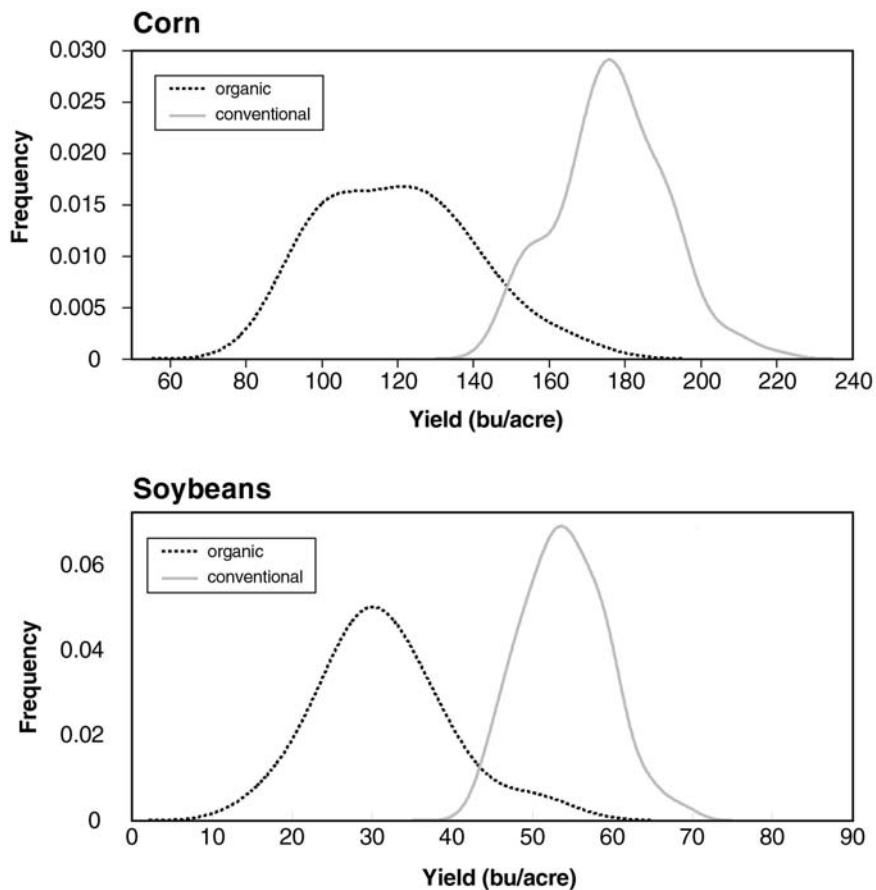
Figure 2. Iowa organic and conventional producers' four-year Actual Production History yield distributions

When RMA's pilot program pegs organic prices to their conventional counterparts and uses commodity futures prices to forecast what the organic crop prices will be at harvest time, they are assuming that the two markets are not only affected by the same shocks but also that they react in a similar fashion. Such linking not only contradicts our earlier findings, which suggest that there is no basis for advocating the existence of a long-run relationship between organic and conventional prices, but also sharply contrasts with observed market dynamics.

Organic crops have historically shown price premiums over their conventional counterparts. The average organic premium from October 2004 until July 2009 for corn across different U.S. markets was $4.17/bu ($7.41/bu for soybeans). However, organic price premiums for corn and soybeans have been shrinking since October 2010. This is because of the rise of commodity prices, boosted by increased demand for ethanol and simultaneous reductions in forecasted supply, while organic prices have been steady. In late February 2011, the time at which crop insurance sets insurable prices, the prices for organic corn and soybeans were $8.60/bu and $18.61/bu, respectively, while conventional prices were $6.86/bu and $13.38/bu, respectively. Hence, the organic-to-

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conventional price ratios going into the 2011 production year were 1.25 for corn and 1.39 for soybeans. These are well below RMA's established prices for both organic crops.

The disparity in the behavior of organic and conventional crop prices implies a changing multiplicative relationship between them, making the price ratio larger or smaller depending on idiosyncratic shocks, and adding evidence to the idea that the two markets are distinct. Thus, the linking of organic to conventional prices for crop insurance purposes by a fixed proportion would not only be incorrect but would also make the level of participation in crop insurance by organic producers dependant on the relationship between the insurance and market prices. This is so because if the price ratio at the time of the price discovery (in February) is low and RMA offers to insure the crops at a higher level, it creates a clear incentive for organic producers to insure their crops during that year under that policy, as the guarantee is being inflated. Conversely, if the price ratio is high, and RMA offers insurance at a lower level, the signal for organic producer is not to insure because the guarantee is deflated.

Moreover, pegging organic crop prices to conventional ones might also result in systematic overpayments or underpayments to producers under the Revenue Protection coverage. For example, a decrease in organic prices at harvest time will never be compensated for, whereas a decrease in conventional prices will incorrectly be part of an organic producer's indemnities, even if organic prices have risen. Given the evidence of a changing multiplicative relationship between organic and conventional crop prices, RMA's pilot program is likely to cause the insurance guarantee for organic crops to be either inflated or deflated depending on whether the level of the market price ratio is below or above the fixed price factor offered by RMA for insurance purposes.

Upon examination of the relationship between organic and conventional crop prices between planting and harvest time, we found that the consequences of the price misalignment derived from the pilot program are sizable under revenue insurance coverage. Using a stochastic structural model between planting and harvesting applied to the U.S. corn market, we found that for the 75% nominal coverage level, when the organic-conventional price ratio is low, the mispricing induces an effective coverage of 106%, and when the price ratio is high, it induces an effective coverage of 45%. This implies that RMA's pilot program is likely to induce adverse selection, because the nominal coverage level is likely to substantially understate the effective coverage when the ratio of organic to conventional market prices at the time of planting is low and overstate the effective coverage when it is high.

Implications
Even though RMA's new pilot program represents an improvement over the previous organic crop insurance policy by which (in case of a crop failure) organic producers obtain an indemnity based on conventional prices, linking organic crops to their conventional counterparts creates faulty ratings in their insurance coverage. Yield differences have not adequately been taken into account. Price relationships between organic and conventional crops are not as consistent as current crop insurance rules imply. Organic crop markets have unique characteristics when compared with their conventional counterparts. Such idiosyncrasies need to be taken into consideration by RMA when setting crop insurance policy for organic farmers.

One recommendation that RMA could utilize quickly to address some of these insurance concerns is to use contract prices to set insurance prices for organic production. This is a

technique that RMA has used for other specialty crops. Contracting is the major marketing mechanism in the organic agricultural sector and contract prices reflect the actual market conditions in organic markets. This change would eliminate RMA's price misalignments for organic production.

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