Organic Crops Deliverable 5.5.1.1.1: Revised Written Rating Report

Contract Number: AG-645S-C-09-0003

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SECTION I. EXECUTIVE SUMMARY

The United States Department of Agriculture (USDA) Risk Management agency (RMA) awarded Contract Number AG-645S-C-09-0003 for a "review of the actuarial appropriateness of RMA's organic rates and organic pricing arrangements."[1] "The objective of this contract [was] to develop improvements in Federal crop insurance policies covering commodities produced in compliance with standards issued by the Department of Agriculture under the national organic program established under the Organic Foods Production Act of 1990 (7 U.S.C. 6501 et seq.), in accordance with the requirements of the Food, Conservation, and Energy Act of 2008."[2] The focus of this report on rating was to "review risk and loss experience of organic commodities covered by RMA, as compared with the same crops produced in the same counties and during the same crop years using nonorganic [sic] methods."[3] "The review and [resulting] recommendation [are to] either confirm or refute the existence of significant, consistent, and systemic variations in loss history between organic and non-organic production."[4] This report contains eight sections, including: this executive summary; an introduction and overview (Section II); an assessment of available data (Section III); a review of the academic literature (Section IV); an evaluation of insurance experience data (Section V); a premium rate analysis (Section VI); and discussions of findings and recommendations (Sections VII and VIII, respectively).

Organic Production and Available Production Risk Data (Sections II and III).
The Organic Foods Production Act, Title XXI of the 1990 Farm Bill, established Federal standards for the production of organic crops. The Title also identified processes for implementation of these standards through the United States Department of Agriculture (USDA) National Organic [Production] Program (NOP). Natural (non-synthetic) substances are generally allowed in organic production under these regulations and synthetic substances are generally prohibited. The 2007 USDA Census of Agriculture (Census) documented 20,437 farms engaged in organic production on 2,577,418 acres, with organic crops harvested from 1,288,088 acres. The Contractor initially made exhaustive efforts to gather available organic yield data from USDA sources, state resources addressing organic crops, producers and producer organizations, and the academic literature. These data were used in the review of risk and loss experience.

Academic Reports of Yield and Yield Variability (Section IV)
There are numerous academic studies comparing organic and conventional yields and corollary studies comparing organic and conventional yield variability. Although some statistically significant differences exist between yields in some circumstances, there is no consistent or systemic pattern in these relationships. Generally, corn managed under organic practices has lower yields than corn managed under conventional practices. This relationship deteriorates over time (i.e., organic yields improve) as producers experience with organic production practices increases and as the locale is affected by these practices. Yields for soybean under organic practices with long rotational cycles are often comparable and occasionally higher than yields under conventional practices. The relationships of yields of crops under organic and conventional practices vary with the crop, the locale, and specific environmental conditions.

[1] USDA, RMA, 2009, Contract Number AG-645S-C-09-0003, Section 5.3 Scope of Work.
[2] USDA, RMA, 2009, Contract AG-645S-C-09-0003, Statement of Work: 5.1. Contract Objective.
[3] USDA, RMA, 2009, Contract Number AG-645S-C-09-0003, Section 5.4.1.1.
[4] Ibid.

Evaluation of the Experience Data (Section V)

The Contractor also conducted an extensive analysis of the FCIC risk and loss experience of organic crops as compared with the same crops produced in the same counties and during the same crop years using non-organic methods. The Contractor initially compared the underwriting, risk, and loss experiences of organic and non-organic crops from an underwriting perspective. The report on this analysis includes

(1) An extensive evaluation of the experience data accumulated by RMA and consideration of rate structure for organic crops in light of the causes of loss reported for those crops;
(2) A rate analysis conducted using the same RMA data; and
(3) Additional evidence about organic and non-organic production from alternative sources, primarily academic reports of yield and yield variability of organically and conventionally produced crops.

Inasmuch as the purpose of the review is to "either confirm or refute the existence of significant, consistent, and systemic variations in loss history exist between organic and conventional commodities, either collectively or on an individual crop basis,"[5] the Contractor has explored a wide variety of mechanisms to consider the risk and loss experience in the context of the underwriting requirements for the organic production. The underwriting review is comprised of three elements: underwriting procedures, insurance experience, and causes of loss in crops insured with the organic codes. The results of the underwriting analysis do not provide sufficient statistical evidence that organic and conventional production methods result in significant, consistent, and systemic differences in insurance experience. The data indicate a wide range of relationships between conventional and organic production.

As the analysis reveals, the aggregate insurance experience for organic production has been very different from that of conventional production over the observations captured in the available data. Although the data provide a noisy picture and are not well suited to aggregate analysis (as evidenced by substantially different implied surcharges in the data), the overall weight of the aggregate performance is too great to dismiss. The Contractor notes that the aggregate insurance performance of organic crops has been inferior to that of conventional crops. The data currently available are too sparse and noisy to draw sound actuarial/statistical conclusions to support premium rate revisions at any acceptable level of aggregation. It is clear from the aggregate loss cost ratios and loss ratios that "organic" is different from "non-organic." Unfortunately the data at less than national aggregate becomes very unstable. The organic and conventional experience comparison at the national crop level suggests considerable deviations from non-organic rates in many cases, with both substantial discounts and increases in the rates, if the data are to be believed. The Contractor does not believe such substantial departures from non-organic rates are justified, and does not believe the data is reliable enough or representative of the true underlying distributions to support these substantial deviations from rates for non-organic production. However, this comparison ignores other important aspect of the organic insurance offer such as loss ratios, T-yields, and reference yields, which play a crucial role in creation of a sustainable, actuarially sound program. Assuming insurable conditions for organic crops are appropriately captured in the available RMA data, an increase in premiums of the magnitude implied by the ratio of loss cost ratios would make the program much less attractive to organic producers and

[5] Ibid.

likely encourage only the riskiest of organic producers to participate in the program. Furthermore, when examined from a wide variety of perspectives, this pattern is neither consistent nor systemic. For some crops, regions, and years, organic crops have lower losses than their conventional counterparts. This is true even at the risk region and state levels of aggregation. In many crops, conventional crops have a higher level of loss than organic crops in extreme risk circumstances (very high losses, as established by the loss ratio or loss cost ratio for the conventional production), but a lower level of losses when responding to lower levels of risk.

The approach applied to organic rating to date, a flat surcharge applied uniformly across all crops and geographies, was a logical starting point for insurance development, especially considering the public policy goals, the required timeframe for action, and the paucity of available data. The variations in performance at all levels of aggregation suggest that substantial adjustments will need to be made to establish equitable and sustainable programs for individual organic crops and geographies. Such adjustments may include changes to the reference yields, T-yields, rate structure, underwriting, and pricing. The challenges are the breadth of adjustments that will likely need to be made over time and the likely interaction of the factors in the performance of the resulting product.

Rate Analysis (Section VI)
A review of premium rate adequacy and appropriateness was undertaken by the Contractor's Rating Department. Data used to test the null hypothesis that organic and conventional production face the same insurance risk (expected loss cost) in a given locale on a per acre basis were gathered from RMA Type 11 (acreage record), Type 15 (yield record), and Type 21 (loss line record) datasets from crop years 2001 through 2008. In addition to consideration of historical loss experience, this element of the rate analysis also examined the Type 11 and 21 files to evaluate insurance experience and the Type 15 files to compare historical short-run yield variability between conventional and organic production. The experience and yield datasets were grouped by policy into two non-mutually exclusive groups, first of paired observations (policies which insured units in which the acreage was either all organic or all non-organic) and then of all observations. The paired datasets allow outcomes (insurance experience and yield variability) from acreage insured under the same policy grown under conventional and organic methods to be directly compared Due to potential asymmetries in the "sampling" that produces the "all observations conventional" and " all observations organic" groups, and because of the "matching" of elements of practices (i.e., soil types, experience, microclimate, etc.) in the paired dataset that focus the analysis primarily on the differences between non-organic and organic production practices, the paired dataset is the preferred dataset for the analysis. Unfortunately, the breadth and depth of the paired dataset is extremely limited. The second grouping includes all units in a county for each crop/county combination for which there was organic production. Attributes were evaluated across policies (producers) to compare organic production and conventional production in total, without the benefits of the paired sampling.

Organic data available for the "all observations" exercise are limited, although more robust than the data in the paired dataset. The results of the rating analysis do not provide sufficient statistical evidence to reject the null hypothesis that organic and conventional production methods face the same insurance risk. While there are differences in yield, loss ratios, and loss cost ratios of non-organic and organic production, the differences are not generally statistically significant.[6] Furthermore, the data show a wide range of relationships between conventional and organic production, especially in the crops where data are sparse. This diversity of responses is evident at all levels of aggregation, but is less conspicuous as data from larger areas and across crops are aggregated. The data are not robust enough to dig deep into specific situations for crop by crop or state by state results. The high degree of variability in the results leads to a failure to reject the null hypothesis that organic and conventional production face the same insurance risk (expected loss cost). Currently, RMA typically uses a multiplicative load of 1.05 on organic contracts (with a few minor exceptions) and it is important to note the analysis presented in this section did not directly test if 1.05 is appropriate. Furthermore, it should be noted the failure to reject the null hypothesis that production risks are the same does not imply that 1.05 is an actuarially unsound value. With available data it is not currently possible to develop an appropriate multiplicative rate adjustment factor for all organic crops. Further study is recommended as more data become available.

There is not proof of a significant, consistent, and systemic difference in insurance experience or yield variability between organic and conventional production. Nonetheless, within the RMA dataset there are specific cases where data exist to identify substantial differences in yield variability between organic and non-organic practices. In those instances, as sufficient data become available, further analysis will indicate whether the crop grown under organic practices is simply an element of the larger set grown under good farming practices or if the organic practice requires an independent rate structure (or discount or surcharge).

Discussion and Conclusions (Sections VII and VIII)

The review exposes some challenges in analyzing the insurance experience data comparing organic and conventional commodities, either collectively or on an individual crop basis. In most cases, where patterns might have been thought to exist, it was also possible to identify where those patterns break down. With the limited data available, artifacts of aggregation and sampling have the potential to lead to potentially dangerous generalizations. The Contractor has attempted to avoid this pitfall and identify where it has occurred in other analyses.

The Contractor’s review refutes the existence of significant, consistent, and systemic variations in loss history between organic and non-organic commodities on an individual crop basis. When data for all crops in all areas are aggregated, the collective insurance experience for organic production has been very different from the insurance experience for non-organic production over the observations captured in the available data. Although the data provide a noisy picture and are not well suited to aggregate analysis, the overall weight of the aggregate performance is too great to dismiss. Public policy precludes the option simply to maintain the existing surcharge.

Based on Contractor research, it appears that the organic insurance pool is subject to adverse selection by a subset of unusually high-risk producers. If the premium rates were raised by the value implied by the available aggregate data, the most likely outcome would be to assure this adverse selection would be exacerbated in future years. Rating, pricing, reference yields, T-

[6] It should be noted that tests of statistical significance are highly dependent on the number of observations available in the applicable data. Given the small overall dataset, the differences in performance between organic and conventional observations would have had to have been relatively large and consistent to meet statistical significance at high levels of confidence. In this circumstance, the failure to demonstrate statistical significance does not necessarily indicate that differences do not exist in the underlying population but rather, that the data available are not adequate to verify these relationships to a high degree of confidence.

yields, and good farming practices need to be addressed collectively on a regional/crop basis, and cannot be addressed effectively until more representative data become available.

Blanket recommendations for all crops cannot be supported given the inconsistency of the data, and there are limited data to support specific recommendations for any given crop. However, there are a number of examples that demonstrate the T-yields are generally too high. In both the aggregate and for the major crops the average of actual organic yields certified by producers is approximately 65 percent of the reference yield. The risk analysis clearly indicates that inappropriate transitional yields are a significant source of the higher loss costs observed for the organic practice. There is substantial variation among states within crops and among crops as evidenced in this and other information contained in the report. Since the data at lower levels of aggregation is noisy and inconsistent, the remaining assessment focuses on the aggregate data. Nonetheless, the Contractor's recommendations are formulated to address different risk profiles and insurance structures.

The Contractor recommends RMA impose no premium differential for crops for which the Crop Provisions specify a very limited set of causes of loss that clearly are independent of management or other variable circumstances (These crops include those insurable under the Florida Citrus Fruit Crop Provisions (09-026); the Texas Citrus Tree Crop Provisions (99-025); the Macadamia Tree Crop Provisions (99-024); the Nursery Crop Provisions (08-073); the Florida Fruit Tree Provisions (08-0014); the Hawaii Tropical Trees Pilot Crop Provisions (09-0265); all crops included under the Common Group Risk Plan (GRP), Basic Provisions. 09-102; all crops included under the Group Risk Income Protection Basic Provisions (05-GRIP-BASIC; and all acreage included under the Pasture, Forage, and Rangeland programs). For the crops for which the guarantee is not based on APH procedures (plan codes 50, 51, and 55), the Contractor recommends RMA make no adjustments to rates until a threshold value of organic units is represented in the experience dataset. For those crops for which the guarantee is not based on APH procedures and which meet the threshold, the Contractor recommends a premium differential (increase or decrease) based on the implicit differential (surcharge or discount) as illustrated in the report. The Contractor further recommends that the maximum reference amount of insurance for organic crops insured under the plans that do not use APH guarantees be reduced by one-third.

Because of the confounding effects of T-yields on insurance experience for crops whose guarantee is based on APH procedures, these crops need to be treated by an alternate approach. Regardless of the extent of the experience data, for all plan code 25 (Revenue Assurance); plan code 42 (Income Protection); plan code 44 (Crop Revenue Coverage); plan code 45 (Indexed Income Protection); and plan code 90 (Actual Production History) crops, the Contractor recommends transitional yields be reduced by 35 percent and that no rate differentials between organic and conventional production be implemented until sufficient data under this new approach are available. The effect of this will be to insure organic production at the same premium rate and cost as that charged for non-organic practices **for the same yield**. These recommendations are based specifically on the role T-yields have played in the experience data collected to date.

The Contractor further recommends that the organic practice be established as a separate type/practice to facilitate the reduction in the transitional yields. To achieve the greatest ability to accrue relevant data, Crop Provisions should be modified to allow organic practice as a separate insurance unit.

These adjustments are intended to reduce the impact of adverse selection going forward. The emphasis would then be on examining and explaining the ongoing insurance experience of organic practice and making appropriate adjustments as that experience is accrued. Judgmental rate increases (or discounts), limited to 10 percent to support the accumulation of data going forward, may be warranted for those crops afforded new price election until credible loss-cost-based rate determinations by crop/region are possible.

SECTION II. INTRODUCTION AND OVERVIEW

Prior to the industrial revolution, most agricultural production worldwide was based primarily on on-farm produced inputs. As transportation systems improved and chemical manufacturing was industrialized, substantial changes in crop production practices, especially in the Western Hemisphere, occurred. Monoculture, the cultivation of a single crop on a farm or in a region, allowed significant mechanization of many labor-intensive farming activities. Use of off-farm inputs (including seed, mineral nutrients, and pesticides) became more common. Late in the 19th Century, as consumers became aware of these changes in agricultural practices, the concept of organic farming, farming eschewing synthetic inputs, developed. However, the term "organic farming" was not generally applied to the practices for an additional half century.[7]

In most developed economies, organic practices were largely abandoned during the period between the two World Wars. This was a period of rapid developments in synthetic organic chemistry and plant breeding. Synthetic nitrogen fertilizers produced using Haber-Bosch synthesis of ammonium nitrate replaced guano and manure as sources of nitrogen for agricultural applications. Use of these synthetic fertilizers generally increased crop yields, especially when monoculture and limited rotations were the predominant approach.[8]

During the same period, crop breeding programs identified the potential benefits of heterosis on yields. Shull defined heterosis as "the interpretation of increased vigor, size, fruitfulness, speed of development, resistance to disease and to insect pests, or to climatic rigors of any kind, manifested by crossbred organisms as compared with corresponding inbreds, as the specific results of unlikeness in…the parental gametes." The "hybrid vigor" characterizing heterosis led to the development of the commercial seed production industry. The development of proprietary hybrid seed lines, first for corn, and eventually for most major and minor crops, introduced a substantial genetic component affecting yields.[9] Soon after World War II, the use of synthetic pesticides and hybrid seed in the United States became prevalent practices. These practices increased farm yields far beyond pre-World War II levels.[10] Subsequently, in the 1990s, genetically modified crops[11] (GMOs) were added to the repertoire of technologies that affected crop yields. Corn,[12] cotton, and rice[13] are among the major crops whose yields are reported to have improved most substantially through specific transgenic modifications.

Increased environmental awareness and growing demand for organic foods fueled the growth of organic farming in the 1970s. At the time, there was general agreement on a philosophical approach for the organic farming concept, but no accepted standards defining the practices. Initially, state certification programs developed standards based on regional production practices. Eventually, a movement to develop a national organic standard led to the Organic Foods

[7] Walter Ernest Christopher James (Lord Northbourner), 2002 (first published 1940), Look to the Land, Sophia Perennis Books, Hillsdale, NY.
[8] Zandstra, H. G., R. H. Anderson and W. K. Dawley, 1969, Effects of fertilizer on yield and quality of Norland potatoes in northeastern Saskatchewan, American Journal of Potato Research, 46: 1099-209X.; Erisman, J.W., M.A. Sutton, J. Galloway, Z. Klimont and W. Winiwarter, 2008, How a century of ammonia synthesis changed the world, *Nature Geoscience* **1**, 636 - 639 (2008)
[9] Basra, A.S., 2000,, Heterosis and Hybrid Seed Production in Agronomic Crops, Food Products Press, Binghamton, NY.
[10] University of California, San Diego, undated, Bacillus thuringiensis: Synthetic Fertilizers, http://www.bt.ucsd.edu/synthetic_pesticide.html, accessed, June 1, 2009.
[11] Organisms whose genetic information has been altered using genetic engineering techniques known as recombinant DNA technology.
[12] Rice, M.E., 2004, Transgenic Rootworm Corn: Assessing Potential Agronomic, Economic and Environmental Benefits, Plant Health Progress doi:10.1094/PHP-2004-0301-01-RV, http://www.plantmanagementnetwork.org/pub/php/review/2004/rootworm/, accessed June, 2009.
[13] Raney, T., 2006, Economic Impact of Transgenic Crops in Developing Countries. Current Opinion in Biotechnology 2006, 17:1-5, http://www.agbioworld.org/pdf/raney.pdf, accessed June, 2009.

Production Act (OFPA), Title XXI of the 1990 Farm Bill.[14] OFPA provided for the establishment of Federal standards for production of organic crops. OFPA was incorporated into the United States (U.S.) Code as Chapter 94 of Title 7.[15] The language of OFPA also identified processes for oversight of Federal organic standards by the USDA National Organic Program (NOP), which "develops, implements, and administers national production, handling, and labeling standards for organic agricultural products."[16]

Use of natural (non-synthetic) substances in organic production is generally allowed under NOP regulations, while use of synthetic substances is prohibited. Consequently, organic crops are produced without employing most conventional pesticides[17] or petroleum-based and sewage-sludge-based fertilizers. Furthermore, the NOP regulations prohibit the use of GMOs and ionizing radiation in organic production and handling.

In 2005, organic farmland in all 50 states was certified under NOP. Nonetheless, in 2007, certified organic cropland and pasture comprised less than 0.5 percent of total U.S. cropland.[18] The 2007 USDA Census of Agriculture (Census) documented 20,437 farms engaged in organic production on 2,577,418 acres, with organic crops harvested from 1,288,088 acres on 16,778 farms and 975,380 acres of organic pasture on 7,268 farms. The Census data indicate 12.2 percent of the acreage (313,950 acres) managed under organic practices was neither harvested nor used as pasture, but instead may have been in summer fallow or similar conservation use. Comparable values for all production are 2,204,792 farms engaged in production on 922,095,840 acres, with crops harvested from 309,607,601 acres on 1,328,004 farms and 408,832,116 acres of pastureland on 1,132,606 farms, with 203,656,123 acres (22.1 percent) managed under conventional practices that were neither harvested cropland nor pastureland.

As a follow-up to the 2007 Census, the USDA National Agricultural Statistics Service (NASS) is conducting a wide-scale survey of organic producers and producers transitioning to organic practices. Organic Production Survey (Survey) instruments were mailed in early May, 2009. Results are expected to be available in early 2010.[19] Questions in the survey address all aspects of the practices, ranging from production and marketing activities to income and expenses. The survey results will provide the most comprehensive snapshot of organic production in the United States to date. The responses to the survey will substantially increase virtually every type of data available on commercial U.S. organic production practices, production, and acreage. [20] It is likely these survey data, in conjunction with Census data, will provide a basis for further

[14] Federal Organic Foods Production Act of 1990, 2004, http://www.sarep.ucdavis.edu/Organic/complianceguide/national6.pdf, accessed March, 2009.
[15] U.S. Code, Title 7, Chapter 94, 2007, http://www.law.cornell.edu/uscode/7/usc_sup_01_7_10_94.html, accessed March, 2009.
[16] USDA, AMS, National Organic Program: Program Overview, 2009, http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateA&navID=NationalOrganicProgram&leftNav=NationalOrganicProgram&page=NOPNationalOrganicProgramHome&acct=nop, accessed April, 2009.
[17] Pesticides like pyrethrins, derived from natural sources, can be used on organic crops.
[18] The distribution of cropland and organic farmland are illustrated in Census maps found at http://www.nass.usda.gov/research/2007mapgallery/album/Farms/Land_in_Farms_and_Land_Use/slides/Acres%20of%20Total%20Cropland.html and http://www.nass.usda.gov/research/2007mapgallery/album/Farms/Land_in_Farms_and_Land_Use/slides/Acres%20Used%20for%20Organic%20Production.html, respectively.
[19] The original release date was late 2009. This was modified in May 2009 to early 2010. USDA, NASS, 2009, Organic Production Survey FAQs, http://www.agcensus.usda.gov/Surveys/Organic_Production_Survey/FAQs/index9.asp.
[20] To assist readers using this report as a stand-alone document, some information in the introduction speaks to issues also addressed in the report on pricing for FCIC insurance of crops produced under NOP approved practices.

exploration of yield relationships between organic and non-organic production for some crops. Further study is recommended to determine how these data affect the agency's treatment of crops produced under organic practices.

While much of the organic production occurs in areas where growers participate actively in Federal Crop Insurance Corporation (FCIC) programs in 2007[21] the proportion of organic acreage insured under FCIC programs was about half the proportion insured for conventional production.[22] Insurance of organic crops has been influenced substantively by Federal legislation. The Agricultural Risk Protection Act of 2000 (ARPA) required RMA to address certified organic farming practices as good farming practices and to provide insurance coverage for crops produced under these practices. Federal crop insurance coverage for organic producers was initially provided through written agreements and subsequently through standard crop insurance policies, using standard policy terms, but with an additional five percent rate load to account for the limited available insurance experience for the practices, RMA's producer yields-based rate theory, and uncertainty related to the organic practices.[23] Testimony from organic producers and representatives of organic producer organizations suggests those producers perceive the 5 percent rating surcharge applied to all organic crops is unfair, in spite of the fact a Federal subsidy covers approximately 67 percent of the premium.

Section 12023 of the Food, Conservation, and Energy Act of 2008 requires RMA to contract for "a review of the underwriting, risk, and loss experience of organic crops covered by the Corporation, as compared with the same crops produced in the same counties and during the same crop years using nonorganic[24] methods …as established using data collected and maintained by the Secretary [of Agriculture] or from other sources."[25] To the maximum extent practicable, the review is to "allow the Corporation to determine whether significant, consistent, or systemic variations in loss history exist between organic and nonorganic production."

RMA awarded Contract AG-645S-C-09-0003, Organic Crops: Review of Risk and Loss Experience and Development of Additional Price Election Procedures, to support research to develop this review. It is important to note the objective of the contracted work on rating, as described in the solicitation.

> *"The objective of this contract is to develop improvements in Federal crop insurance policies covering commodities produced in compliance with standards issued by the Department of Agriculture under the national organic program established under the Organic Foods Production Act of 1990 (7 U.S.C. 6501 et*

[21] See the Census map on organic production referenced earlier and the Census map on Federally insured crop land at http://www.nass.usda.gov/research/2007mapgallery/album/Farms/Land_in_Farms_and_Land_Use/slides/Acres%20Enrolled%20in%20Crop%20Insurance%20Programs.html),

[22] Based on 2007 Census of Agriculture total crop production data and RMA Summary of Business as compiled by the Contractor.

[23] USDA, RMA, 2008, Organic Crops: Review of Risk and Loss Experience and Development of Additional Price Election Procedures, Statement of Work, Section 5.2.

[24] For the purposes of this report, the words "nonorganic" [sic], "non-organic," and "conventional" are both used. While the Crop Insurance Handbook defines "nonorganic farming practice" as "a practice commonly recognized in a conventional farming operation by which synthetic pesticides and fertilizers are used" and "conventional farming practice" as "a system or process for producing an agricultural commodity, excluding organic farming practices, that is necessary to produce the crop that may be, but is not required to be generally recognized by agricultural experts for the area to conserve or enhance natural resources and the environment." Conventional and non-organic both effectively exclude organic production practices.

[25] USDA, RMA, 2009, Contract AG-645S-C-09-0003, Section 5.2. Background.

seq.), in accordance with the requirements of the Food, Conservation, and Energy Act of 2008."[26]

An additional RMA objective identified in the solicitation is to facilitate the eventual establishment of unique organic practice rating components as research is completed and more insurance experience is accumulated. Furthermore, the contract requires:

> *"The review and recommendation should either confirm or refute the existence of* ***significant**, **consistent**, and **systemic** variations in loss history between organic and conventional commodities, either collectively or on an individual crop basis."* [emphasis added by the Contractor] [27]

"Significant," as a statistical term, means occurring not merely by chance, but rather as a result of actions or outcomes that are closely linked (i.e., that are connected by strong correlations or by a causal relationship). Statistical significance measures the likelihood of a statistical test obtaining the same result repeatedly, or the likelihood that the relationship described by the sample data accurately reflects the underlying population and was not the product of chance in sampling. In the context of such testing, significance levels (equated to the Greek letter α) are chosen by the researcher. Commonly used significance levels are 0.05, 0.01, and 0.001 (5 percent, 1 percent, and 0.1 percent respectively). Type I errors (false positives) are minimized with lower significance levels. Type II errors (false negatives) become less likely with higher significance levels, so the significance levels are often chosen with the potential impacts of Type I and Type II errors in mind. Researchers may examine more than one α level in the course of an analysis. After an α level is chosen, it is then compared against the probability level determined through an appropriate statistical test. If the probability level of an event occurring by chance is less than the chosen significance level, the event is deemed statistically significant. If an α level of 0.01 is chosen, an event must occur less than 1 percent of the time due to the effect of chance to be considered significant. Regarding a comparison of organic and conventional yields, yield variability, and insurance experience, the challenge is identifying data where it is possible to make any appropriate test of significance.

"Consistent" has a similar meaning when applied to both meta-data analysis[28] and descriptive statistics. The term consistent means free from substantial variation or contradiction. Statistically, consistency can imply a small standard deviation or coefficient of variation. Consistency is also often associated with statistical estimators; consistent statistical estimators grow closer and closer to the parameter they are estimating as the sample size grows larger. Logically, if there is a consistent relationship between conventional crops and organic crop yield variability, exceptions to that pattern would be limited and sporadic, particularly in large samples. In the context of crop insurance, inconsistency in the yield of a particular crop can lead to higher coefficients of variation, which generally equate to higher rates. However, the rates would be expected to be consistently higher if the yield variability is consistently higher and, conversely, to be lower where yields have consistently lower coefficients of variation.

[26] USDA, RMA, 2008, Organic Crops: Review of Risk and Loss Experience and Development of Additional Price Election Procedures Solicitation, and USDA, RMA, 2009, Contract AG-645S-C-09-0003, Statement of Work: 5.1.
[27] USDA, RMA, 2008, Organic Crops: Review of Risk and Loss Experience and Development of Additional Price Election Procedures Solicitation, and USDA, RMA, 2009, Contract AG-645S-C-09-0003, Statement of Work: 5.4.1.1.
[28] Metadata are values and/or other documentation that describes objects in a formalized way. They provide information on data and about processes of producing and using data. Metadata describe statistical data and, to some extent, processes and tools involved in the production and usage of statistical data. Consequently, data collected using different sampling methods, though having similar values, may not be considered consistent unless there are appropriate tests of the sampling methods themselves.

"Systemic" means of a system, relating to a system, or common to a system. In this instance, the system is a system of organic and conventional crop production. If there is a systemic difference between performance of crops under these practices, that difference would be expected to exist for different crops, in different regions, and at different times. Furthermore, "systemic variations" can be expected to be similar across disparate observations (i.e., if the conventional practice consistently results in a 15 percent higher yield in a crop, it would be expected to result in a similarly consistent elevated yield in another crop if the differences are to be considered systemic). In addition, there is a system of crop insurance experience. If there is a systemic difference between the insurance experience for crops under the organic and conventional practices, that difference would be expected to exist for different crops, in different regions, and at different times.

Consequently, the contract establishes very high standards for the comparison of organic and conventional risk and loss experience. To identify the existence of significant, consistent, and systemic variations in loss history between organic and conventional commodities, either collectively or on an individual crop basis, requires sufficient data for an appropriate analysis of these crucial characteristics.

There are three possibilities that each require different amounts of data for evaluation. First, the risk characteristics of organic production may simply be a subset within the risk characteristics of the same crop within the larger population of all good farming practices. Second, organic production of a crop may track conventional production of the same crop, but with yields modified by an additive or multiplicative factorial relationship. Finally, the organic crop may be so different from the conventional crop that it is best treated entirely independently. Data requirements in each case will be influenced by the consistency of the yield relationship between the two practices. A single organic producer in a region cannot provide a basis for any statistical test of significance, even if his or her data covers a number of years of production. Furthermore, a large number of producers with one or two years of data also provide a very limited basis for testing of yield differences. The sample size greatly influences whether a hypothesis "the yield risks associated with the practices are not different" can be tested, and if it can be tested, whether the hypothesis can be rejected.

While the contract indicates RMA would provide insurance experience for the 2004, 2005, 2006, and 2007 crop years, the Contractor also obtained data for 2001 through 2003 and for 2008 from RMA, and incorporated those data into the review when appropriate. The Contractor identified no biases resulting from the incorporation of these additional data. However, incorporation improves the analysis by increasing both the depth (i.e., the period considered) and breadth (i.e., locations and crops considered) of the dataset. Yet even with the inclusion of these additional data, the insurance experience dataset for most crops is thin. The crop by crop differences in yields and yield variability, as well as the regional and temporal differences in insurance experiences, argue against treating all organic production identically or in aggregate. However, for a limited number of crops and states, sufficient losses to meet RMA's credibility standard for counties have been accrued at the state level. The Contractor believes an additional two to three years of experience will likely supply sufficient data for credibility-weighted adjustment of rating for additional crops grown organically.

To further address the question of "significant, consistent, and systemic variations" in insurable risks between organic and conventional commodities, either collectively or on an individual crop basis, the Contractor made extensive efforts to identify and collect available organic and non-organic crop yield comparisons and comparisons of yield variability data from a wide variety of sources. The Contractor then examined the available data, with special attention to the context provided by the limited Federal organic crop data and by the role of yield and yield variability in establishing crop insurance rates. The Contractor believes this approach addresses the requirements that the review "include the widest available range of data collected by the Secretary and other outside sources of information; and …not be limited to loss history under existing crop insurance policies."[29]

The work encompassed under Contract AG-645S-C-09-0003 is demanding due to the breadth of organic crops produced. In 2008, there was a wide range of crops produced organically and insured under FCIC programs (Table 1 and Appendix A). The insured crops ranged from a single unit of filler tobacco on half an acre to 1,788 units of wheat (0.3 percent of all insured wheat units in 2008) comprising almost 200,000 acres (0.4 percent of all insured wheat acres in 2008).

TABLE 1. 2008 Organic Crops Insured Under FCIC Plans of Insurance

Alfalfa Seed	Citrus - Florida (continued)	Corn, Popcorn	Peaches, Fresh Freestone
Almonds	Citrus IV - Navel Oranges	Corn, Sweet	Peas, Dry
Apples	Tangelos, and Tangerines	Cotton	Peas, Green
Apricots, Fresh	Citrus V - Murcott and Temple	Cotton - Extra Long Staple	Peanuts
Apricots, Processing	Oranges	Cranberries	Pears
Avocados	Citrus VII - Grapefruit and	Figs	Plums
Barley	Late Oranges	Flax	Potatoes
Beans, Processing	Citrus - Texas	Forage Production	Prunes
Beans, Dry	Grapefruit	Forage Seeding	Rice
Blueberries	Citrus Trees - Florida	Grain Sorghum	Rye
Cherries	Grapefruit Trees	Grapes	Safflower
Citrus - California and Arizona	Orange Trees	Grapes, Table	Soybeans
Lemons	All Other Citrus Trees	Macadamia Nuts	Strawberries
Mineola Tangelos	Citrus Trees - Texas	Macadamia Trees	Sunflowers
Mandarins	Citrus Trees I - Early and	Millet	Tobacco, Burley
Grapefruit	Midseason Orange Trees	Mustard	Tobacco, Cigar Filler
Oranges, Valencia	Citrus Trees IV - Rio Red and	Nectarines, Fresh	Tobacco, Cigar Binder
Oranges, Navel	Star Ruby Grapefruit Trees	Oats	Tobacco, Flue Cured
Oranges, Sweet	Citrus Trees V - Ruby Red	Onions	Tomatoes
Citrus - Florida	Grapefruit Trees	Peaches	Walnuts
Citrus I - Early and Midseason	Corn	Peaches, Cling Processing	Wheat
Oranges	Corn, Hybrid Seed	Peaches, Freestone Processing	Wild Rice, Cultivated

Source: The Contractor's analysis of RMA Summary of Business Data, June, 2009

A number of favorable and unfavorable preconceptions concerning organic production add to the challenge of evaluating differences in the performance of crops under conventional and organic

[29] Section 12023 of the Food, Conservation, and Energy Act of 2008, 122 STAT. 2147.

practices. Due to the increased production that accompanied the introduction of synthetic fertilizers and pesticides, there is a general assumption that yields under organic practices will necessarily be lower than those under conventional practices. Based on a review of the literature and RMA data, this is not always the case. Furthermore, while the NOP regulations prohibit the use of genetically modified organisms[30] and ionizing radiation in organic production and handling, many other technologies have contributed to substantial increases in productivity of organic crops. These include, but are not limited to, development of better seed through conventional breeding, advances in irrigation, developments in tillage/bedding technologies, substantial improvements in data management and analysis, and a better understanding of the effects of extended crop rotations. Under some conditions, organic crop yields may exceed those for crops produced under conventional practices, especially when longer rotations are used and conditions under the two practices are matched as much as the management practices allow.

The wide range of locations involved in organic production (Table 2) and the relatively limited data available in each area add to the complexity of the required analysis of insurance experience. Examination of patterns on a fine scale simultaneously introduces the possibility of sampling errors (which are more likely in smaller samples) on the one hand and poorly matched samples for comparison on the other. Due to the limited data and the challenges in creating a well-designed comparison, analysts are reluctant to disregard poorly matched data in the absence of a perfect match.

TABLE **2. States, Acreage, and FCIC Policies Earning Premium for Insured U.S. Organic Production**

Year	States	Acres	Policies Earning Premium
2001	26	27,938	145
2002	25	72,789	445
2003	26	77,767	578
2004	33	225,539	1,520
2005	34	280,942	1,898
2006	36	368,909	2,576
2007	37	439,451	3,110
2008	38	479,668	3,565

Source: The Contractor's analysis of RMA Summary of Business Data, December, 2008

The Contractor's assessment of insurance experience and the yield and loss data address the questions raised in the "Scope of Work" as described in the solicitation and the ensuing contract. The remainder of this report documents:

- An assessment of available data;
- The literature addressing organic and conventional yield variability;
- RMA underwriting and insurance experience for organic crops;

[30] These are organisms whose genetic information has been altered using genetic engineering techniques known as recombinant DNA technology.

- An actuarial analysis of RMA yield and loss for organic crops;
- A discussion focused on the implications of available data on the current rating paradigm;
- A discussion of the implications of available data on establishing yield relationships; and
- The Contractor's recommendations.

SECTION III. ORGANIC CROP YIELD DATA SOURCES

In 2007, the Census documented 16,778 farms harvesting organic crops on 1,288,088 acres. As a follow-up to the organic data collection in the Census, NASS is gathering additional data through the Survey.

The Survey is the first wide-scale survey of organic farming in the United States conducted by the USDA, and represents a scale of data collection that has not been, and likely cannot be, duplicated privately. The Survey was sent to all respondents to the Census who indicated they had organic production (including those who reported production of only organic livestock, dairy, eggs, and forage) and also allows participation by organic producers who did not participate in the Census.[31]

The Survey is collecting comprehensive information about organic acreage, production, and production value for numerous named insured (Table 3) and uninsured (Table 4) organic crops. The Survey instrument also allows entry of crop data for crops not listed by NASS. The Survey is collecting, using a uniform instrument and procedure, essential data to evaluate the production and valuation of insured organic crops. The broad-ranging and comprehensive scope of the Organic Production Survey is well beyond the scope of data collection anticipated in Contract AG-645S-C-09-0003. Unfortunately, none of the data collected under the Survey will be available until after the completion of this study.

[31] USDA, NASS, 2009, Organic Production Survey FAQs: What if I want to participate in the survey but didn't get one in the mail?, http://www.agcensus.usda.gov/Surveys/Organic_Production_Survey/FAQs/index11.asp, accessed May, 2009.

TABLE 3. Crops Named in the NASS Organic Production Survey and also Insured under Named-crop FCIC Programs

Almonds	Mint, peppermint, and spearmint	Safflower
Apples	Oats for grain or seed	Snap beans, for processing
Avocados	Onions, dry	Sorghum for grain or seed,
Barley for grain or seed	Oranges, all	Sorghum for silage or greenchop
Dry Beans	Peaches, all	Soybeans for beans
Blueberries, tame	Peanuts for nuts	Squash, all (Winter Squash)
Cabbage, all	Pears, all	Strawberries
Canola	Peas, dry peas and lentils	Sugarcane for sugar
Cherries, sweet	Peas, green	Sunflower seed (Sunflowers)
Corn for grain or seed	Peas	Sweet corn
Corn for silage or greenchop	Pecans, all	Sweet potatoes
Cotton, all	Peppers, bell	Tangerines
Cranberries	Plums and prunes	Tomatoes (in the open)
Figs	Popcorn	Walnuts, English
Flaxseed (Flax)	Potatoes	Watermelons
Grapefruit	Proso millet	Wheat, Winter for grain or seed
Grapes	Rice	Wheat, Durum for grain or seed
Lemons	Rye for grain or seed.	Wheat, Other spring for grain/seed

Source: Compiled from the USDA NASS Organic Production Survey Instrument and USDA RMA 2009 Crop Policies and Pilot Program Lists

TABLE 4. Crops Named in the NASS Organic Production Survey but Not Insured under Named-crop FCIC Programs

Beans, snap (fresh)	Garlic
Blackberries and Dewberries	Hazelnuts/Filberts
Broccoli	Herbs, dried
Buckwheat	Herbs, fresh-cut
Cantaloupes and muskmelons	Honeydew melons
Carrots	Lettuce
Cauliflower	Peas, green (fresh)
Celery	Pistachios
Cherries, tart	Raspberries
Dates	Spinach

Source: Compiled from the USDA NASS Organic Production Survey Instrument and USDA RMA 2009 Crop Policies and Pilot Program Lists

Historically, organic data have been difficult to collect and assess. Organic production represents a small fraction of the total agricultural production in the United States. Much of the data is proprietary, and in many cases the data provide tools for marketing and market development. Furthermore, organic production is widely scattered across the continent.

The Contractor made exhaustive efforts to gather available organic yield data through USDA sources, including NASS, Agricultural Marketing Service (AMS), Economic Research Service (ERS), and from extension offices and similar state resources addressing organic crops yields. The Contractor also collected additional data from academic and private sources. In developing the protocol for collection of additional data, the Contractor considered the constraints imposed by the Paperwork Reduction Act on the Government and its contractors. The Contractor conducted an extensive review of academic, trade, and popular literature to glean any appropriate information and identify potential data sources. Internet sources were searched to identify potential data sources and to gain insight into organic practices and production risks; the producer and marketing communities; and economics of organic regulation, production, and marketing. In this context, the Contractor identified resources for an initial data request and instituted a process designed to flow through the organic industry at all levels. The expectation was, due to the integrated nature of the organic community, the data request would reach audiences that could not otherwise be identified.

The Organic Trade Association (OTA)[32] was established in 1985, initially to promote organic food production and eventually to support trade across the organic supply chain. The Contractor worked with OTA to identify potential sources among their membership for organic yield datasets. The Contractor also worked closely with crop experts, producer organizations, advocacy organizations, consultants, cooperatives, and individuals within the organic community to obtain access to data. Attempts were made to gather data from as many sources as possible.

The Organic Crop Insurance Conundrum

As noted earlier, insurance of organic crops has been influenced substantively by legislation. When ARPA required certified organic farming practices to be treated as good farming practices for insurance purposes, crop insurance coverage was initially provided through written agreements. The agreements were based on a comprehensive underwriting review of the particulars of each request by RMA's Regional Offices. Premium rates for these written agreements were determined either by using county rates for the crops under conventional practices from actuarial tables and applying a factor determined by the RMA Regional Office or by calculating individualized rates based on producer data. This was a remarkable attempt to provide appropriate individualized coverage. However, these written agreements placed a substantial administrative burden on RMA Regional Offices and insurance providers, and were perceived by producers as burdensome.

Subsequently, Federal insurance of organic crops was provided through standard crop insurance policies, using standard policy terms, but with an additional five percent rate load to account for the limited available insurance experience for the practices, RMA's producer yields-based rate theory, and uncertainty related to the organic practices. This was an attempt to provide a general simplified mechanism for structuring Federal insurance of organic crops.

Development of actuarially sound crop insurance products requires considerable amounts of data consistent with actuarial principles of credibility. For example, under one approach, farm-level data provided by several producers for a period not less than 4 years is combined with county-

[32] Formerly the Organic Foods Production Association of North America.

level data for 10 to 40 years. This allows risks associated with individual production to be coupled with longer term risks associated with the locale, crop, and practices. Analysis of insurance experience, like the development efforts, also requires considerable breadth and depth in the data. The approach currently used to establish premiums rates for organic production (i.e., a surcharge on conventional rates) appropriately assumes data for organic crops are limited, but also assumes performance of the organic crop will basically be similar to the conventional crop performance.

Among the RMA data there are only two (2) crop-county combinations with ten (10) or more producer records (policies/units earning premium for organic production) for four (4) years of organic production: apples in Grant County, Washington, and flax in Kidder County, North Dakota (Table 5). There are only 143 crop-county combinations with five (5) or more producer records (policies) for four (4) years of organic production. In these counties, there are an additional 89 policies/units with 2 to 3 years of insurance experience data. All totaled, of the 3,140 counties in the United States, only 191 have one or more organic crop production records with four or more years in the RMA dataset. Generally, due to these limitations, organic yields appear to be a set within the larger set of yields produced under good farming practices. Of the 5,742 crop-county-year organic yield averages that can be calculated from RMA data, only 621 are statistically significantly different (at the 95 percent confidence level) from the yield average for the same crop in the same county grown under conventional practices.

TABLE 5. Number of Policies Earning Premium by Crop and Location with Five or More Producer Records for Organic Production Each Year from 2005 through 2008

Crop	State	County	Four Years	Two to Three Years
Almonds	California	Merced	8	3
Apples	Washington	Grant	11	11
		Yakima	7	9
Cotton	Texas	Borden	5	0
Dry Peas	Montana	Sheridan	5	0
Flax	North Dakota	Kidder	10	9
Grapes	California	Madera	5	5
		Mendocino	5	7
		Napa	6	4
	Washington	Benton	8	2
		Yakima	8	5
Pears	Washington	Chelan	6	2
		Yakima	6	7
Prunes	California	Sutter	6	3
Wheat	Colorado	Logan	5	1
	Montana	Blaine	6	2
		Daniels	5	3
		Sheridan	8	0
		Valley	7	8
	North Dakota	Kidder	7	8
	Utah	San Juan	9	5

Source: The Contractor's Underwriting Department using RMA insurance experience data.

SECTION IV. LITERATURE ADDRESSING ORGANIC AND CONVENTIONAL CROP YIELD VARIABILITY

In light of the data limitations in the insurance experience data, the Contractor made an exhaustive search of the academic literature to identify potential sources of comparative data for organic and conventional production. Lampkin[33] identified a number of difficulties in making such comparisons. First is an issue of definitions. While the NOP standards provide a limit to the range of practices that can be considered organic, it is clear that within this range there are wide variations in the levels of inputs, years of rotation, and species incorporated into the rotation. Furthermore, varietal differences affect both yields and income. Similar differences can be seen in conventionally produced crops, accounting for some of the differences in yield evident in Government and academic data. Lampkin also identifies "normative" effects derived from the values and prejudices of the individuals and institutions supporting the research comparing conventional and organic production. Objectives and performance measures can bias the results of research, both by limiting data collected and the analysis of those data. The time course of the comparison is also crucial.[34] As early as the 1940s, Walter James identified the need to examine the effects of organic practices over a long term.[35] Yet the logistics of such studies are complicated by financial and staffing considerations and by the evolution of technology. The changing meaning of "best management practices" over time and by region complicates any study designed to compare organic and conventional yields and yield variability.

Comparisons of farming systems are most effective when they are conducted on a large scale. Comparisons conducted after the organic system has completed the transition from conventional to organic are more effective than studies that capture the variability inherent in the transition period. Some studies show more than five years are required for this transition to eliminate any residual effects of previous conventional practices. Comparisons also need to be made over a period that captures data from several rotational cycles. Replicating comparisons improve the validity of the studies. Finally, any study design needs to be flexible enough to reflect the dynamic nature of farm-level management.[36]

Yield variability between farms and/or plots is one factor affecting comparisons between organic and conventional production. This variability may result from differences in soil composition, rotational design, time since conversion, and management.[37] These differences make it particularly difficult to make comparisons of aggregate data. In Denmark and Switzerland, differences between organic and conventional productivity are generally greater for crops than for livestock, with organic grains and potatoes yielding 50 to 85 percent of their conventional counterparts.[38] In a survey study of Canadian producers, yields of organic grains are reported to be more stable than those under conventional practices, implying less variability and lower expected loss ratios. In one study with 2 organic and 2 matched conventional farms, the 5 year

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[33] Lampkin, N.H., 1994, Researching Organic Farming Systems, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK.
[34] Ibid..
[35] Walter Ernest Christopher James (Lord Northbourner), 2002 (first published 1940), Look to the Land, Sophia Perennis Books, Hillsdale, NY.
[36] Lampkin, N.H., 1994, Researching Organic Farming Systems, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK
[37] Lampkin, N.H., 1994, Economics of Organic Farming in Britain, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK.
[38] Dubgaard, A., 1994, Economics of Organic Farming in Denmark, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK; Muhlebach, I., and J. Muhlebach, 1994, Economics of Organic Farming in Switzerland, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK.

average yields for the organic crops were higher than the conventional yields by 14 (winter wheat) to 16 percent (maize). Nonetheless, throughout Canada, average organic yields, both higher and lower than the conventional averages, are reported.[39]

Extrapolating farm-level yield results beyond the locale of the farm is problematic, especially in a country as large as the United States. Yields are influenced by localized climate variables, unmanageable pest problems, soil qualities, and other localized characteristics. Furthermore, if the studies cover a short period, differential weather effects on plants grown under different practices and stages of transition can mask the underlying yield potential and exaggerate the difference in yield variability. These patterns were evident in a study of 4 pairs of matched farms in Australia over a 35 year period. Organic yields of wheat tended to be higher than expected in exceptionally poor years and lower than expected in exceptionally good years.[40] This damping of yield variability is evident primarily in long term studies.

Crop yields reflect both the potential of the crop system and the impact of environmental factors. The potential is defined by the collective attributes of the cropping system, such as the soil quality, the genetics of the seed employed, the climate of the production region, the management practices utilized, and the ability of the operator. The potential defines a set of possible outcomes (e.g., the minimum and maximum possible yields). Specific environmental factors, such as nutrient availability, pests, precipitation, and insolation[41] determine how much of the potential is actually realized during the crop year. These specific environmental factors acting on the potential vary from year to year. In one year production might be limited by precipitation. In another it might be limited by disease. In a third year the limitations may be available nitrogen or soil pH. Consequently, since the potential of the crop system and the specific environmental factors interact to establish yield, yield variability also reflects these two constituents.

The literature documents substantial differences in yields between crops grown under organic and conventional practices, but is rife with conflicting results and interpretations.[42] Most early studies were conducted over a short term (four to ten years) and documented initial yields for many crops grown under organic practices that were lower than those for the same crop grown under conventional practices.

There are three important issues with these early studies. First, the definitions of organic practices are vague and varied depending on the producer and the researcher. Second, many of the studies focus on energy requirements and therefore focus on organic practices that substantially limited energy inputs. In many commercial organic operations, energy intensive operations substitute for chemical applications, particularly for weed control. Therefore, limiting

[39] Henning, J., 1994, Economics of Organic Farming in Canada, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK.
[40] Wynen, E., 1994, Economics of Organic Farming in Australia, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK.
[41] A measure of the sunlight reaching the Earth's surface in a specific area during a given period.
[42] Smolik, J.D., and T.L. Dobbs, 1991, Crop yields and economic returns accompanying the transition to alternative farming systems, Journal of Production Agriculture 4:153-161; Bernardi, G.M., 1978, Organic and conventional wheat production: examination of energy and economics, Agro-ecosystems, 4:367-376; Klepper, R., W. Lockeretz, B. Commoner, M. Gertler, S. Fast, D. O'Leary, and R. Blobaum, 1977, Economic performance and energy intensiveness on organic and conventional frams in the Corn Belt, American Journal of Agricultural Economics, 59:1-12; United States Department of Agriculture, Study Team on Organic Farming, 1980, Report and Recommendations on Organic Farming: Productivity in Organic Farming, pp. 52-56; Dobbs, T. and J.D. Smolik. 1996. Productivity and profitability of conventional and alternative farming systems: A long-term on-farm paired comparison. Journal of Sustainable Agriculture 9:63–77.

energy inputs can limit yields. Finally, many of these early studies focus on paired farms. While this is a logical approach to examine differences in yield, environmental factors even within a field can cause substantial differences in yield. On non-irrigated land, in a wet year a low lying area may have substantially reduced yields as compared to nearby elevated areas. The same area in a dry year may show much higher productivity than the elevated acreage.

Longer-term studies with careful experimental design show organic yields generally increase over time. These increases are often attributed to improved soil quality resulting from the organic management practices.[43] To some extent, this period of conditioning is reflected in the conventional to organic transition period defined in the NOP, but the amount of time required for the full transition may be much longer.

Variation in yields is an inherit risk of crop production. Under most conventional practices, growers use substantial mechanical and/or chemical inputs to limit the impact of unpredictable environmental conditions. Smith *et al*. assessed average crop yields and temporal yield variability over a 14 year period under conventional, no-till, low-input, or organic practices at the W. K. Kellogg Biological Station Long Term Ecological Research site in southwestern Michigan. The research focused on corn, soybean, and winter wheat in a three-year rotation. Yields were measured annually and yield variability was estimated using the coefficient of variation for each crop phase. Yield variability differed among management practices and rotational phases and was highest in the organic system. Yields under conventional and no-till practices were similar for all crops. Yields under organic practices were lower for corn and winter wheat, however yields for soybeans were not significantly different under any of the practices.[44]

The smaller effect of management practices on yield variability for soybeans is a pattern reported in a variety of studies in different parts of the United States. However, these differences are not consistent from region to region or from year to year. During one 9 year trial, soybean yield averaged 19 percent lower (2.88 metric tons per hectare) in the 3 organic systems studied than in the conventional systems (3.57 metric tons per hectare).[45] Based on the analysis in the report, weed competition alone accounted for this difference. There were no consistent differences in wheat yield among cropping systems.[46] Under conventional high-input management, soybeans have been shown to have higher temporal yield variability than either corn or sorghum.[47] In a rotation including corn, soybean, cotton, oats, black oats (*Avena strigosa*), wheat, rye, rice, and green manure, the factors affecting variability of yield differ from one crop to another.

[43] Jonsson, S., 2002, Crop yields in organic and conventional production – studies from the Öjebyn project, Proceedings of the UK Organic Research 2002 Conference, Powell, J. et al., eds., pp. 43-46; Pimentel, D., P. Hepperly, J. Hanson, D. Douds, and R. Seidel, 2005, Environmental, Energetic, and Economic Comparisons of Organic and Conventional Farming Systems, Bioscience, 55:573-582; Delate, K., M. Duffy, C. Chase, A. Holste, H. Friedrich, and N. Wantate, 2002, An economic comparison of organic and conventional grain crops in a long-term agroecological research (LTAR) site in Iowa, American Journal of Alternative Agriculture 18:59–69.
[44] Smith, R.G., Menalled, F.D., Robertson, G. 2007. Yield and Temporal Yield Variability under Conventional and Alternative Management Systems. Agronomy Journal.99:1629-1634.
[45] Assuming 60 lbs per bushel for soybeans, 2.88 metric tons per hectare is roughly equivalent to 42.7 bushels per acre for organic production and 3.57 metric tons per hectare is roughly equivalent to 53.3 bushels per acre for conventional production.
[46] Cavigelli, M.A., J.R. Teasdale and A.E. Conklin, 2008, Long-Term Agronomic Performance of Organic and Conventional Field Crops in the Mid-Atlantic Region, Agronomy Journal 100:785-794
[47] Eghball, B., and G.E. Varvel, Fractal Analysis of Temporal Yield Variability of Crop Sequences: Implications for Site-Specific Management, Agronomy Journal, 89:851-855.

Furthermore, relative changes in yield from one year to another suggest the causes of yield variability may change over time.[48]

Soil structure and quality introduce an important source of variation in crop yield.[49] Changes in soil characteristics, including both availability of mineral nutrients and organic composition of the soils, appear to account for some of the temporal and species yield variability.[50] In a study examining cereal yields in China from 1949 through 1998, the average yield variability of rice and other grain crops was very significantly and negatively correlated with the cropland soil organic matter level. Furthermore, the correlation between soil organic matter and cereal productivity was significant in most cases, but the relationship degraded as production practices incorporated new technologies.[51]

Increased yields during the transitional period to organic production have been attributed to improved soil quality. However, there was no difference in tomato yields between established organic and first-year transitional plots in one study. Yet the organic systems had higher yields than the comparable conventional system. Benefits from a winter legume cover crop may have contributed to the yield improvements of the organic production relative to conventional practices. It may also be that improvements in organic yields result from increases in experience with organic management practices.[52]

A carefully managed experiment in Oklahoma examined yield during the transition to organic production of vegetables. The transitional crops were sweet corn, bell pepper, and cucumber. By the third year, yields of the rotation, bell pepper, but not of cucumber and sweet corn, were as productive under organic practices as under conventional.[53] Duram reports that in comparing farm-level productivity, organic yields were lower than conventional yields in 15 cases, were higher in 13 cases, and were equal in 2 cases. In these studies, organic productivity was less variable and produced higher yields in stressful growing conditions, particularly during periods of drought.[54] For the last 10 years of a 21 year comparison of organic and conventional production in Pennsylvania, organic corn yields were only 3 percent less than conventional yields. The organic yields were higher than the conventional yields in drought years.[55] These results suggest the organic practice would have lower loss cost ratios due to the ability of the organic crops to overcome stressful conditions.

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[48] Viera, S.R.; J.L. Hatfield, D.R. Nielsen, and J.W. Biggar, 1983,Geostatistical theory and application to variability of some agronomical properties, Hilgardia, 51:pp. 1-75; Viera, S.R. and A. Paz Gonzalez, 2003, Analysis of the spatial variability of crop yield and soil properties in small agricultural plots, Bragantia, 62: pp. 127-138, http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0006-87052003000100016&lng=en&nrm=iso, accessed May 2009.
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[51] Pan, G., Pete Smith, and W. Pan, 2009, The role of soil organic matter in maintaining the productivity and yield stability of cereals in China, Agriculture, Ecosystems & Environment, 129: p344-348.
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[54] Duram, L.A., 2005, Organic Farmers in the U.S.: Opportunities, Realities and Barriers, Symposium Proceedings: Organic Agriculture: Innovations in Organic Marketing, Technology, and Research
[55] Pimentel, D., P. Hepperly, J. Hanson, D. Douds,, and R. Seidel, 2005, Environmental, energetic, and economic comparisons or organic and conventional farming systems, BioScience 55:7:573-582.

Ten year production trials in Minnesota evaluated a corn–soybean rotation and a corn–soybean–oat/alfalfa–alfalfa rotation under four management strategies. One trial was on land with a history of conventional fertilizer and pesticide application; another was on land which had not been treated with synthetic fertilizers or pesticides. Chemical inputs under the four management practices included organic chemical inputs, low and high levels of conventional inputs, and replicates managed without external inputs. In this experiment, relative yields of organic corn were reduced to a lower extent than those of organic soybeans compared to the conventional counterpart. This study showed beneficial effects of a longer crop rotation on yields, which are often masked by external inputs in conventional production.[56] Furthermore, the patterns of yields under the high-input conventional production and the organic management using a four year rotation were similar, especially in the last six or seven years of the trials.

The effects of management practices on variability of crop yields were assessed in a four year study in Michigan. Practices included continuous corn and a corn–corn–soybean–wheat rotation under both conventional and organic production. Yield variability was assessed using the coefficient of variation and a multivariate dissimilarity index (Bray-Curtis). Corn yields in the organic rotation were not significantly different from those in the conventional monoculture. Variability in corn yield was highest under conventional monoculture.[57]

Another study reported the yield of winter rapeseed grown organically as lower and more variable than the yields of rapeseed grown conventionally. A study of 19 fields in 4 regions of France over 2 years showed competition with weeds in early winter explained much of the crop variation, while pest damage in the spring explained a smaller portion of variation.[58] However, as producers develop strategies to deal with these limiting factors, organic yields increase and variability decreases. This has been a recurring theme in the literature on crop yields under organic production practices.

The Long-Term Research on Agricultural Systems experiment has been monitoring the effects of conventional and alternative practices in California on crop yields since 1993; the planned duration of the project is 100 years. One study follows two-year rotations with multiple replicates including irrigated conventional and organic corn-tomato rotational systems. For years three through nine of the experiment, average yields of the organic system for corn were significantly lower than those for conventional corn, and the organic corn yields had significant negative trends. Yet there were no significant differences in average yields of tomato between conventional and organic practices, and organic tomato yields showed a significant positive trend.[59] Furthermore, on "average, yields were not significantly different between the two systems, but there was less year-to-year variation in the organic systems."[60]

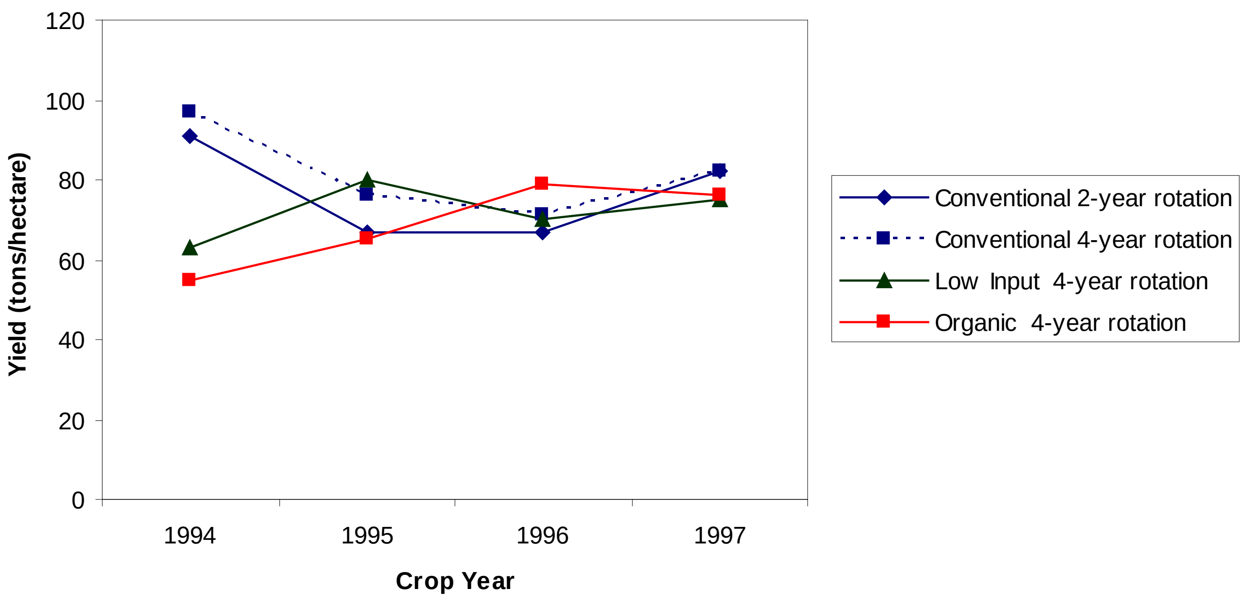
[56] Porter, P.M., D.R. Huggins, C.A. Perillo, S.R. Quiring, and R.K. Crookstone, 2003, Organic and Other Management Strategies with Two- and Four-Year Crop Rotations in Minnesota, Agronomy Journal 95:233-244.
[57] Smith, R.G., and K.L. Gross, 2006, Weed community and corn yield variability in diverse management systems, Weed Science 54: pp. 106-113.
[58] Valantin-Morison, M., and ,J. M. Meynard, 2008, Diagnosis of limiting factors of organic oilseed rape yield. A survey of farmers' fields, Agronomy for Sustainable Development, 28: pp. 527-539.
[59] Denison, R.F., D.C. Bryant, and T.E. Kearney, 2004. Crop yields over the first nine years of LTRAS, a long-term comparison of field crop systems in a Mediterranean climate. Field Crops Res., 86:267-277.
[60] Denison, R.F., D.C. Bryant, and T.E. Kearney, 2004. Crop yields over the first nine years of LTRAS, a long-term comparison of field crop systems in a Mediterranean climate. Field Crops Res., 86:267-277.

A four year comparison of conventional, low-input, and organic yields for tomatoes in California's Sacramento Valley evaluated the importance of weeds, nitrogen, and water as yield-limiting factors. Tomato yields ranged from about 55 metric tons per hectare to over 90 metric tons per hectare (Figure 4). Significant treatment differences were observed in the first two years of the study, but were not evident thereafter.

FIGURE 1. Tomato Yields under Four Different Management Practices*

*Alternative text descriptions of figures in this report are provided to assure access to the information contained in those figures consistent with guidance available from the USDA Office of the Chief Information Officer Web-site, including a section entitled "Web-based Intranet and Internet Information and Applications (1194.22)," which states "The standards do not prohibit the use of web site graphics or animation. Instead, the standards aim to ensure that such information is also available in an accessible format. Generally, this means use of text labels or descriptors for graphics" (http://www.access-board.gov/sec508/summary.htm) and the section entitled "Providing Appropriate Alternative Text" under "Principles of Accessible Design" found in the WebAim (Web Accessibility in Mind) Web-site (http://webaim.org/intro/#implementin).

Figure 1 illustrates a four year comparison (1994 through 1997) of conventional, low-input, and organic yields for tomatoes in California's Sacramento Valley. Tomato yields ranged from about 55 metric tons per hectare to over 90 metric tons per hectare. Statistically significant treatment differences in yield were observed in the first two years of the study, with conventional and low input yields exceeding those of the organic crop, but were not evident in 1996 and 1997, the last two years of the study.



Source: After Clark, M.S., W.R. Horwath, C. Shennan, K.M. Scow, W.T. Lantni and H. Ferris, 1999, Nitrogen, weeds and water as yield-limiting factors in conventional, low-input, and organic tomato systems, Agriculture, Ecosystems & Environment 73:257-270. (Figure 1 Data)

Multivariate analysis indicates weeds, nitrogen, and water all influenced yields in this study, but the relative importance of each was dependent upon the management practices. The findings indicate organic and low-input tomato systems in this region can produce yields similar to those of conventional systems. Nitrogen availability was most important in limiting yields in the organic system and water availability was more important under conventional management.[61]

[61] Clark, M.S., W.R. Horwath, C. Shennan, K.M. Scow, W.T. Lantni and H. Ferris, 1999, Nitrogen, weeds and water as yield-limiting factors in conventional, low-input, and organic tomato systems, Agriculture, Ecosystems & Environment 73:257-270.

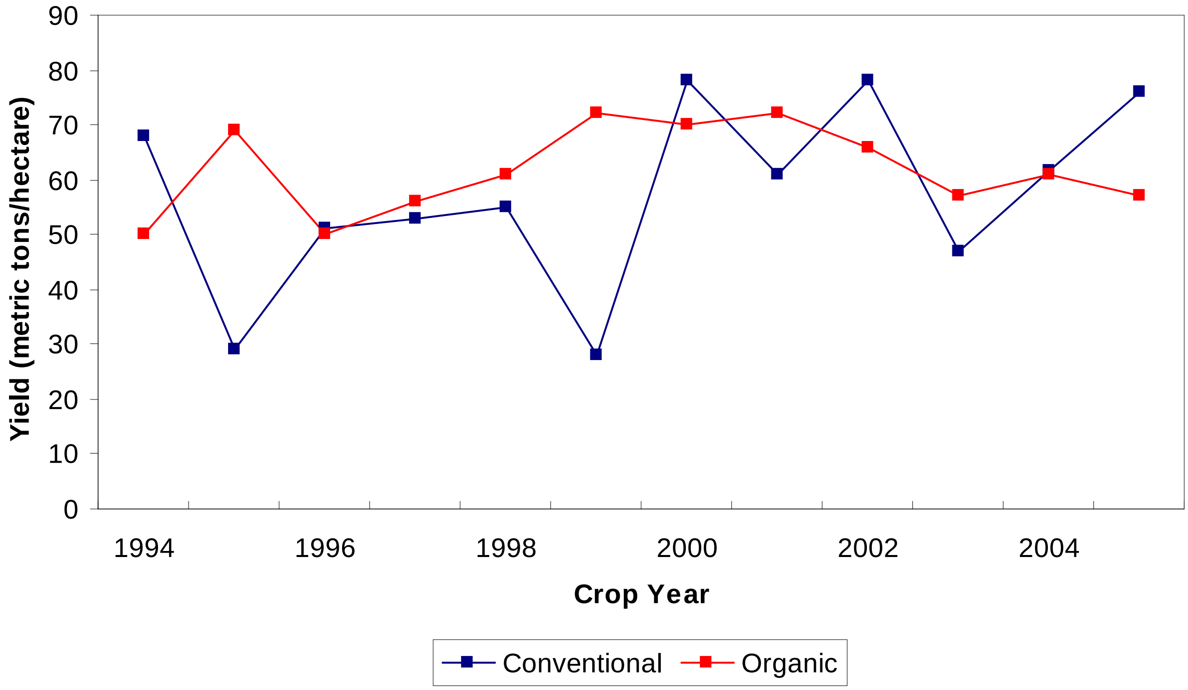
Yield variability was lowest in the low impact system and essentially equal in the conventional and organic systems.

A long-term, cropping systems comparison at the Center for Integrated Farming Systems at Russell Ranch near the University of California – Davis focuses on the sustainability and environmental impact of agriculture. The experiment was inspired by results from other long-term experiments showing short-term trends can be poor predictors of long-term sustainability. The project compared organic and conventional irrigated corn/tomato production in multiple one acre replicates (Figure 2). Conventional plots received synthetic pesticides as needed, while the organic crops received only organically approved pesticides, such as sulfur and Bt compounds. Crop yields and total biomass were measured annually. The authors report within year variability is generally lower under conventional practices, while between year yield variability is lower under organic practices. On average, yields are not significantly different between the two systems.[62]

[62] Kaffka, S.R.; D.C. Bryant, and R.F. Denison, 2005, Comparison of organic and conventional maize and tomato cropping systems from a long-term experiment in California, Proceedings of the First Scientific Conference of the International Society for Organic Farming Research, U.Koepke, D.Neuhoff, P. Cornish, W. Lockeretz, and H.Wiler, eds.; Institute of Organic Agriculture, 218-221; Mitchell, A.E., Y-J. Hong, E. Koh, D.M. Barrett, D.E. Bryant, R.F. Denison, and S. Kaffka, 2007. Ten-Year Comparison of the Influence of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes Journal of Agricultural and Food Chemistry, 55: 6154-6159.

Figure 2. Tomato Yields Under Two Different Management Practices*

* Figure 2 illustrates a twelve year comparison (1994 through 2005) of conventional and organic yields for tomatoes in California's Sacramento Valley. Organic yields ranged from about 50 metric tons per hectare to over 70 metric tons per hectare, while conventional yields ranged from about 30 metric tons per hectare to over 80 metric tons per hectare. On average, over the 12 years, yields are not significantly different between the two systems.



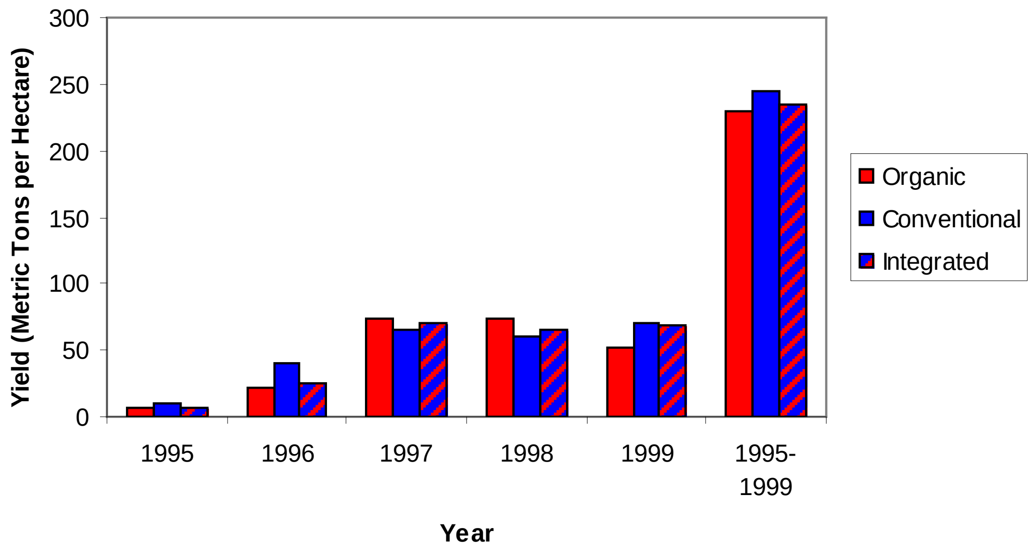
Source: After Mitchell, A.E., Y-J. Hong, E. Koh, D.M. Barrett, D.E. Bryant, R.F. Denison, and S. Kaffka, 2007. Ten-Year Comparison of the Influence of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes Journal of Agricultural and Food Chemistry, 55: 6154-6159. (Figure 2 Data)

In a five year study on apple yields in new orchards, conventional yields exceed organic yields in the first two years of the study and in the fifth year (Figure 3). Practices integrating elements of both conventional and organic practices appear to provide some yield benefits under varying conditions. Yields are not significantly different between the two systems.[63] Yet the pattern of yields over time shows some of the challenges in studying yield and yield variability, particularly in long lived perennials.

[63] Reganold, J.P., J.D. Glover, P.K. Andrews and H.R. Hinman, 2001, Sustainability of three apple production systems, Nature, 410:926-930.

FIGURE 3. Apple Yields in a New Grove under Three Different Management Practices*

* Figure 3 illustrates a five year comparison (1995 through 1999) of conventional and organic yields for apples in a newly established orchard in Washington State, as well as yields under integrated practices incorporating elements of both the organic and conventional procedures. Yields under all three approaches increased during the first three years. In the third through fifth years, the organic yields exceeded the conventional yields twice, while the conventional yield was greater than the organic yield once. The five-year cumulative yields under the three systems of management were not significantly different.



Source: After Reganold, J.P., J.D. Glover, P.K. Andrews and H.R. Hinman, 2001, Sustainability of three apple production systems, Nature, 410:926-930. (Figure 3 Data)

After more than 110 years, the Old Rotation experiment at Auburn University continues to document the long-term effects of crop rotation and winter legume cover crops on sustainable cotton (Gossypium hirsutum L.) production in the southeastern United States. Long-term yields indicate winter legumes are as effective as nitrogen fertilizers in producing maximum cotton yields and increasing soil organic carbon (SOC). Higher SOC results in higher cotton yields. However, rotating cotton with corn (Zea mays L.) in a two-year rotation or rotating corn, winter wheat (Triticum aestivum L.), and soybeans [Glycine max. (L.) Merr.] in a three-year rotation produced little long-term cotton yield advantage beyond that associated with just the improvements in SOC. Cotton yields over 110 years have hardly increased in plots without winter legumes or without the application of synthetic or natural nitrogen fertilizers. Corn yields in dryland rotations with cotton are generally low for the region where the trials are being maintained.[64]

The effects of technological advances can be seen in crops grown in the Old Rotation under almost every practice. In the 1950s, yields of all crops increased with increasing rates of application of potassium and phosphorus. Since adoption of subsoil applications of fertilizers (whether organic or synthetic), high-residue (conservation) tillage, and genetically modified cultivars in 1997, all non-irrigated crops have produced their highest recorded yields since the study began.

[64] Mitchell, Charles C., Delaney, Dennis P., Balkcom, Kipling S. A Historical Summary of Alabama's Old Rotation (circa 1896): The World's Oldest, Continuous Cotton Experiment. Agronomy Journal, 2008; 100 (5): 1493 DOI: 10.2134/agronj2007.0395.

Based on the large investment in breeding and genetically modifying varieties used in conventional practices as compared to the rather recent and relatively modest investment in selection of varieties for organic practices, some differences in yield potential are expected. The highest yielding winter wheat varieties under conventional practices are often not the highest yielding under organic practices. An analysis of variance for yield among 35 genotypes in paired organic and conventional systems showed highly significant ($P < 0.001$) interactions between genotype and management practices in 4 of 5 locations. Selection of varieties specifically targeting organic practices produced yields 15 percent, 7 percent, 31 percent, and 5 percent higher in 4 locations than the yields resulting from selection for conventional practices. Varieties bred in and adapted to organic practices will allow organic production to approach the yield potential for the crop, location, and practice.[65]

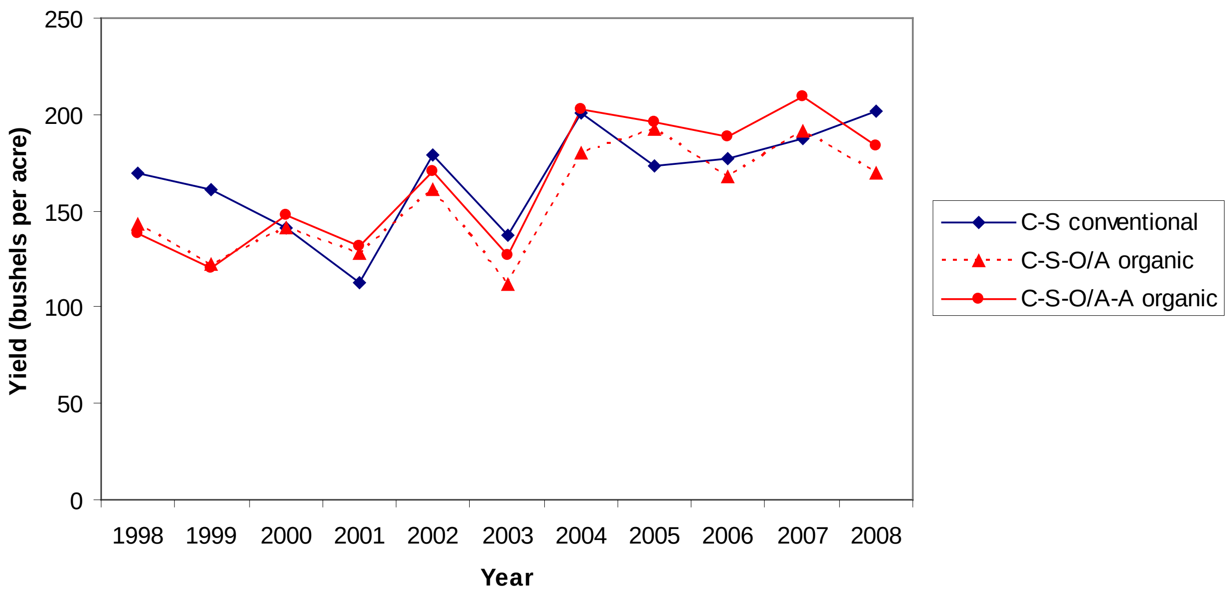
Iowa State University has maintained a crop system comparison for approximately three decades. The original system included a wide variety of conventional and organic rotations that were modified over time. A conventional corn-soybean (C-S) rotation was added in 1998 to assess the benefits of both the price premium for soybeans and the soil nitrogen credit from the soybean crop. The conventional rotations receive herbicides, insecticides, and commercial fertilizer as determined by soil analysis. In the organic corn-soy-oat/alfalfa (C-S-O/A) rotation, alfalfa is seeded as a companion crop with oats. The annual, non-dormant alfalfa, is used as a "green manure." An additional corn-soy-oats/alfalfa-alfalfa (C-S-O/A-A) provides a second year of alfalfa growth, increasing the nitrogen credits in the rotation. The corn stubble is fall chisel plowed, the soybean stubble is spring field cultivated, and the alfalfa is moldboard plowed after a fall application of dry livestock manure. Organic corn and soybeans are rotary hoed prior to emergence (weather permitting) followed by three cultivations, the last with hillers attached to the cultivator to bury more weeds.

The Contractor extracted yield data for corn and soybean from the annual published reports of the Iowa State crop system comparisons. Early in the trials, conventional corn yields were significantly better than organic yields. Over time, the organic yields improved and, particularly in the case of the longer term rotational system, were comparable to the yields under conventional practices (Figure 4).

[65] Murphy, K.M., K.G. Campbell, S.R. Lyon and S.S. Jones, 2007, Evidence of varietal adaptation to organic farming systems, Field Crops Research, 102:172-177.

FIGURE 4. Corn Yields in the Iowa State Crop System Comparisons 1998 through 2008*

* Figure 4 illustrates an 11 year comparison (1998 through 2008) of corn yields from conventional corn-soybean rotations and organic corn-soybean-oats/alfalfa and corn-soybean-oats/alfalfa-alfalfa rotations in an Iowa study. Over time there was a tendency for yields under all practices to increase. During the first two years of the study the conventional yields were substantially greater than the organic yields. This pattern was not maintained after the third year. The longer organic rotation had the highest yields in four of the last five years of the study.



Source: The Contractor's Research Department using Iowa State University Comparison of Organic and Conventional Crops at the Neely-Kinyon Long-term Agroecological Research (LTAR) Station:[66] (Figure 4 Data)

The differences between conventional and organic yields seen in corn are less evident for soybeans grown under those practices (Figure 5). While small differences in yields, sometimes significant, are seen, there is no consistent pattern of yield differences and over time, yields and yield variability of the conventional and organic soybeans are comparable.

[66] http://extension.agron.iastate.edu/organicag/researchreports/n-kltar98.pdf
http://extension.agron.iastate.edu/organicag/researchreports/n-kleopold99.pdf
http://extension.agron.iastate.edu/organicag/researchreports/n-kleopold00.pdf
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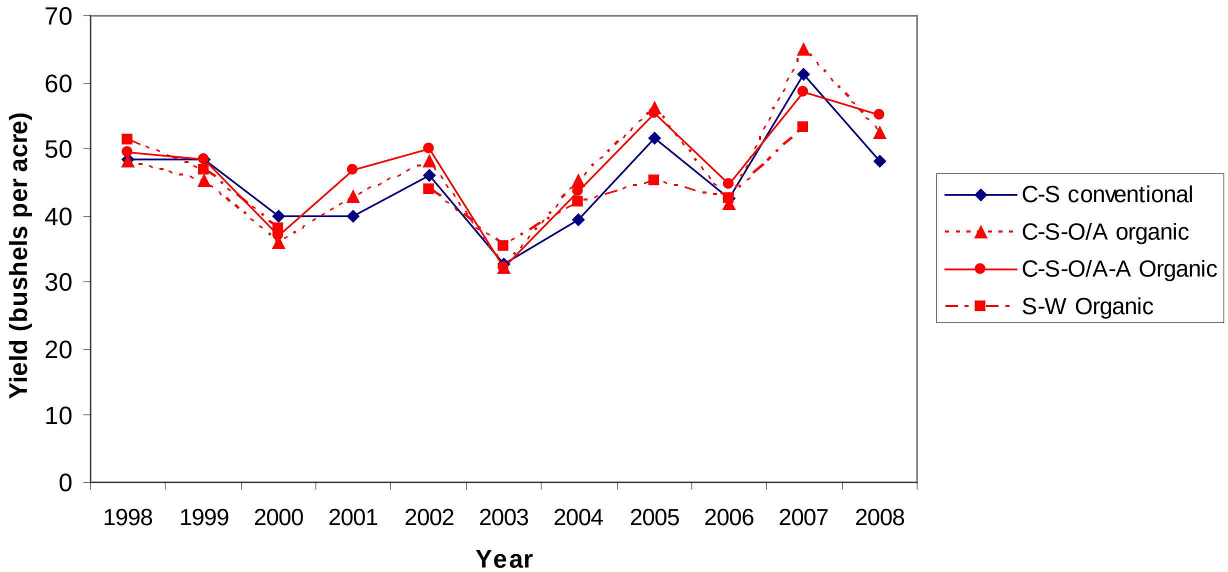
http://extension.agron.iastate.edu/organicag/researchreports/nk08ltar.pdf

FIGURE 5. Soybean Yields in the Iowa State Crop System Comparisons 1998 through 2008*

* Figure 5 illustrates an 11 year comparison (1998 through 2008) of soybean yields from conventional corn-soybean rotations and organic corn-soybean-oats/alfalfa, corn-soybean-oats/alfalfa-alfalfa, and soybean-wheat rotations in an Iowa study. Over time there was a tendency for yields under all practices to increase. While small differences in yields, sometimes significant, are evident, there is no consistent pattern of yield differences and over time, yields and yield variability of the conventional and organic soybeans are comparable.



Source: The Contractor's Research Department using Iowa State University Comparison of Organic and Conventional Crops at the Neely-Kinyon Long-term Agroecological Research (LTAR) Station:[67] (Figure 5 Data)

The Contractor obtained unpublished plot-level data for a similar crop system comparison in the Mid-Atlantic region. The comparison, performed under the auspices of the Sustainable Agricultural Systems Laboratory of the Animal and Natural Resources Institute of the Agricultural Research Service of the USDA, focuses on differences in long-term performance of organic and conventional crops.[68] It is instructive to examine these data at both the plot level (Figures 6, 8 and 10) and the aggregate level (Figures 7, 9, and 11). Some patterns observed in other studies are also evident in these data. However, plot by plot differences can be masked when simple averages of organic and conventional performance are reported. Furthermore, the importance of outliers that dramatically affect insurance performance is more evident in these charts (e.g., the disparate performance of the conventional no-till corn in 2000).

[67] http://extension.agron.iastate.edu/organicag/researchreports/n-kltar98.pdf
http://extension.agron.iastate.edu/organicag/researchreports/n-kleopold99.pdf
http://extension.agron.iastate.edu/organicag/researchreports/n-kleopold00.pdf
http://extension.agron.iastate.edu/organicag/researchreports/nk01ltar.pdf
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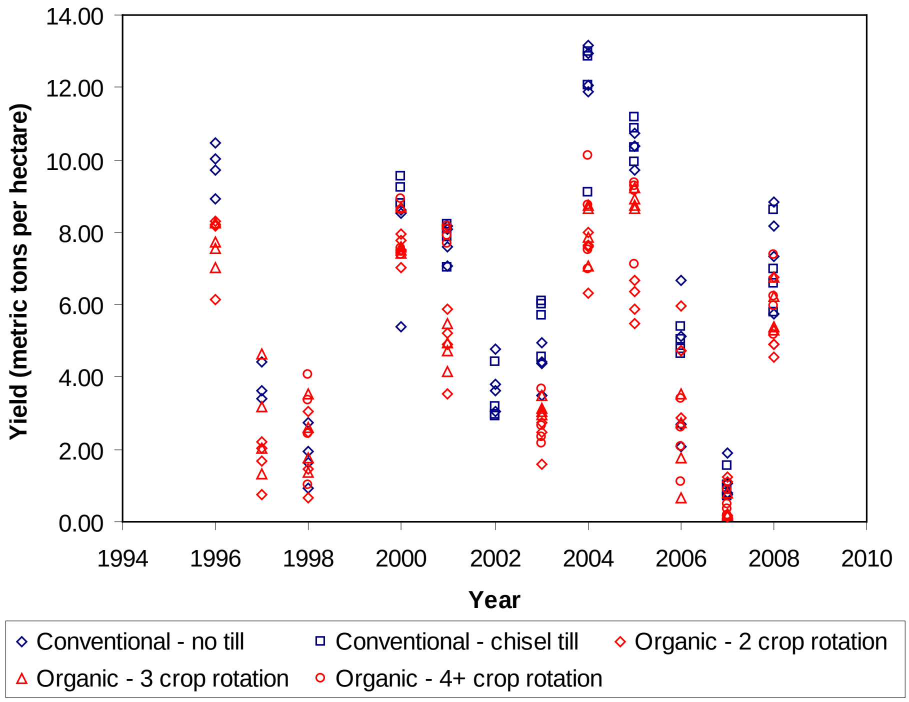
http://extension.agron.iastate.edu/organicag/researchreports/nk07ltar.pdf
http://extension.agron.iastate.edu/organicag/researchreports/nk08ltar.pdf
[68] Cavigelli, M.A., B.L. Hima, J.C. Hanson, J.R. Teasdale, A.E. Conklin, and Y-C Lu, 2009, Long-term economic performance of organic and conventional field crops in the mid-Atlantic region, Renewable Agriculture and Food Systems: 24:102–119.

FIGURE 6. Corn Yields by Plot in the Mid-Atlantic Region Crop System Comparisons 1996 through 2008*

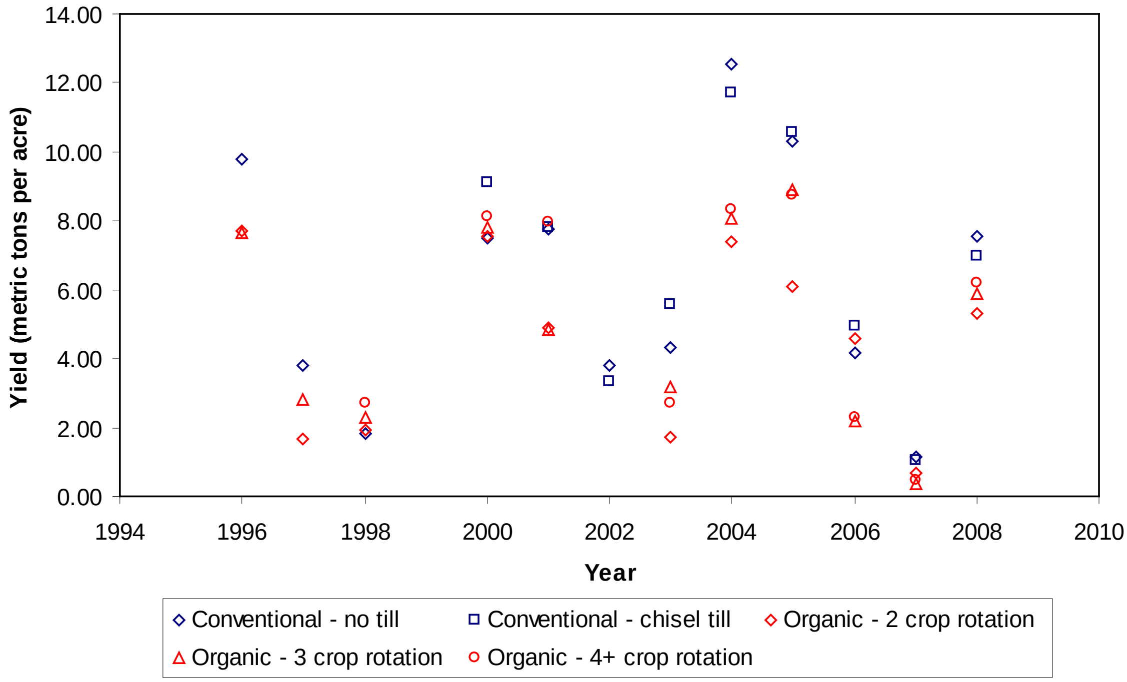
* Figure 6 illustrates a 12 year comparison (1996 through 2008) of corn yields from individual plots in a study of 2 conventional and 3 organic management practices. Yields were quite variable within treatments and between treatments. Longer organic rotations tended to perform better than shorter organic rotations. Corn yields and yield variability under conventional practices tended to be greater than those under organic practices.



Source: The Contractor's Research Department using data supplied by M.A. Cavigelli, USDA ARS. (Figure 6 Data)

FIGURE 7. Average Corn Yields in the Mid-Atlantic Region Crop System Comparisons 1996 through 2008*

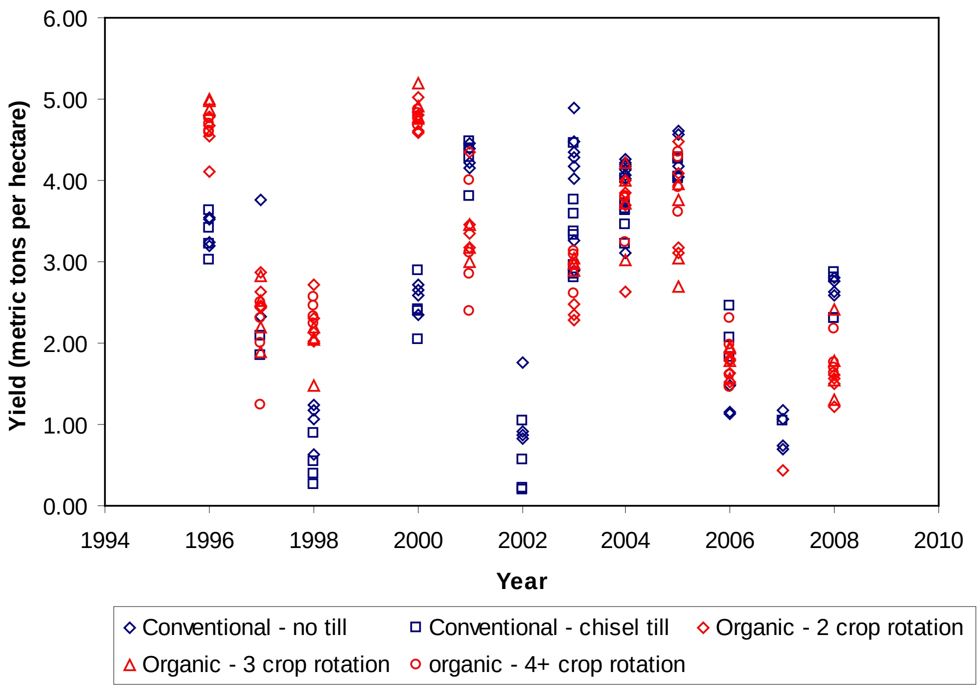
* Figure 7 illustrates the average values by treatment and year for the same 12 year comparison of corn yields as in Figure 6. Average conventional yields were generally higher than average organic yields, but much of the within treatment yield variability (from individual plots) under conventional practices is masked by graphing only the average the yields.



Source: The Contractor's Research Department using data supplied by M.A. Cavigelli, USDA ARS. (Figure 7 Data)

FIGURE 8. Soybean Yields by Plot in the Mid-Atlantic Region Crop System Comparisons 1996 through 2008*

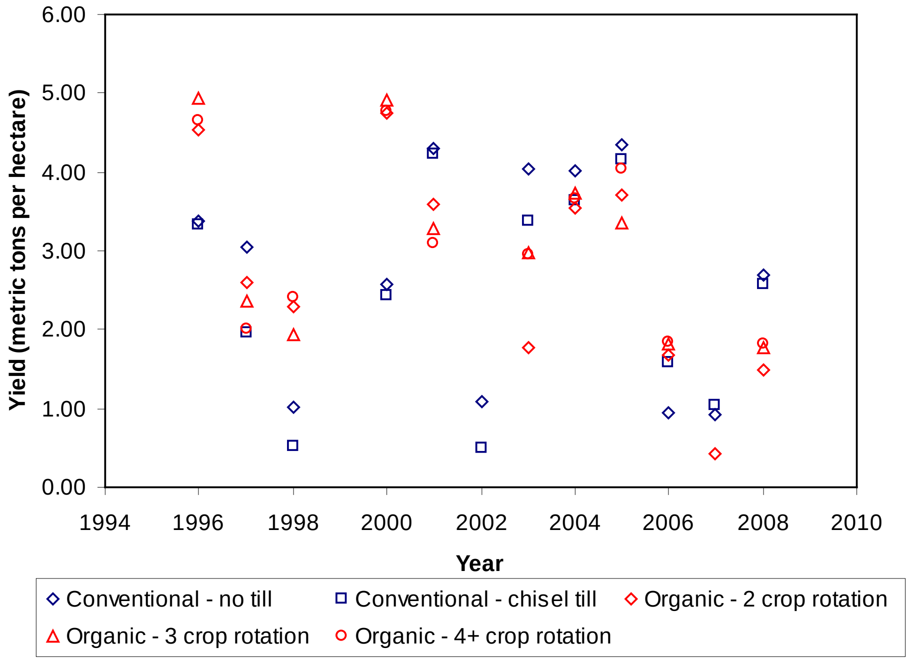
* Figure 8 illustrates a 12 year comparison (1996 through 2008) of soybean yields from individual plots in a study of 2 conventional and 3 organic management practices. Soybean yields were somewhat less variable within treatments than corn yields in the same study. The length of rotation seemed to have less effect on soybean yields than on corn yields. Differences between organic and conventional yields were less substantial and less consistent than for corn.



Source: The Contractor's Research Department using data supplied by M.A. Cavigelli, USDA ARS. (Figure 8 Data)

FIGURE 9. Average Soybean Yields in the Mid-Atlantic Region Crop System Comparisons 1996 through 2008*

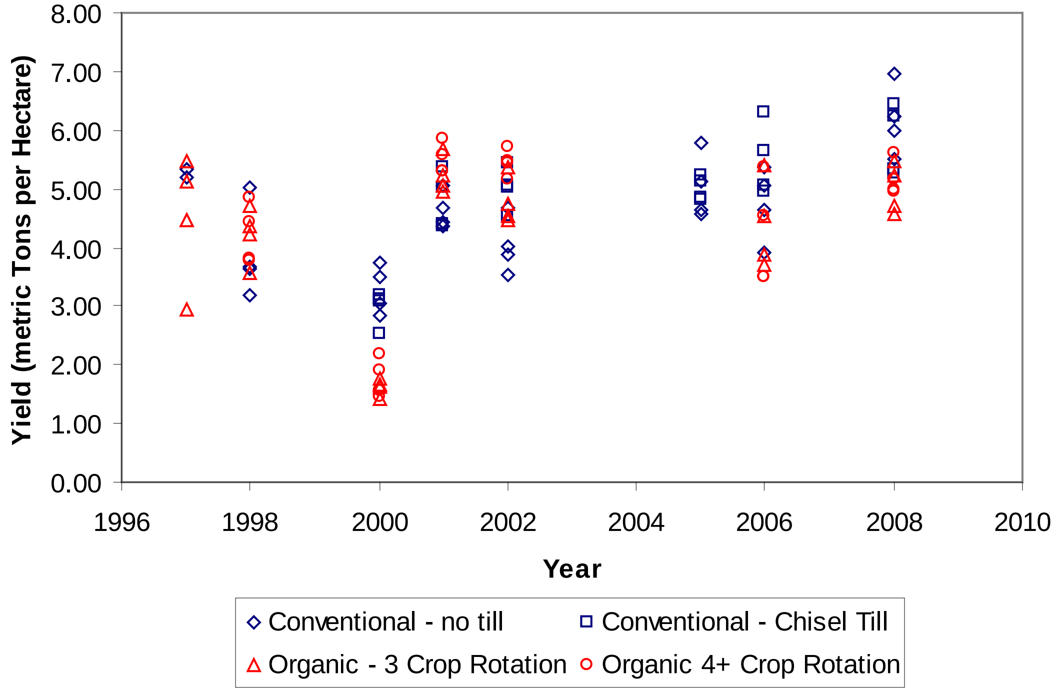
* Figure 8 illustrates a 12 year comparison (1996 through 2008) of soybean yields from individual plots in a study of 2 conventional and 3 organic management practices. Soybean yields were somewhat less variable within treatments than corn yields in the same study. The length of rotation seemed to have less effect on soybean yields than on corn yields. Differences between organic and conventional yields were less substantial and less consistent than for corn.



Source: The Contractor's Research Department using data supplied by M.A. Cavigelli, USDA ARS. (Figure 9 Data)

Figure 10. Wheat Yields in the Mid-Atlantic Region Crop System Comparisons 1997 through 2008*

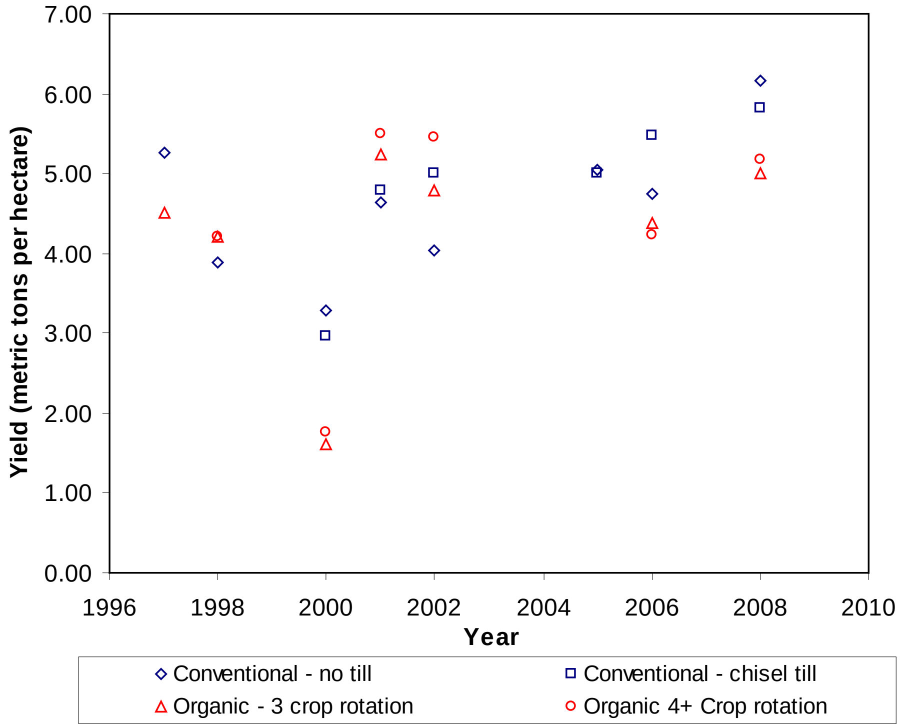
* Figure 10 illustrates comparison of wheat yields from individual plots in a study of two conventional and two organic management practices (1997 through 2008). Wheat yields were somewhat less variable within treatments than corn yields in the same study. The length of rotation seemed to have less effect on wheat yields than on corn yields. Differences between organic and conventional yields were less substantial and less consistent than for corn.



Source: The Contractor's Research Department using data supplied by M.A. Cavigelli, USDA ARS. (Figure 10 Data)

FIGURE 11. Wheat Yields in the Mid-Atlantic Region Crop System Comparisons 1998 through 2008

* Figure 11 illustrates the average values by treatment and year for the comparison of wheat yields in Figure 8. Average conventional yields were higher than average organic yields for all treatments in four years, while average organic yields for all treatments were higher than average conventional yields in two years.



Source: The Contractor's Research Department using data supplied by M.A. Cavigelli, USDA ARS. (Figure 11 Data)

Crop yields in the Mid-Atlantic crop system comparison varied between years, largely due to differences in precipitation. There were no statistically significant differences in average grain yields between the two conventional systems. Average corn and soybean yields in these conventional systems were generally greater than in the three organic systems, but not in any consistent pattern. Among organic systems, corn yields increased with increasing crop rotation length. There were no consistent effects of crop rotation length on soybean or wheat yields. Although on an annual basis there may be significant differences in organic and conventional yields, there is no consistent practice which has the higher yield; nor is there consistency in the significance of differences; and the patterns between crops are not consistent. Annual yields in these trials are influenced by changing technologies, temperature, precipitation patterns, and a host of other factors.

Soil quality is often considered a primary source of yield variability. Crop productivity is affected by soil organic matter, nutrient availability, soil water capacity, soil aggregate stability, and soil biology.[69] Management practices affect all these soil characteristics. While soil quality differences have been implicated in some of the disparity between organic and conventional

[69] Millar, J., 2007, Soil Variability, Carbon Variability, Nutrient Variability, USDA on-line publication, http://www.sdnotill.com/2007/Soil%20Variability-Millar.htm, accessed May, 2009.

yields, as well as differences in yield variability under particular practices, differences in yield and yield variability can not be explained by soil quality alone. The evidence is increasing that more diverse cropping systems, whether organic or conventional, have fewer pest problems. Variation in crop yield is likely to be lower in a system with greater biological diversity. In the transition from a high input monoculture system to a more diverse cropping system, yield may drop and variance in yield may increase drastically at the early stages of the transition. As the transition progresses, the variance may decrease as pest populations come under increased natural control and yields increase.[70]

[70] Maxwell, B.D., 1999, A Perspective On Ecologically Based Pest Management, Weed Science 47:129. http://weedeco.msu.montana.edu/WeedEdu/EBPM%20Perspectives.htm, accessed May, 2009.

SECTION V. RMA UNDERWRTITING AND INSURANCE EXPERIENCE FOR ORGANIC CROPS

This section of the report responds to elements of Section 5.2. of the Contract addressing "a review of the underwriting, risk, and loss experience of organic crops covered by the Corporation and loss experience of organic crops covered by the Corporation, as compared with the same crops produced in the same counties and during the same crop years using nonorganic methods."[71] Inasmuch as the purpose of the review is to "either confirm or refute the existence of significant, consistent, and systemic variations in loss history exist between organic and conventional commodities, either collectively or on an individual crop basis,"[72] the Contractor has explored a wide variety of approaches to consider the risk and loss experience in the context of the underwriting requirements for the organic production. The review is comprised of three elements, including:

(1) A discussion of the administrative and underwriting procedures addressing crops produced under organic management practices;
(2) An evaluation of the experience data accumulated by RMA for organic practice versus non-organic practice of the same crops in the same county; and
(3) Consideration of the relationship of the rate surcharge for organic crops in light of the causes of loss reported for those crops.

V.A. A Brief History of Underwriting Organically Produced Crops by FCIC

References to organically grown crops can be found in various documents related to underwriting on the RMA website. The Contractor reviewed various documents to provide a summary of the contents and identify the changes to policy as these changes occurred.

Underwriting Practices Addressing Organically Produced Crops

Prior to 2001, acreage of organically produced crops was required to be insured if the producer also insured conventional production, provided the acreage and the crop met the conditions of insurability as stated in the Basic Provisions and the various Crop Provisions. However, as stated in Bulletin MGR-01-004[73] Organic Farming Practices-Implementation of the Section 123 of Agricultural Risk Protection Act of 2000 (ARPA) (January 17, 2001):

> *In the past, crop insurance policies may not have covered production losses when organic insect, disease, and weed control measures were used and such measures were not effective. Such determinations were made because the insured had not complied with the definition of good farming practices contained in the Basic Provisions.*

Thus, although losses due to drought, excess precipitation, or similar cause beyond the control of the producer could be covered and indemnified under the crop insurance policies, losses due to failure to use non-organic pesticides were not covered if the loss adjuster determined that such losses could have been avoided had those products been used. Use of such pesticides would be contrary to the organic regimen; hence, for practical purposes, such losses were not covered by the crop insurance policies in force at that time. There was no reduction in premium although the

[71] Section 5.4.1.1 of the Contract
[72] Ibid.
[73] Bulletins referenced in this report are compiled in Appendix B.

scope of the crop insurance for organically produced crops was limited compared to the scope of insurance for conventionally produced crops.

MGR-01-004 further stated that "Section 123 of the Agricultural Risk Protection Act of 2000 (ARPA) now requires that organic farming practices be recognized as good farming practices." This legislation reversed the standard that losses resulting from the failure to use non-organic pesticides were not covered if the loss adjuster determined that such losses could have been avoided had those conventional products been used. To implement this new standard, since it was not possible to revise the Basic Provisions and all other crop insurance documents under the procedures of the Administrative Procedures Act in a timely manner, the Bulletin extended insurance coverage for organically produced crops via written agreements.[74] The Bulletin applied to all crops with a sales closing date of March 15, 2001 or later. Thus, the Corporation began to offer coverage under written agreements for crops planted in the spring of 2001, while the approach was not effective for crops with sales closing dates earlier than March 15 until the 2002 crop year.[75]

Producers of organic crops who failed to request the written agreement were subject to the interpretation of the Basic Provisions that losses due to failure to use non-organic pesticides were not covered if the loss adjuster determined that such losses could have been avoided had conventional products been used. Furthermore, coverage was not made available for "… catastrophic risk, income protection, and revenue assurance plans of coverage and for pilot program crops unless permitted by the crop provisions."

The written agreements authorized by MGR-01-004 were governed by the standards established by the 2001 Written Agreement Handbook (FCIC-24020) (11-00) "Standards and Instructions for Processing of Actuarial Requests and Written Agreements." Organically produced crops are not mentioned specifically in this document. The Handbook "… allows the flexibility to provide insurance coverage for land or persons involved in the production of insurable crops and to amend the terms and condition of insurance provided in the insurance policy **when specifically permitted** by the regulation, policy, actuarial documents, or special provisions." Requests for written agreements were required to contain "…all information required to establish insurance coverage in accordance with the policy and actuarial documents."

Written agreements were to be based on a comprehensive underwriting review of the particulars of each request. RMA's Regional Offices were responsible for issuing these agreements. The conditions for approval of a request for a written agreement as stated in the 2001 Written Agreement Handbook were:

(1) RMA determines that adequate information is available for the individual and/or county to establish an actuarially sound premium rate and insurance coverage for the insurable crop;
(2) The crops, types, practices, or varieties are adapted to prevalent production conditions of the county;
(3) All required information was received by the specified deadlines;

[74] Written agreements are documents issued by the RMA Regional Offices (or approved insurance providers if authorized) and accepted in writing by the insured to modify the terms of coverage stated in the Basic Provisions, the Crop Provisions, and the actuarial documents.
[75] Due to the extended insurance period, citrus crops generally were not covered until the 2003 crop year.

(4) Individual requests are submitted for each insured;
(5) The crop is commercially grown in the county and viable markets for the crop are available (applicable for counties without actuarial documents);
(6) The requested change to the terms of insurance is determined by RMA to conform to sound insurance principles;
(7) The requested change is a significant variation (as determined by RMA) from the terms and conditions established by the policy, and/or actuarial documents or special provisions, and is authorized by such documents, or other RMA issuances;
(8) The requested changes to the terms and conditions of insurance are not prohibited by the Federal Crop Insurance Act, as amended, or by the insurance policy; and
(9) It is the result of an appeal or mediation decision RMA is required to implement.

The Regional Offices were instructed to "deny requests that do not meet any of these conditions" and to provide an explanation to the Insurance Provider for denied requests. When a request for a written agreement was denied, the original terms and conditions of the contract (if applicable) were to remain in force.

Premium rates for written agreements were to be determined as follows:
(1) [The rate] Shown on the county actuarial documents for the reference county. (The rate tables for the reference state and county may be attached for this purpose. Any exceptions must be noted.);[76]
(2) Determined by applying a factor to rates from the reference county actuarial documents;
(3) Determined by quoting individualized rates at the 75 percentage coverage. Differential factors for the crop will be used to determine the premium rate for other coverage percentages; or
(4) Determined by using an add-on rate to the preliminary base rate.

Under the law in effect in 2004, rates were to be established with the goal of achieving and maintaining a cumulative national loss ratio of 1.075.[77,78] MGR-01-004 was to remain active until its contents were incorporated into the Crop Insurance Handbook and the Written Agreement Handbook, with a projected disposal date of December 31, 2002.

Bulletin MGR-02-001 "Written Agreements – 2002 Crop Year" (2-22-02) announced additional procedures for approval of written agreements due to excessive loss ratios on certain written agreements. These additional procedures required disapproval of requests for written agreements on acreage on which two or more indemnities had been paid (there is no reference to a base period for this determination) or that had a cumulative loss ratio of 3.00 or greater for all years for which the written agreement was in effect. The justification for this action was Section 508(c)(9) of the Act: "The Board may limit the availability of additional coverage under this subsection in any county or area, or on any farm, on the basis of the insurance risk involved." The terms of MGR-01-004 remained in effect.

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[76] Regional Offices were authorized to use actuarial data for the crop either from the county where the land was located or from a county deemed to be more representative of the production conditions for which the written agreement was requested. For example, if only non-irrigated practice was specified in a county whereas the written agreement requested coverage for irrigated practice, the actuarial data for a county with irrigated practice for the crop might be referenced instead.
[77] This applies to ALL written agreements that establish a rate.
[78] Note the Food, Conservation, and Energy Act of 2008 changed this target loss ratio to 1.000.

Bulletin MGR-02-015 "Written Agreements – 2003 Crop Year" (July 16, 2002) directed that "… information relating to written agreements found in the 2003 Crop Insurance Handbook, the 2001 Written Agreement Handbook, and MGR-02-001 shall provide the experience criteria and procedures to be used in requesting, reviewing, and approving or rejecting written agreements. The 2003 Crop Insurance Handbook will control if conflicts exist between it and the 2001 Written Agreement Handbook."

The 2003 Crop Insurance Handbook (FCIC-18010-01) (June 2002) added a procedure to recognize organic practices as "good farming practices" via written agreements. The issuance primarily identified the application deadline, the approval authority, and the required documentation. It referred the user to the Organic Crop Insurance Underwriting Guide (FCIC-24140) (03-2001) for specific reporting requirements and instructions. That issuance provided these specific provisions, among others:

- Organic acreage [under written agreement] was to be reported with the appropriate production practice and type that would pertain to conventional practice and type (irrigated, non-irrigated, etc.).
- Producers were required to follow good organic farming practices and any conventional farming practices not in conflict with the organic practice.
- Acreage on which an organic practice was followed, but for which a producer did not request a written agreement, was to be insured under the conventional practice and was subject to uninsured cause of loss appraisals for losses due to weeds, insects, and disease that were deemed to have been avoidable.
- The insured was required to provide at least three years of acceptable records that documented organic production (not necessarily insurable crops in all years) for organic certified acreage and all available records for organic transitional acreage.

Bulletin MGR-03-009 "Written Agreements – 2004 Crop Year" (08/28/03) directed that "… information relating to written agreements found in the 2004 Crop Insurance Handbook, the 2001 Written Agreement Handbook, and MGR-02-001 shall provide the experience criteria and procedures to be used in requesting, reviewing, and approving or rejecting written agreements. The Crop Insurance Handbook will control if conflicts exist between it and the 2001 Written Agreement Handbook." The 2004 Crop Insurance Handbook contained the same information as did the 2003 Handbook with regard to written agreements with the exception that definitions contained in the Organic Crop Insurance Underwriting Guide were included.

Bulletin MGR-04-004 "Written Agreement Experience Criteria – 2004 and Succeeding Crop Years" (March 12, 2004) allowed persons previously denied written agreements under the terms of MGR-02-001 to apply for a written agreement if the producer:

(1) executed an actual production history form, and
(2) provided supporting documentation to demonstrate that no loss would have occurred in at least two years since the written agreement was denied. The provisions of MGR-03-009 remained in effect otherwise.

A fundamental change in the underwriting of organic practices occurred with the publication of a final rule (68 FR 37723, June 25, 2003) to promulgate the 2004 Common Crop Insurance Regulations. This regulation amended the definition of good farming practice to include organic practices as "… those generally recognized by the organic agricultural industry for the area or contained in the organic plan." With this amendment, a factor (1.05) to adjust the premium rate for certified organic acreage was added to the actuarial documents for 2004 crops with a contract change date of November 30, 2003 or later (primarily crops planted in the spring of 2004). The factor was added to the actuarial documents for crops with earlier contract change dates effective for the 2005 crop year, along with a factor (also 1.05) for organic transitional acreage. This change meant producers no longer were required to submit detailed justification before acreage could be insured as organic. It instead shifted the burden of proof of organic practice to situations when loss or damage was claimed.

Under the rules established beginning the 2004 crop year for crops with an organic factor on the actuarial tables, the insured person was required to have in his or her possession, on the date the acreage was reported, a written certification from the certifying agent that specific acreage qualified as certified or transitional. The documentation was required to specifically identify fields and acreage to which the certification applied and those to which it did not. Proof of this evidence was not required at the time the acreage was reported, but the 2004 Loss Adjustment Manual (FCIC-25010) (1-2004) directed the loss adjuster to request the records and verify the information. Acreage with an organic certification, on which an organic practice was being followed, and for which a premium rate was shown on the actuarial documents was required to be insured as organic. If there was no organic factor on the actuarial tables and no written agreement was requested or approved, the acreage would be insured under the conventional practice and be subject to the uninsurable cause of loss provisions for weeds, insects, and disease. However, in March 2004, the 2004 Loss Adjustment Manual was clarified to state that acreage on which an organic practice was being followed was UNINSURABLE whenever there was no premium rate on the actuarial table, no written agreement was in effect on such acreage, and the acreage was certified as organic certified or transitional acreage.

The 2006 Loss Adjustment Manual added a provision that "The 'Organic farming practice' (as defined in the Basic Provisions) does not apply (including an insured's exemption from the National Organic Program requirement of an organic certification to sell a commodity as organic) when the insured has no organic plan in effect from a certifying agent." Under this provision, producers who sell less than $5,000 a year in organic products are not allowed to insure acreage as organic even if they follow organic practices. A certification is mandatory under the crop insurance program although it is not required under NOP. Under NOP, qualifying producers must abide by the national standards for organic products and may label their product as organic. However, the acreage on which the crop is produced may not be insured as organic.

Effective for the 2006 crop year, the actuarial documents for rice were amended to add Organic (Transitional) and Organic (Certified) as specified insurable practices rather than labeling such acreage as an option (as continues to be the case for all other crops). This change in approach allowed RMA to adjust the reference yields, the base premium rate, and the T-yields for the organic practice in each county. Both the reference yields and the T-yields were reduced by 50 percent. The base premium rate was increased by the 5 percent organic factor previously assessed for the organic practice. The actual change in the base premium rate differed slightly from 5 percent due to rounding of the surcharge. The values of the exponent and of the fixed rate load were not changed.

The purpose of this action was to reduce the transitional yields to levels that evidence suggested were more appropriate for organic rice. The change could only be made in this manner, since transitional yields are associated with a type and practice on the actuarial documents, and the option code does not permit this treatment. If this were the only change made, the premium rates for organic production based in whole or in part on transitional yields would have risen substantially since the premium rate is negatively associated with the yield ratio. By reducing the reference yield, the yield ratio remains at 1.00 and the insured would pay the same premium rate on the unit (but with the 5 percent load) as previously *if the approved yield were based entirely on transitional yields and the transitional yield and the reference yield are equal, or if the average actual yields were 50 percent lower than the original reference yield.*

The effect of these changes is much more complex and depends on the number and magnitude of actual yields certified for a unit. A lower rate than paid originally is one potential outcome. The rate might also be much lower than the premium rate charged for conventional practice. This would occur if actual yields had less than the assumed 50 percent "yield drag" compared to conventional yields. Consider the example illustrated in Table 6:

Table 6. Parameters Illustrating the Potential Effects of Changes in 2006 Crop Year Rice Underwriting Lowering Premium Rates

	Conventional	Organic
Base Premium Rate	0.051	0.055
Exponent	-1.8	-1.8
Fixed Rate Load	0.031	0.031
Reference Yield	5,000	2,500

With these parameters, the premium rate for an approved yield of 5,000 lbs. for conventional practice is 8.2 percent and the rate for an approved yield of 2,500 lbs. for organic practice is 8.6 percent. However, if the organic "yield drag" is only 25 percent relative to the conventional yield, the <u>average</u> yield for the organic practice would be 3,750 pounds. This would result in a premium rate of 5.7 percent for average organic production. The premium rate for the average organic practice is less than the rate charged for an average yield of conventional practice. The difference is that a yield of 3,750 pounds is 50 percent better than the reference yield for organic practice, whereas that yield is 25 percent worse than the reference yield for conventional practice. Consequently, the setting of an appropriate reference yield is crucial to the success of this approach to addressing issues with the insurance for organic crops. Additional discussion of the effect of this change is provided in the section of this report entitled "Use of Transitional Yields and Relationship of Actual Yields to Reference Yields."

Changes to Procedural Documents that Affected Organically Produced Crops

The 2001 Organic Crop Insurance Underwriting Guide (FCIC-24140) (03-2001) provided detailed definitions of organic production and details for issuing written agreements to insure crops produced using organic practices. MGR-01-004 had announced that "RMA will issue coverage and rate rules, underwriting guidelines, and procedures to establish coverage for organic producers through written agreements. These materials will be issued in the near future." FCIC-24140 was released approximately two months later, but the Contractor could not find any

Manager's or Product Management Bulletin to announce its availability. Subsequent issuances as documented above never referenced FCIC-24140 as a source of information for underwriting organically produced crops.

The 2003 Crop Insurance Handbook (FCIC-18010-01) (6-02) modified Section 4, which dealt with Written Agreements, by adding a reference to organically produced crops recognized as good farming practices. The information referenced FCIC-24140 as a source document for underwriting such agreements.

The 2004 Crop Insurance Handbook (FCIC-18010) (6-03) added definitions concerning organically produced crops that also were contained in FCIC-24140. It did not change the material in Section 4 that had been added in the 2003 Handbook.

The 2005 Crop Insurance Handbook (FCIC-18010) (6-04) replaced FCIC-24140 as well as other issuances. Information from FCIC-24140 is included as Exhibit 38 to the 2005 Crop Insurance Handbook.

Beginning with the 2005 crop year, for Crop Provisions with filing dates on or after November 30, 2004, a provision for organically produced crops was added to the actuarial documents. Any organic acreage was made insurable by including the appropriate code in the Record Type 11 (acreage). A five percent surcharge is automatically added to the premium rate when the appropriate code is entered. As noted earlier, no written agreements for organically produced crops were found in the experience data once this information was included on the actuarial documents.

V.B. Documentation of the Insurance Experience for Organically Produced Crops

A review of the Data Acceptance System Handbook (known as Manual 13 or Appendix III to the Standard Reinsurance Agreement (SRA)) reveals provision for capture of data related to insurance of organically produced crops beginning in the 2001 crop year. Beginning that year, written agreements for organically produced crops were specifically recognized with an explicit set of codes.

Table 7 identifies the coding of the organic data processed under the Record Type 11 (Acreage) by year as specified in the Data Acceptance System Handbook. The codes are interpreted as follows:

- RC Certified Organic Acreage with a location or reference county.
- RT Transitional Organic Acreage with a location or reference county.
- NC Certified Organic Acreage with no reference county.
- NT Transitional Organic Acreage with no reference county.
- OC Organic Certified Acreage
- OT Organic Transitional Acreage
- 702 Organic Certified (rice only)
- 712 Organic Transitional (rice only)

The difference in the alphabetic coding was based on the source of the premium rate and other insurance information: whether it was from the county where the land was located (no reference county) or whether the written agreement data referenced another county for that information (with a location or reference county). Information in Table 7 identifies the data fields in which the codes appeared for each year. The 2007-2008 data are the same as 2005-2006. Due to reformatting of the record, the location changed but the nature of the information did not.

TABLE 7. Codes Specified for the Type 11 Record with Respect to Reporting Organic Data, 1999-2008

Year	Field 26 Written Agreement Type	Field 28 Written Agreement Processing Flag	Field 49 Common Option Codes	Field 23 Written Agreement Type	Field 25 Written Agreement Processing Flag	Field 46 Common Option Codes	Field 11 *
2008	OC	RC, RT, NC, NT	OC, OT				702, 712
2007	OC	RC, RT, NC, NT	OC, OT				702, 712
2006				OC	RC, RT, NC, NT	OC, OT	702, 712
2005				OC	RC, RT, NC, NT	OC, OT	N/A
2004				OC, OT	RC, RT, NC, NT	OC	N/A
2003				OC, OT	RC, RT, NC, NT	Blank	N/A
2002				OC, OT	RC, RT, NC, NT	Blank	N/A
2001				OC, OT	RC, RT, NC, NT	Blank	N/A
2000			← No references to organic →				
1999			← No references to organic →				

*These codes in Field 11 apply only to rice 702 (certified) and 712 (transitional)
Source: The Contractor's Underwriting Department using USDA, RMA data.

W&A reviewed the document "Actuarial Documentation of Multiple Peril Crop Insurance Ratemaking Procedures"[79] (Actuarial Procedures). This document provides a detailed description of the procedures followed by RMA to establish premium rates. Premium rates are based on experience to the extent this is practical, with an experience period beginning in 1975 if data from that period are available at the county level for a crop (page 16). The data at the county/crop level (all practices and types combined) are assigned a credibility score based on the number of units indemnified during the experience period. The credibility score is based on 271 paid indemnities during the experience period (page 21). If there are 271 or more paid indemnities, the credibility score is 1.00. If the number of paid indemnities is fewer than 271, the credibility score is formed by taking the square root of the ratio of the number of paid indemnities to 271. For example, if the number of paid indemnities is 100, the credibility score is the square root of (100/271), which is approximately 60 percent. This means the data from the county/crop level are weighted only 60 percent in the ratemaking process. Data from surrounding counties then receive a greater weight.

Type/practice data are treated differently.[80] According to the Actuarial Procedures, "Type/Practice factors are derived from MPCI data that is aggregated at a level greater than the county level. This is appropriate, since the county data would likely lack sufficient credibility. In addition, we would not expect that the relative impact of specific practices would vary

[79] http://www.rma.usda.gov/pubs/2000/mpci_ratemaking.pdf
[80] The organic practice (with the exception of rice) is treated as an option under the actuarial procedures of RMA, and can be considered to generally conform to treatment of a type/practice.

significantly from one county to the next (although the impact could vary across broader regions)" (page 32). This statement implies, but does not specifically state, that the same standard for credibility (a minimum of 271 losses) applies to type/practice data as to the county/crop data. Accordingly, under the Actuarial Procedures, it is appropriate to aggregate the organic data to a higher level of aggregation than the county. The first level to consider might be a grouping of counties having similar characteristics (an RMA risk region). The Contractor first aggregated data to the state/crop level to determine the number of such combinations that might meet the credibility standard established by RMA. The Contractor is not aware that aggregation to a level greater than a state is practiced in the ratemaking procedures, and notes this is not discussed in the Actuarial Procedures. The parenthetical comment about variability in "broader regions" included above raises a caution about aggregation. In addition, aggregation across crops is likely to be problematic. This aggregation is not discussed in the Actuarial Procedures since RMA's ratemaking procedures are applied crop by crop.

With the credibility standard of 271 losses, the following crop/state combinations (Table 8) are fully credible at the state level for type/practice determinations (number in parentheses is number of units indemnified).[81]

TABLE 8. Credible Crop/State Combinations at the 271 Indemnities per Crop/State Level

Crop	State
Wheat	Colorado (311), Montana (747), and North Dakota (455)
Flax	North Dakota (463)
Corn	Iowa (353), Minnesota (404), Wisconsin (445)
Soybeans	Iowa (391), Minnesota (643), Wisconsin (313)

The process described in Actuarial Procedures can be applied directly to these crop/state combinations. However, recall that the experience period for ratemaking begins in 1975 for crops with that much experience. It would not be reasonable to expect some crops to accrue 271 losses in only 5 years compared to the totality of the loss history considered in a ratemaking exercise. If the standard were relaxed to state that the number of losses in the organic experience period must be proportional to the length of the experience period for the crop, fewer years would be necessary to ascribe a reasonable credibility to the data. Although this is not discussed in the Actuarial Procedures, it might be an appropriate adjustment to recognize the recent introduction of capture for organic data. Assuming this adjustment is acceptable, the number of losses for 5 years would be 41 (5 years divided by 33 years times 271). In this case, the following crop/state combinations (Table 9) could be considered to have a reasonable degree of credibility:

[81] These state/crop combinations are ranked as fully credible based on the simplifying assumption that 271 indemnity records at the state level provides the same level of credibility as 271 records at the county level.

TABLE 9. Credible Crop/State Combinations at the Adjusted Indemnities per Crop/State Level

Crop	State
Wheat	Minnesota (98), Nebraska (76), Oklahoma (58), South Dakota (43), Texas (58), Utah (94), and Wyoming (164)
Oats	Minnesota (44) and North Dakota (129)
Millet	Colorado (62) and Nebraska (84)
Rice	Arkansas (77) and Texas (48)
Cotton	Texas (142)
Almonds	California (76)
Corn	Illinois (88), Michigan (168), Ohio (48), and South Dakota (49)
Dry Beans	Michigan (51)
Grain Sorghum	Kansas (67)
Grapes	California (52)
Apples	California (218)
Dry Peas	Montana (159) and North Dakota (79)
Sunflowers	North Dakota (47)
Soybeans	Illinois (92), Missouri (65), Nebraska (103), and North Dakota (69)
Potatoes	Colorado (65)
Barley	Montana (64) and North Dakota (138)

The group of crop/state combinations that is fully credible with the standard of 271 loss observations constitutes slightly less than one-half of all organic units indemnified during 2004-2008. By reducing the standard on a pro-rata basis, slightly more than three-fourths of the loss units are included. The complete table of crop/state combinations and number of losses is included as Appendix C.

In the foreseeable future, it is unlikely organic production of any commodity crop will represent more than a small percentage of the total production of the crop. In 2007, the percentage of insured organic acreage approached 40 percent of the NASS reported organic acreage from the Census. If the insurance for the organic production adequately and appropriately addresses the risks the crop faces, it is easier to foresee comparable relative levels of participation between organic production and non-organic production. Data available as a result of the increase in insured organic acreage will support development of appropriate yield differentials and yield variability analyses when appropriate time series are available. The Contractor believes RMA will need to apply the procedures it has established to determine a differential for a practice when data are relatively scarce compared to the totality of data for a crop/state combination. Organic experience data for most crops do not yet meet the standard of credibility established by RMA unless the assumption that geography does not affect the performance can be supported.

Written Agreement History and Performance

Data for written agreements for organic crops from the 2001 crop year to the 2005 crop year were compiled. Data for 2005 represent the limited number of crops for which there was no organic factor (1.05) on the actuarial tables (primarily citrus, for which the contract change date was November 2003). The NC code (organic certified acreage where the written agreement used county actuarial data where the land was located) accounted for over 70 percent of the activity with written agreements, and the RC code (organic certified acreage where the written agreement used another county's actuarial data) accounted for about 25 percent of the activity with written agreements. Transitional acreage was less than three percent of the activity with written agreements. The number of units or acres for which producers sought a written agreement was negligible. The perception of a relatively small chance of an uninsured cause of loss appraisal for certain causes of loss and the burden of applying for a written agreement may have been barriers to participation in the organic coverage by organic producers during this period. Table 10 displays written agreement performance by type for the years 2001 through 2005.

TABLE 10. Written Agreements issued by Type and Performance, 2001 through 2005

Written Agreement Code	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio \1	Loss Cost Ratio
NC	2,267	170	29,217	3,596	12.3	1,066	47.0	5,036	1.400	0.172
NT	66	5	928	116	12.5	25	37.9	138	1.183	0.148
RC	823	42	8,466	951	11.2	341	41.4	1,036	1.090	0.122
RT	12	0	67	12	18.6	8	66.7	33	2.608	0.485
Total	3,168	217	38,679	4,676	12.1	1,440	45.5	6,242	1.335	0.161
NC Percent of Total	71.6	78.5	75.5	76.9		74.0		80.7		
Transitional Percent of Total	2.5	2.3	2.6	2.8		2.3		2.7		

Source: The Contractor's Underwriting Department after USDA, RMA data.

It is not possible to compare non-organic insurance experience in a manner that corresponds to the four codes for written agreements since more than one type of written agreement may have been issued in a particular county. Thus, matching non-organic business to the business addressed under individual written agreement codes would result in double-counting in some cases. Hence, for a comparison of organic and conventional experiences, only the grand total of the non-organic business is shown. However, as seen in Table 10, the majority of this activity is associated with the NC code. The non-organic business represents the same crops for which at least one written agreement to cover organic production was issued in a county for the same crop year.

Crops insured under written agreements constituted about one half percent of the units, acres, liability, and premium in the same counties where the written agreements were issued. However, the organic share of the loss data is about twice as large, about one percent. The percentage of units indemnified, the loss ratio, and the loss cost ratio are 2 up to almost 3 times greater for the organic practice even though the earned premium rate was 36 percent greater. [82] Since these contracts were individually underwritten by RMA Regional Offices, there is no systematic underlying structure to the insurance offers that were made under this system. Each office was directed to follow a specific process utilizing specified information to develop the parameters of the insurance offer. However, a certain amount of judgment was allowed. In addition, applicants were required to submit a significant amount of information, a task some producers found onerous. This may have discouraged some producers from applying for coverage. This raises the question of reliability and comparability of this information with data generated when organic acreage became generally insurable as an option. Since these data are much worse than the later data, the Contractor recommends it be used for setting premium rates for the organic practice with caution. Greater weight should be given to the much more standardized data developed beginning in crop year 2005.

Table 11 demonstrates the magnitude of various variables with respect to the organic practice, when considered in conjunction with Table 10. Table 10 contains data regarding transitional and certified organic acreage insured during 2001-2005. Table 11 contains the non-organic data for the same counties for those years. For example, the organic practice represented 3,168 organic units insured compared to 636,164 non-organic units insured, which indicates organic units represented only 0.497 percent of the non-organic units insured.

[82] The data in the row labeled "Organic Share" represent the absolute percentage share of the variable (such as acres insured) or the relative level of a percentage variable such as percent of unit indemnified. A value greater than 100 percent in the latter case indicates that units insured under the organic practice were more likely to be involved in a loss situation relative to non-organic units based purely on an assessment of the numbers.

TABLE 11. Non-Organic Crops in Counties in Which a Written Agreement was Issued for Organic Practice, 2001 through 2005

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Non-Organic	636,164	47,637	9,145,122	813,281	8.9	133,717	21.0	562,517	0.692	0.062

Source: The Contractor's Underwriting Department using USDA, RMA data.

Common Option Code History and Performance

Use of a common option code for organic acreage is found in the data beginning with the 2004 crop year. Acreage included under an organic practice increased substantially once it no longer was necessary to apply for a written agreement. Even after acknowledging the difference in the number of years in each dataset, it still is clear that producers were more likely to insure acreage as organic during 2004 through 2008 when there were common option codes on the actuarial documents. Under the rules in effect for most of this period, such acreage was required to be insured under the organic practice if a certificate was in effect on the acreage and the organic practice was followed. The organic share of the acreage tripled, but still remained at less than two percent of insured acres for common counties and crops.

As was the case under written agreements, almost all the insured acreage was certified organic acreage; only limited acreage is classified as transitional organic acreage (Table 12). Aggregate loss performance of acreage insured under the organic code improved relative to written agreements, but only marginally. The percent of units indemnified, the loss ratio, and the loss cost ratio continued to be substantially higher than the same measures of performance for acreage insured under non-organic practices. This pattern is consistent at the highest level of aggregation, but is not statistically significant at that level. Nor is it consistent between crops, by county, or temporally, or systemic as experience is aggregated to a lower level. Nonetheless, from the **perspective of an insurance construct**, the losses associated with organic production need to be addressed in an appropriate manner. Differences in risk associated with different crops need to be addressed as data become available, while the insurance structure should not distort participation patterns in ways that result in adverse selection. As additional data become available, it should be possible to establish statistically valid yield differentials, differences in yield variability, and corresponding differences in T-yields and rates. In the meantime, RMA should apply its ratemaking methodology as it normally would when data for a type/practice represent only a small share of the total insurance experience for a crop.

TABLE 12. Organic Acreage Insured Under the OC and OT Common Option Code, 2004 through 2008*

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
OC	21,964	1,503	394,824	50,133	12.7	8,480	38.6	55,753	1.112	0.141
OT	2,404	158	54,959	5,253	9.6	826	34.4	6,294	1.198	0.115
Total	24,368	1,661	449,783	55,386	12.3	9,306	38.2	62,047	1.120	0.138
Transitional Percent of Total	10.9	10.5	13.9	10.5		9.7		11.3		

* The unique actuarial approach for rice and the resulting insurance experience is described earlier in the report.

Source: The Contractor's Underwriting Department using USDA, RMA data.

Use of Transitional Yields and Relationship of Actual Yields to Reference Yields
The Contractor analyzed the Type 15 records in the 2008 experience file to determine 1) use of transitional yields and 2) the relationship of actual yields certified by the producer to the reference yield. This relationship determines the rate that is charged for a particular yield in a particular county. First, it was necessary to resolve a discrepancy in the data.

The Contractor's review of the procedures set forth in Appendix 38 of the Crop Insurance Handbook led to the set of rules set forth as follows:

(1) Whenever a unit or portion thereof is being converted to organic production, two databases are established: one to capture actual organic yields on the acreage as long as it remains in transitional organic status (Database A) and the second to accrue actual organic yields from transitional and certified organic acreage (Database B).[83]
(2) The initial entries into Database A are appropriate transitional yields (either adjusted or unadjusted according to the rules of APH). For most crops, these are the standard T-yields and for rice, the special T-yields established for this crop.
(3) Once production begins on the transitional organic acreage, actual yields are entered into this database with a flag of "G" (actual transitional organic yield). "This yield type can be combined with up to nine years of any other yield type (except S, SX, A, AY, NA, PA, PP, PW) for a minimum of four years" (DAS Type 15 record Exhibits).[84] Each actual year of production thus replaces one of the T-yields included at the initiation of the database.
(4) Database B also is populated initially with the appropriate T-yields. The T-yields are replaced by the actual transitional organic yields with a flag of "G" until the acreage attains the status of organic certified.
(5) Once the acreage has attained the status of organic certified, the actual organic certified yields, identified with a flag of "V," are entered in the database. As these enter the database, the oldest of the four "T" or "G" yields is eliminated. Once four years of "V" yields are available, the database builds to ten years. As in the case of a "G" flag, "This yield type can be combined with up to nine years of any other yield type (except S, SX, A, AY, NA, PA, PP, PW) for a minimum of four years" (DAS Type 15 record Exhibits).[85]

The Type 15 data do not conform entirely to the data structure as described. Numerous records contain a flag of "A," which is inconsistent with the guidance in the Crop Insurance Handbook that conventional actual yields are not entered into an organic database. The Contractor found that records with an "A" flag for yields did not contain either "V" or "G" flags. The "A" flags were combined with "T" and other flags. When the Contractor examined the records for rice, all records that contained one of more "T" flags did contain the organic T-yield from the FCI-35 specific for that crop. Thus, it appears the records with "A" type yields were edited with the requirement: "Can be combined with up to 9 years of any yield type other than S for a minimum of 4 years." In contrast, the records that contained a "V" or "G" were edited with the requirement stated earlier in this section. But, the Contractor notes, the Crop Insurance Handbook specifically prohibits use of conventional yields in the organic databases. Thus, the "A" type code or any of

[83] The terms "Database A" and "Database B" do not appear in the procedures. The nomenclature is adopted in this report for convenience.
[84] http://www.rma.usda.gov/data/m13/aprvd2006.html
[85] http://www.rma.usda.gov/data/m13/aprvd2006.html

its relatives should not appear in these data. Based on these findings, the Contractor concluded that records containing "A" flags really were intended to be "G" or "V" flags.

Rice Type 15 Data

The rice Type 15 data for the 2008 crop year are considered first for two reasons: 1) it is a relatively small dataset and 2) the Contractor's earlier observations about the potential the premium rate could be lower on organic acreage than would be charged for the same yield on non-organic acreage.

There were a total of 472 records for rice produced under organic practices in the 2008 crop year Type 15 dataset. The distribution of those records by state and by number of actual yields is shown in Table 13. California and Texas each accounted for around one-half these organic Type 15 records. Only about one-third of the records had more than one actual yield. An actual yield includes all yield types "A," "G," and "V."

TABLE 13. **Number of Type 15 Records for Rice by State and Number of Actual Yields, 2008 Type 15 File**

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas	Grand Total	Percent
None		53		1	150	204	43
1		79			35	114	24
2		24			14	38	8
3		14	1		6	21	4
4		16			3	19	4
5	1	13			1	15	3
6		12				12	3
7		14			1	15	3
8		5				5	1
9	1	9			1	11	2
10		13			5	18	4
Grand Total	2	252	1	1	216	472	

Table 14 shows the ratios of the average actual yield to the reduced reference yield that applies to organic practices for rice. Data for Arkansas, Louisiana, and Mississippi provide no meaningful information. The reduced reference yield clearly is much lower than the average of the actual yields in California regardless of the number of actual yields included in the Type 15 records. The reduced reference yield is too high in Texas for virtually all cases, but the number of observations above two actual yields per record is extremely small. However, where there are larger numbers of observations, the ratio of the average actual yield to the organic reference yield tends to be larger. This may indicate a difference in short-term results and longer-term relationships.

TABLE 14. **Average Ratio of Actual Yields to Organic Reference Yield for Rice, by State and Number of Actual Yields, 2008 Type 15 File**

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas
None	N/A	N/A	N/A	N/A	N/A
1		1.53			0.83
2		1.41			1.03
3		1.44	2.56		0.75
4		1.50			0.72
5	2.60	1.56			0.56
6		1.39			
7		1.46			0.75
8		1.31			
9	2.03	1.32			0.84
10		1.55			1.30
Average	2.32	1.45	2.56		0.85

Table 15 reports the average ratio of the average actual yield to the non-organic reference yield. The data reveal the same characteristics as does Table 14. However, the table does demonstrate the percentage the average actual yield represents of the original reference yield. In California, the organic practice tends to be about 25 percent lower than the non-organic practice at most numbers of yields per record. Texas, on the other hand, is very variable, with an average yield drag of organic to non-organic of around 58 percent. However, the range is large due to the low numbers of observations in some instances.

TABLE 15. Average Ratio of Actual Yields to Non-Organic Reference Yield for Rice, by State and Number of Actual Yields, 2008 Type 15 File

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas
None	N/A	N/A	N/A	N/A	N/A
1		0.76			0.42
2		0.70			0.51
3		0.72	1.28		0.38
4		0.75			0.36
5	1.30	0.78			0.28
6		0.70			
7		0.73			0.37
8		0.66			
9	1.02	0.66			0.42
10		0.78			0.65
Average	1.16	0.72	1.28		0.42

Table 16 simply indicates the average multiplier of the base premium rate assuming an exponent of -1.800 in all cases. This is intended merely to demonstrate a range of the multipliers. All yield ratios were individually cupped at -0.50 and capped at 1.50 consistent with practice for calculating this value.

TABLE 16. Average Multiplier of Base Premium Rate with Organic Reference Yield for Rice, by State and Number of Actual Yields, 2008 Type 15 File

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas
1		0.768			1.980
2		0.712			1.356
3		0.694	0.482		2.043
4		0.642			1.901
5	0.482	0.556			2.810
6		0.685			
7		0.702			1.689
8		0.754			
9	0.482	0.680			1.383
10		0.522			0.770
Average	0.482	0.672	0.482		1.741

Table 17 shows the numbers of actual yields by organic practice. Virtually all the data were reported as certified organic when the organic flag is included. Differences in the average actual yield by practice are not reported due to the scarcity of yields flagged as transitional organic practice.

TABLE 17. Rice: Number of Actual Yields by Organic Practice, 2008 Type 15 File

Number of Actual Yields	Certified Organic	Transitional Organic
0	116	88
1	105	9
2	35	3
3	21	
4	19	
5	13	2
6	12	
7	15	
8	5	
9	11	
10	17	1

Conclusions Regarding Rice

The data indicate the across the board adjustment to the rice reference yields and transitional yields for organic practice was inappropriate. It appears California reference yields were reduced more than appropriate and Texas reference yields may not have been reduced enough. However, the data for Texas are less conclusive than the data for California, since so few units reported more than one or two actual yields when any actual yields were reported. The status for Arkansas, Louisiana, and Mississippi cannot be determined due to the lack of data. The adjustments to the T-yields were affected similarly. In some cases, the reference yield and the T-yield are not identical; however, in all cases the Contractor examined, the differences were not large. Hence, the inference from the comparisons of the ratios of the average actual yield to the reference yield that they apply to transitional yields as well.

All Crops Results

Table 18 reports the number of Type 15 records in the 2008 dataset along with certain characteristics of those records for each crop for which an organic practice was reported and that are either Type B or Type C crops for the purposes of Actual Production History. About one-third of all records consisted exclusively of T-yields, a value that is relatively constant for corn, soybeans, and wheat. Several other crops also had about one-third of all records composed only of t-yields. There is a wide variation in use of T-yields among the remaining crops.

TABLE 18. Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, All Crops and States

Crop	Total Records	Records with no Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
11	5,507	1,835	33	15,450	4.2	0.63
12	18	9	50	42	4.7	0.57
13	31	13	42	28	1.6	0.39
15	27	17	63	21	2.1	0.45
16	974	320	33	2,305	3.5	0.71
17	342	120	35	712	3.2	0.59
18	472	204	43	900	3.4	0.90
21	185	94	51	565	6.2	1.11
22	7	0	0	16	2.3	0.89
28	70	10	14	323	5.4	0.71
29	29	5	17	150	6.3	1.17
31	688	101	15	2,100	3.6	0.66
33	130	42	32	428	4.9	0.67
34	2	0	0	9	4.5	0.31
36	24	3	13	127	6.0	1.04
39	2	2	100	0	0.0	0.00
41	3,319	1,252	38	8,104	3.9	0.65
42	110	31	28	188	2.4	0.44
43	69	45	65	76	3.2	0.47
46	18	5	28	44	3.4	0.45
47	847	438	52	1,202	2.9	0.57
49	73	28	38	102	2.3	0.37
51	178	83	47	357	3.8	0.40
52	65	9	14	271	4.8	1.18
53	274	39	14	1,476	6.3	1.05
54	600	143	24	1,800	3.9	0.87
55	3	1	33	10	5.0	1.41
58	9	2	22	40	5.7	0.38
60	18	3	17	85	5.7	1.55
64	85	23	27	97	1.6	0.43
67	528	130	25	905	2.3	0.38
69	3	2	67	1	1.0	0.42
75	150	114	76	94	2.6	0.47
78	565	277	49	798	2.8	0.45
81	3,074	984	32	8,789	4.2	0.67
84	172	47	27	348	2.8	0.54
87	117	13	11	574	5.5	0.94
89	150	34	23	664	5.7	0.78
91	987	328	33	1,975	3.0	0.64
92	45	8	18	232	6.3	1.02
94	69	11	16	187	3.2	0.79
107	1	0	0	1	1.0	0.06
218	18	5	28	70	5.4	1.08
219	4	0	0	29	7.3	0.92
220	65	24	37	244	6.0	0.78
221	7	0	0	33	4.7	1.00
222	1	0	0	1	1.0	0.71
223	83	10	12	453	6.2	0.91
229	43	35	81	10	1.3	0.28
231	2	0	0	2	1.0	0.95
234	1	1	100	0	0.0	0.00
235	1	1	100	0	0.0	0.00
256	1	0	0	6	6.0	0.86
Total	20,263	6,901	34	52,444	3.9	0.68

1/ Average for all records containing at least one actual yield.

When actual yields were reported, the typical record contained nearly four actual yields, indicating insurance typically is based on a relatively long history of organic practice. An interesting comparison is the ratio of the average of the actual yields certified to the reference yield, the value of which is about two-thirds. All the major crops – corn, soybeans, and wheat – that collectively account for a large share of the organic acreage also have an average actual yield that is about two-thirds of the reference yield. These three crops also had about four certified yields on average for each unit with actual certified yields. Thus, it would appear that the reference yields, on average, tend to exceed the production potential of acreage used for organic production by about 50 percent (reference yield should be reduced by one-third on average).

Differences among states exist. Tables 19, 20, and 21 report data by state for wheat, corn, and soybeans, respectively. The variable of greatest interest is the ratio of certified actual yields to the reference yield, a value that shows variation among states. This difference in some cases is based on few observations. But, it is difficult to make generalizations among states on the basis of these data. Are differences in the ratio due to differences in the average yield on organic acres or to differences in the basis of the reference yield? Since the Contractor must accept the reference yield as a given, it appears the potential yield on organic acres is not consistent among states, a characteristic that also was evident with the rice data considered earlier.

TABLE 19. Wheat: Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, by State

State	Total Records	Records with No Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
06	29	16	55	31	2.4	0.50
08	515	211	41	1,335	4.4	0.83
16	59	15	25	187	4.3	0.63
17	32	5	16	112	4.1	0.98
19	9	2	22	10	1.4	1.08
20	273	76	28	1,104	5.6	0.77
26	192	89	46	173	1.7	0.71
27	493	252	51	629	2.6	0.49
30	1,616	413	26	4,730	3.9	0.61
31	352	126	36	1,107	4.9	0.83
34	1	1	100	0	0.0	0.00
36	3	0	0	21	7.0	1.07
38	930	243	26	2,987	4.3	0.67
39	15	7	47	35	4.4	0.45
40	51	14	27	116	3.1	0.84
41	16	14	88	2	1.0	0.14
46	230	67	29	840	5.2	0.62
48	90	36	40	219	4.1	0.63
49	219	110	50	496	4.6	0.47
53	27	13	48	25	1.8	0.30
55	57	36	63	36	1.7	0.50
56	298	89	30	1,255	6.0	0.81
Grand Total	5,507	1,835	33	15,450	4.2	0.63

1/ Average for all records containing at least one actual yield.

TABLE 20. Corn: Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, by State

State	Total Records	Records with No Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
06	1	0	0	2	2.0	1.26
08	20	6	30	29	2.1	0.54
09	2	2	100	0	0.0	0.00
16	8	3	38	7	1.4	0.50
17	122	42	34	318	4.0	0.61
18	10	4	40	20	3.3	0.54
19	609	155	25	2,167	4.8	0.81
20	81	19	23	312	5.0	0.73
23	17	2	12	38	2.5	0.65
24	7	4	57	3	1.0	0.99
26	393	183	47	639	3.0	0.68
27	619	260	42	1,316	3.7	0.72
29	40	6	15	101	3.0	0.70
31	341	152	45	716	3.8	0.68
33	1	1	100	0	0.0	0.00
34	3	0	0	5	1.7	0.54
36	55	15	27	163	4.1	0.58
37	11	3	27	14	1.8	0.48
38	125	56	45	156	2.3	0.59
39	65	19	29	131	2.8	0.51
41	2	1	50	2	2.0	0.52
42	35	16	46	104	5.5	0.34
46	107	28	26	474	6.0	0.51
48	14	11	79	7	2.3	0.19
50	29	15	52	57	4.1	0.55
51	29	6	21	100	4.3	0.88
53	9	4	44	7	1.4	0.77
55	533	218	41	1,204	3.8	0.67
56	31	21	68	12	1.2	0.22
Grand Total	3,319	1,252	38	8,104	3.9	0.65

1/ Average for all records containing at least one actual yield.

TABLE 21. Soybeans: Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, by State

State	Total Records	Records with No Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
13	2	1	50	2	2.0	1.40
17	131	32	24	498	5.0	0.74
18	8	3	38	17	3.4	0.37
19	621	174	28	2,137	4.8	0.76
20	70	21	30	174	3.6	0.61
24	7	5	71	3	1.5	1.03
26	456	190	42	999	3.8	0.60
27	744	201	27	2,109	3.9	0.63
29	82	6	7	408	5.4	0.82
31	252	108	43	550	3.8	0.75
34	2	0	0	3	1.5	0.44
36	30	8	27	111	5.0	0.56
37	11	0	0	15	1.4	0.88
38	120	49	41	196	2.8	0.47
39	56	9	16	183	3.9	0.75
42	6	1	17	17	3.4	0.65
46	115	32	28	459	5.5	0.66
48	5	4	80	2	2.0	0.25
51	15	3	20	66	5.5	0.78
55	341	137	40	840	4.1	0.53
Grand Total	3,074	984	32	8,789	4.2	0.67

1/ Average for all records containing at least one actual yield.

Additional disaggregation of data by state is not included in this report; however, the data on which Tables 18 through 21 are based is included in Appendix D. The general indications provided in Tables 18 through 21 are similar for all crops and states that have a reasonable amount of data.

Organic Acreage Under Common Option Code Relative to Non-Organic Acreage of the Same Crops in the Same Counties

Units insured with a common option code for organic practice represented only about 1.5 percent of the total units, acres, liability, and premium of the same crops in the same counties (Table 22). The aggregate indemnities, however, were nearly three percent of the total for these crops and counties. The earned premium rate for acreage insured with an organic code was about 27 percent greater than for the same crops in the same counties. In spite of this higher premium rate, both the loss ratio and the loss cost ratio were substantially higher in the aggregate than for acreage insured without an organic common option code. While this pattern is consistent at the highest level of aggregation, it is not statistically significant at that level. Differences in risk associated with different crops need to be addressed as data become available and the insurance structure should not distort participation patterns in any way that can result in adverse selection. As additional data become available, it should be possible to establish statistically valid yield differentials, differences in yield variability, and corresponding differences in T-yields and rates. In the meantime, RMA should apply its ratemaking methodology as it normally would when data for a type/practice represent only a small share of the total insurance experience for a crop.

As will be demonstrated later, there are major differences among crops and states with regard to the performance of organic acreage relative to non-organic acreage. Tables 12 and 22 are to be interpreted in the same manner as Tables 10 and 11.

TABLE 22. Non-Organic Acreage of Same Crops Insured in Counties with a Common Option Code for Organic Practice, 2004 through 2008

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Non-Organic	1,497,444	113,694	34,590,732	3,348,387	9.7	343,418	22.9	2,280,253	0.681	0.066

Source: The Contractor's Underwriting Department using USDA, RMA data.

Significance of Counties with an Organic Code, 2004 through 2008

The contract requires comparisons of organic and non-organic insurance performance in the same counties. However, this raises the question: "How representative are counties with organic coverage relative to all counties in which insurance was written during these years?" Counties in which at least 1 unit with organic coverage was reported during 2004 through 2008 represented slightly more than 10 percent of units and acres, and about 13 percent of premium and liability for all eligible insurance plans in the United States during those years (Table 23).[86] Interestingly, the earned premium rate, the loss ratio, and the loss cost ratio for the counties with at least one unit insured with organic practice was lower than the U.S. average for all additional coverage. These data may indicate that organic practice was more prevalent in counties with relatively lower premium rates than the national average. As will be shown later, the dominance of California with regard to liability and premiums likely biases the earned premium rate. But, when examined solely within the counties with an organically insured practice, the organic practice in the aggregate had higher than average premium rates and worse than average loss experience.

[86] Insurance plan codes such as GRP and GRIP for which organic codes are not offered are excluded from the All U.S. data. These plan codes automatically would not have been included in the county/crop combinations with an organic practice code.

TABLE 23. Experience in Counties with Organic Practice Versus all Additional Coverage in the United States, 2004 through 2008

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
With Organic Code 1/	1,521,812	115,355	35,040,514	3,403,773	9.7	352,724	23.2	2,342,300	0.688	0.067
All U.S. 2/	14,695,151	1,062,958	265,839,212	26,826,649	10.1	3,356,644	22.8	19,677,272	0.733	0.074
Percent Organic	10.4	10.9	13.2	12.7	95.9	10.5	100.4	11.9	NA	NA

Source: The Contractor's Underwriting Department using USDA, RMA data.
1/ With organic code = at least one unit was insured in a county using an organic code during 2004 through 2008
2/ All U.S. indicates all counties in the United States but excluding insurance plans without organic option codes.

TABLE 9. Credible Crop/State Combinations at the Adjusted Indemnities per Crop/State Level

Crop	State
Wheat	Minnesota (98), Nebraska (76), Oklahoma (58), South Dakota (43), Texas (58), Utah (94), and Wyoming (164)
Oats	Minnesota (44) and North Dakota (129)
Millet	Colorado (62) and Nebraska (84)
Rice	Arkansas (77) and Texas (48)
Cotton	Texas (142)
Almonds	California (76)
Corn	Illinois (88), Michigan (168), Ohio (48), and South Dakota (49)
Dry Beans	Michigan (51)
Grain Sorghum	Kansas (67)
Grapes	California (52)
Apples	California (218)
Dry Peas	Montana (159) and North Dakota (79)
Sunflowers	North Dakota (47)
Soybeans	Illinois (92), Missouri (65), Nebraska (103), and North Dakota (69)
Potatoes	Colorado (65)
Barley	Montana (64) and North Dakota (138)

The group of crop/state combinations that is fully credible with the standard of 271 loss observations constitutes slightly less than one-half of all organic units indemnified during 2004-2008. By reducing the standard on a pro-rata basis, slightly more than three-fourths of the loss units are included. The complete table of crop/state combinations and number of losses is included as Appendix C.

In the foreseeable future, it is unlikely organic production of any commodity crop will represent more than a small percentage of the total production of the crop. In 2007, the percentage of insured organic acreage approached 40 percent of the NASS reported organic acreage from the Census. If the insurance for the organic production adequately and appropriately addresses the risks the crop faces, it is easier to foresee comparable relative levels of participation between organic production and non-organic production. Data available as a result of the increase in insured organic acreage will support development of appropriate yield differentials and yield variability analyses when appropriate time series are available. The Contractor believes RMA will need to apply the procedures it has established to determine a differential for a practice when data are relatively scarce compared to the totality of data for a crop/state combination. Organic experience data for most crops do not yet meet the standard of credibility established by RMA unless the assumption that geography does not affect the performance can be supported.

Written Agreement History and Performance

Data for written agreements for organic crops from the 2001 crop year to the 2005 crop year were compiled. Data for 2005 represent the limited number of crops for which there was no organic factor (1.05) on the actuarial tables (primarily citrus, for which the contract change date was November 2003). The NC code (organic certified acreage where the written agreement used county actuarial data where the land was located) accounted for over 70 percent of the activity with written agreements, and the RC code (organic certified acreage where the written agreement used another county's actuarial data) accounted for about 25 percent of the activity with written agreements. Transitional acreage was less than three percent of the activity with written agreements. The number of units or acres for which producers sought a written agreement was negligible. The perception of a relatively small chance of an uninsured cause of loss appraisal for certain causes of loss and the burden of applying for a written agreement may have been barriers to participation in the organic coverage by organic producers during this period. Table 10 displays written agreement performance by type for the years 2001 through 2005.

Table 10. Written Agreements issued by Type and Performance, 2001 through 2005

Written Agreement Code	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio \1	Loss Cost Ratio
NC	2,267	170	29,217	3,596	12.3	1,066	47.0	5,036	1.400	0.172
NT	66	5	928	116	12.5	25	37.9	138	1.183	0.148
RC	823	42	8,466	951	11.2	341	41.4	1,036	1.090	0.122
RT	12	0	67	12	18.6	8	66.7	33	2.608	0.485
Total	3,168	217	38,679	4,676	12.1	1,440	45.5	6,242	1.335	0.161
NC Percent of Total	71.6	78.5	75.5	76.9		74.0		80.7		
Transitional Percent of Total	2.5	2.3	2.6	2.8		2.3		2.7		

Source: The Contractor's Underwriting Department after USDA, RMA data.

It is not possible to compare non-organic insurance experience in a manner that corresponds to the four codes for written agreements since more than one type of written agreement may have been issued in a particular county. Thus, matching non-organic business to the business addressed under individual written agreement codes would result in double-counting in some cases. Hence, for a comparison of organic and conventional experiences, only the grand total of the non-organic business is shown. However, as seen in Table 10, the majority of this activity is associated with the NC code. The non-organic business represents the same crops for which at least one written agreement to cover organic production was issued in a county for the same crop year.

Crops insured under written agreements constituted about one half percent of the units, acres, liability, and premium in the same counties where the written agreements were issued. However, the organic share of the loss data is about twice as large, about one percent. The percentage of units indemnified, the loss ratio, and the loss cost ratio are 2 up to almost 3 times greater for the organic practice even though the earned premium rate was 36 percent greater. [82] Since these contracts were individually underwritten by RMA Regional Offices, there is no systematic underlying structure to the insurance offers that were made under this system. Each office was directed to follow a specific process utilizing specified information to develop the parameters of the insurance offer. However, a certain amount of judgment was allowed. In addition, applicants were required to submit a significant amount of information, a task some producers found onerous. This may have discouraged some producers from applying for coverage. This raises the question of reliability and comparability of this information with data generated when organic acreage became generally insurable as an option. Since these data are much worse than the later data, the Contractor recommends it be used for setting premium rates for the organic practice with caution. Greater weight should be given to the much more standardized data developed beginning in crop year 2005.

Table 11 demonstrates the magnitude of various variables with respect to the organic practice, when considered in conjunction with Table 10. Table 10 contains data regarding transitional and certified organic acreage insured during 2001-2005. Table 11 contains the non-organic data for the same counties for those years. For example, the organic practice represented 3,168 organic units insured compared to 636,164 non-organic units insured, which indicates organic units represented only 0.497 percent of the non-organic units insured.

[82] The data in the row labeled "Organic Share" represent the absolute percentage share of the variable (such as acres insured) or the relative level of a percentage variable such as percent of unit indemnified. A value greater than 100 percent in the latter case indicates that units insured under the organic practice were more likely to be involved in a loss situation relative to non-organic units based purely on an assessment of the numbers.

TABLE 11. Non-Organic Crops in Counties in Which a Written Agreement was Issued for Organic Practice, 2001 through 2005

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Non-Organic	636,164	47,637	9,145,122	813,281	8.9	133,717	21.0	562,517	0.692	0.062

Source: The Contractor's Underwriting Department using USDA, RMA data.

Common Option Code History and Performance

Use of a common option code for organic acreage is found in the data beginning with the 2004 crop year. Acreage included under an organic practice increased substantially once it no longer was necessary to apply for a written agreement. Even after acknowledging the difference in the number of years in each dataset, it still is clear that producers were more likely to insure acreage as organic during 2004 through 2008 when there were common option codes on the actuarial documents. Under the rules in effect for most of this period, such acreage was required to be insured under the organic practice if a certificate was in effect on the acreage and the organic practice was followed. The organic share of the acreage tripled, but still remained at less than two percent of insured acres for common counties and crops.

As was the case under written agreements, almost all the insured acreage was certified organic acreage; only limited acreage is classified as transitional organic acreage (Table 12). Aggregate loss performance of acreage insured under the organic code improved relative to written agreements, but only marginally. The percent of units indemnified, the loss ratio, and the loss cost ratio continued to be substantially higher than the same measures of performance for acreage insured under non-organic practices. This pattern is consistent at the highest level of aggregation, but is not statistically significant at that level. Nor is it consistent between crops, by county, or temporally, or systemic as experience is aggregated to a lower level. Nonetheless, from the **perspective of an insurance construct**, the losses associated with organic production need to be addressed in an appropriate manner. Differences in risk associated with different crops need to be addressed as data become available, while the insurance structure should not distort participation patterns in ways that result in adverse selection. As additional data become available, it should be possible to establish statistically valid yield differentials, differences in yield variability, and corresponding differences in T-yields and rates. In the meantime, RMA should apply its ratemaking methodology as it normally would when data for a type/practice represent only a small share of the total insurance experience for a crop.

TABLE 12. Organic Acreage Insured Under the OC and OT Common Option Code, 2004 through 2008*

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
OC	21,964	1,503	394,824	50,133	12.7	8,480	38.6	55,753	1.112	0.141
OT	2,404	158	54,959	5,253	9.6	826	34.4	6,294	1.198	0.115
Total	24,368	1,661	449,783	55,386	12.3	9,306	38.2	62,047	1.120	0.138
Transitional Percent of Total	10.9	10.5	13.9	10.5		9.7		11.3		

* The unique actuarial approach for rice and the resulting insurance experience is described earlier in the report.

Source: The Contractor's Underwriting Department using USDA, RMA data.

Use of Transitional Yields and Relationship of Actual Yields to Reference Yields
The Contractor analyzed the Type 15 records in the 2008 experience file to determine 1) use of transitional yields and 2) the relationship of actual yields certified by the producer to the reference yield. This relationship determines the rate that is charged for a particular yield in a particular county. First, it was necessary to resolve a discrepancy in the data.

The Contractor's review of the procedures set forth in Appendix 38 of the Crop Insurance Handbook led to the set of rules set forth as follows:

(1) Whenever a unit or portion thereof is being converted to organic production, two databases are established: one to capture actual organic yields on the acreage as long as it remains in transitional organic status (Database A) and the second to accrue actual organic yields from transitional and certified organic acreage (Database B).[83]
(2) The initial entries into Database A are appropriate transitional yields (either adjusted or unadjusted according to the rules of APH). For most crops, these are the standard T-yields and for rice, the special T-yields established for this crop.
(3) Once production begins on the transitional organic acreage, actual yields are entered into this database with a flag of "G" (actual transitional organic yield). "This yield type can be combined with up to nine years of any other yield type (except S, SX, A, AY, NA, PA, PP, PW) for a minimum of four years" (DAS Type 15 record Exhibits).[84] Each actual year of production thus replaces one of the T-yields included at the initiation of the database.
(4) Database B also is populated initially with the appropriate T-yields. The T-yields are replaced by the actual transitional organic yields with a flag of "G" until the acreage attains the status of organic certified.
(5) Once the acreage has attained the status of organic certified, the actual organic certified yields, identified with a flag of "V," are entered in the database. As these enter the database, the oldest of the four "T" or "G" yields is eliminated. Once four years of "V" yields are available, the database builds to ten years. As in the case of a "G" flag, "This yield type can be combined with up to nine years of any other yield type (except S, SX, A, AY, NA, PA, PP, PW) for a minimum of four years" (DAS Type 15 record Exhibits).[85]

The Type 15 data do not conform entirely to the data structure as described. Numerous records contain a flag of "A," which is inconsistent with the guidance in the Crop Insurance Handbook that conventional actual yields are not entered into an organic database. The Contractor found that records with an "A" flag for yields did not contain either "V" or "G" flags. The "A" flags were combined with "T" and other flags. When the Contractor examined the records for rice, all records that contained one of more "T" flags did contain the organic T-yield from the FCI-35 specific for that crop. Thus, it appears the records with "A" type yields were edited with the requirement: "Can be combined with up to 9 years of any yield type other than S for a minimum of 4 years." In contrast, the records that contained a "V" or "G" were edited with the requirement stated earlier in this section. But, the Contractor notes, the Crop Insurance Handbook specifically prohibits use of conventional yields in the organic databases. Thus, the "A" type code or any of

[83] The terms "Database A" and "Database B" do not appear in the procedures. The nomenclature is adopted in this report for convenience.
[84] http://www.rma.usda.gov/data/m13/aprvd2006.html
[85] http://www.rma.usda.gov/data/m13/aprvd2006.html

its relatives should not appear in these data. Based on these findings, the Contractor concluded that records containing “A” flags really were intended to be “G” or “V” flags.

Rice Type 15 Data

The rice Type 15 data for the 2008 crop year are considered first for two reasons: 1) it is a relatively small dataset and 2) the Contractor’s earlier observations about the potential the premium rate could be lower on organic acreage than would be charged for the same yield on non-organic acreage.

There were a total of 472 records for rice produced under organic practices in the 2008 crop year Type 15 dataset. The distribution of those records by state and by number of actual yields is shown in Table 13. California and Texas each accounted for around one-half these organic Type 15 records. Only about one-third of the records had more than one actual yield. An actual yield includes all yield types “A,” “G,” and “V.”

TABLE 13. **Number of Type 15 Records for Rice by State and Number of Actual Yields, 2008 Type 15 File**

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas	Grand Total	Percent
None		53		1	150	204	43
1		79			35	114	24
2		24			14	38	8
3		14	1		6	21	4
4		16			3	19	4
5	1	13			1	15	3
6		12				12	3
7		14			1	15	3
8		5				5	1
9	1	9			1	11	2
10		13			5	18	4
Grand Total	2	252	1	1	216	472	

Table 14 shows the ratios of the average actual yield to the reduced reference yield that applies to organic practices for rice. Data for Arkansas, Louisiana, and Mississippi provide no meaningful information. The reduced reference yield clearly is much lower than the average of the actual yields in California regardless of the number of actual yields included in the Type 15 records. The reduced reference yield is too high in Texas for virtually all cases, but the number of observations above two actual yields per record is extremely small. However, where there are larger numbers of observations, the ratio of the average actual yield to the organic reference yield tends to be larger. This may indicate a difference in short-term results and longer-term relationships.

TABLE 14. **Average Ratio of Actual Yields to Organic Reference Yield for Rice, by State and Number of Actual Yields, 2008 Type 15 File**

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas
None	N/A	N/A	N/A	N/A	N/A
1		1.53			0.83
2		1.41			1.03
3		1.44	2.56		0.75
4		1.50			0.72
5	2.60	1.56			0.56
6		1.39			
7		1.46			0.75
8		1.31			
9	2.03	1.32			0.84
10		1.55			1.30
Average	2.32	1.45	2.56		0.85

Table 15 reports the average ratio of the average actual yield to the non-organic reference yield. The data reveal the same characteristics as does Table 14. However, the table does demonstrate the percentage the average actual yield represents of the original reference yield. In California, the organic practice tends to be about 25 percent lower than the non-organic practice at most numbers of yields per record. Texas, on the other hand, is very variable, with an average yield drag of organic to non-organic of around 58 percent. However, the range is large due to the low numbers of observations in some instances.

TABLE 15. Average Ratio of Actual Yields to Non-Organic Reference Yield for Rice, by State and Number of Actual Yields, 2008 Type 15 File

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas
None	N/A	N/A	N/A	N/A	N/A
1		0.76			0.42
2		0.70			0.51
3		0.72	1.28		0.38
4		0.75			0.36
5	1.30	0.78			0.28
6		0.70			
7		0.73			0.37
8		0.66			
9	1.02	0.66			0.42
10		0.78			0.65
Average	1.16	0.72	1.28		0.42

Table 16 simply indicates the average multiplier of the base premium rate assuming an exponent of -1.800 in all cases. This is intended merely to demonstrate a range of the multipliers. All yield ratios were individually cupped at -0.50 and capped at 1.50 consistent with practice for calculating this value.

TABLE 16. Average Multiplier of Base Premium Rate with Organic Reference Yield for Rice, by State and Number of Actual Yields, 2008 Type 15 File

Number of Actual Yields	Arkansas	California	Louisiana	Mississippi	Texas
1		0.768			1.980
2		0.712			1.356
3		0.694	0.482		2.043
4		0.642			1.901
5	0.482	0.556			2.810
6		0.685			
7		0.702			1.689
8		0.754			
9	0.482	0.680			1.383
10		0.522			0.770
Average	0.482	0.672	0.482		1.741

Table 17 shows the numbers of actual yields by organic practice. Virtually all the data were reported as certified organic when the organic flag is included. Differences in the average actual yield by practice are not reported due to the scarcity of yields flagged as transitional organic practice.

Table 17. Rice: Number of Actual Yields by Organic Practice, 2008 Type 15 File

Number of Actual Yields	Certified Organic	Transitional Organic
0	116	88
1	105	9
2	35	3
3	21	
4	19	
5	13	2
6	12	
7	15	
8	5	
9	11	
10	17	1

Conclusions Regarding Rice

The data indicate the across the board adjustment to the rice reference yields and transitional yields for organic practice was inappropriate. It appears California reference yields were reduced more than appropriate and Texas reference yields may not have been reduced enough. However, the data for Texas are less conclusive than the data for California, since so few units reported more than one or two actual yields when any actual yields were reported. The status for Arkansas, Louisiana, and Mississippi cannot be determined due to the lack of data. The adjustments to the T-yields were affected similarly. In some cases, the reference yield and the T-yield are not identical; however, in all cases the Contractor examined, the differences were not large. Hence, the inference from the comparisons of the ratios of the average actual yield to the reference yield that they apply to transitional yields as well.

All Crops Results

Table 18 reports the number of Type 15 records in the 2008 dataset along with certain characteristics of those records for each crop for which an organic practice was reported and that are either Type B or Type C crops for the purposes of Actual Production History. About one-third of all records consisted exclusively of T-yields, a value that is relatively constant for corn, soybeans, and wheat. Several other crops also had about one-third of all records composed only of t-yields. There is a wide variation in use of T-yields among the remaining crops.

TABLE 18. Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, All Crops and States

Crop	Total Records	Records with no Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
11	5,507	1,835	33	15,450	4.2	0.63
12	18	9	50	42	4.7	0.57
13	31	13	42	28	1.6	0.39
15	27	17	63	21	2.1	0.45
16	974	320	33	2,305	3.5	0.71
17	342	120	35	712	3.2	0.59
18	472	204	43	900	3.4	0.90
21	185	94	51	565	6.2	1.11
22	7	0	0	16	2.3	0.89
28	70	10	14	323	5.4	0.71
29	29	5	17	150	6.3	1.17
31	688	101	15	2,100	3.6	0.66
33	130	42	32	428	4.9	0.67
34	2	0	0	9	4.5	0.31
36	24	3	13	127	6.0	1.04
39	2	2	100	0	0.0	0.00
41	3,319	1,252	38	8,104	3.9	0.65
42	110	31	28	188	2.4	0.44
43	69	45	65	76	3.2	0.47
46	18	5	28	44	3.4	0.45
47	847	438	52	1,202	2.9	0.57
49	73	28	38	102	2.3	0.37
51	178	83	47	357	3.8	0.40
52	65	9	14	271	4.8	1.18
53	274	39	14	1,476	6.3	1.05
54	600	143	24	1,800	3.9	0.87
55	3	1	33	10	5.0	1.41
58	9	2	22	40	5.7	0.38
60	18	3	17	85	5.7	1.55
64	85	23	27	97	1.6	0.43
67	528	130	25	905	2.3	0.38
69	3	2	67	1	1.0	0.42
75	150	114	76	94	2.6	0.47
78	565	277	49	798	2.8	0.45
81	3,074	984	32	8,789	4.2	0.67
84	172	47	27	348	2.8	0.54
87	117	13	11	574	5.5	0.94
89	150	34	23	664	5.7	0.78
91	987	328	33	1,975	3.0	0.64
92	45	8	18	232	6.3	1.02
94	69	11	16	187	3.2	0.79
107	1	0	0	1	1.0	0.06
218	18	5	28	70	5.4	1.08
219	4	0	0	29	7.3	0.92
220	65	24	37	244	6.0	0.78
221	7	0	0	33	4.7	1.00
222	1	0	0	1	1.0	0.71
223	83	10	12	453	6.2	0.91
229	43	35	81	10	1.3	0.28
231	2	0	0	2	1.0	0.95
234	1	1	100	0	0.0	0.00
235	1	1	100	0	0.0	0.00
256	1	0	0	6	6.0	0.86
Total	20,263	6,901	34	52,444	3.9	0.68

1/ Average for all records containing at least one actual yield.

When actual yields were reported, the typical record contained nearly four actual yields, indicating insurance typically is based on a relatively long history of organic practice. An interesting comparison is the ratio of the average of the actual yields certified to the reference yield, the value of which is about two-thirds. All the major crops – corn, soybeans, and wheat – that collectively account for a large share of the organic acreage also have an average actual yield that is about two-thirds of the reference yield. These three crops also had about four certified yields on average for each unit with actual certified yields. Thus, it would appear that the reference yields, on average, tend to exceed the production potential of acreage used for organic production by about 50 percent (reference yield should be reduced by one-third on average).

Differences among states exist. Tables 19, 20, and 21 report data by state for wheat, corn, and soybeans, respectively. The variable of greatest interest is the ratio of certified actual yields to the reference yield, a value that shows variation among states. This difference in some cases is based on few observations. But, it is difficult to make generalizations among states on the basis of these data. Are differences in the ratio due to differences in the average yield on organic acres or to differences in the basis of the reference yield? Since the Contractor must accept the reference yield as a given, it appears the potential yield on organic acres is not consistent among states, a characteristic that also was evident with the rice data considered earlier.

TABLE 19. Wheat: Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, by State

State	Total Records	Records with No Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
06	29	16	55	31	2.4	0.50
08	515	211	41	1,335	4.4	0.83
16	59	15	25	187	4.3	0.63
17	32	5	16	112	4.1	0.98
19	9	2	22	10	1.4	1.08
20	273	76	28	1,104	5.6	0.77
26	192	89	46	173	1.7	0.71
27	493	252	51	629	2.6	0.49
30	1,616	413	26	4,730	3.9	0.61
31	352	126	36	1,107	4.9	0.83
34	1	1	100	0	0.0	0.00
36	3	0	0	21	7.0	1.07
38	930	243	26	2,987	4.3	0.67
39	15	7	47	35	4.4	0.45
40	51	14	27	116	3.1	0.84
41	16	14	88	2	1.0	0.14
46	230	67	29	840	5.2	0.62
48	90	36	40	219	4.1	0.63
49	219	110	50	496	4.6	0.47
53	27	13	48	25	1.8	0.30
55	57	36	63	36	1.7	0.50
56	298	89	30	1,255	6.0	0.81
Grand Total	5,507	1,835	33	15,450	4.2	0.63

1/ Average for all records containing at least one actual yield.

Table 20. Corn: Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, by State

State	Total Records	Records with No Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
06	1	0	0	2	2.0	1.26
08	20	6	30	29	2.1	0.54
09	2	2	100	0	0.0	0.00
16	8	3	38	7	1.4	0.50
17	122	42	34	318	4.0	0.61
18	10	4	40	20	3.3	0.54
19	609	155	25	2,167	4.8	0.81
20	81	19	23	312	5.0	0.73
23	17	2	12	38	2.5	0.65
24	7	4	57	3	1.0	0.99
26	393	183	47	639	3.0	0.68
27	619	260	42	1,316	3.7	0.72
29	40	6	15	101	3.0	0.70
31	341	152	45	716	3.8	0.68
33	1	1	100	0	0.0	0.00
34	3	0	0	5	1.7	0.54
36	55	15	27	163	4.1	0.58
37	11	3	27	14	1.8	0.48
38	125	56	45	156	2.3	0.59
39	65	19	29	131	2.8	0.51
41	2	1	50	2	2.0	0.52
42	35	16	46	104	5.5	0.34
46	107	28	26	474	6.0	0.51
48	14	11	79	7	2.3	0.19
50	29	15	52	57	4.1	0.55
51	29	6	21	100	4.3	0.88
53	9	4	44	7	1.4	0.77
55	533	218	41	1,204	3.8	0.67
56	31	21	68	12	1.2	0.22
Grand Total	3,319	1,252	38	8,104	3.9	0.65

1/ Average for all records containing at least one actual yield.

TABLE 21. Soybeans: Use of Actual Yields and Ratio of Average Actual Yield to Reference Yield, by State

State	Total Records	Records with No Actual Yield	Percent No Actual Yield	Total Actual Yields	Average per Record 1/	Ratio Actual Yield to Reference Yield
13	2	1	50	2	2.0	1.40
17	131	32	24	498	5.0	0.74
18	8	3	38	17	3.4	0.37
19	621	174	28	2,137	4.8	0.76
20	70	21	30	174	3.6	0.61
24	7	5	71	3	1.5	1.03
26	456	190	42	999	3.8	0.60
27	744	201	27	2,109	3.9	0.63
29	82	6	7	408	5.4	0.82
31	252	108	43	550	3.8	0.75
34	2	0	0	3	1.5	0.44
36	30	8	27	111	5.0	0.56
37	11	0	0	15	1.4	0.88
38	120	49	41	196	2.8	0.47
39	56	9	16	183	3.9	0.75
42	6	1	17	17	3.4	0.65
46	115	32	28	459	5.5	0.66
48	5	4	80	2	2.0	0.25
51	15	3	20	66	5.5	0.78
55	341	137	40	840	4.1	0.53
Grand Total	3,074	984	32	8,789	4.2	0.67

1/ Average for all records containing at least one actual yield.

Additional disaggregation of data by state is not included in this report; however, the data on which Tables 18 through 21 are based is included in Appendix D. The general indications provided in Tables 18 through 21 are similar for all crops and states that have a reasonable amount of data.

Organic Acreage Under Common Option Code Relative to Non-Organic Acreage of the Same Crops in the Same Counties

Units insured with a common option code for organic practice represented only about 1.5 percent of the total units, acres, liability, and premium of the same crops in the same counties (Table 22). The aggregate indemnities, however, were nearly three percent of the total for these crops and counties. The earned premium rate for acreage insured with an organic code was about 27 percent greater than for the same crops in the same counties. In spite of this higher premium rate, both the loss ratio and the loss cost ratio were substantially higher in the aggregate than for acreage insured without an organic common option code. While this pattern is consistent at the highest level of aggregation, it is not statistically significant at that level. Differences in risk associated with different crops need to be addressed as data become available and the insurance structure should not distort participation patterns in any way that can result in adverse selection. As additional data become available, it should be possible to establish statistically valid yield differentials, differences in yield variability, and corresponding differences in T-yields and rates. In the meantime, RMA should apply its ratemaking methodology as it normally would when data for a type/practice represent only a small share of the total insurance experience for a crop.

As will be demonstrated later, there are major differences among crops and states with regard to the performance of organic acreage relative to non-organic acreage. Tables 12 and 22 are to be interpreted in the same manner as Tables 10 and 11.

TABLE 22. Non-Organic Acreage of Same Crops Insured in Counties with a Common Option Code for Organic Practice, 2004 through 2008

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Non-Organic	1,497,444	113,694	34,590,732	3,348,387	9.7	343,418	22.9	2,280,253	0.681	0.066

Source: The Contractor's Underwriting Department using USDA, RMA data.

Significance of Counties with an Organic Code, 2004 through 2008

The contract requires comparisons of organic and non-organic insurance performance in the same counties. However, this raises the question: "How representative are counties with organic coverage relative to all counties in which insurance was written during these years?" Counties in which at least 1 unit with organic coverage was reported during 2004 through 2008 represented slightly more than 10 percent of units and acres, and about 13 percent of premium and liability for all eligible insurance plans in the United States during those years (Table 23).[86] Interestingly, the earned premium rate, the loss ratio, and the loss cost ratio for the counties with at least one unit insured with organic practice was lower than the U.S. average for all additional coverage. These data may indicate that organic practice was more prevalent in counties with relatively lower premium rates than the national average. As will be shown later, the dominance of California with regard to liability and premiums likely biases the earned premium rate. But, when examined solely within the counties with an organically insured practice, the organic practice in the aggregate had higher than average premium rates and worse than average loss experience.

[86] Insurance plan codes such as GRP and GRIP for which organic codes are not offered are excluded from the All U.S. data. These plan codes automatically would not have been included in the county/crop combinations with an organic practice code.

Table 23. Experience in Counties with Organic Practice Versus all Additional Coverage in the United States, 2004 through 2008

	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
With Organic Code 1/	1,521,812	115,355	35,040,514	3,403,773	9.7	352,724	23.2	2,342,300	0.688	0.067
All U.S. 2/	14,695,151	1,062,958	265,839,212	26,826,649	10.1	3,356,644	22.8	19,677,272	0.733	0.074
Percent Organic	10.4	10.9	13.2	12.7	95.9	10.5	100.4	11.9	NA	NA

Source: The Contractor's Underwriting Department using USDA, RMA data.
1/ With organic code = at least one unit was insured in a county using an organic code during 2004 through 2008
2/ All U.S. indicates all counties in the United States but excluding insurance plans without organic option codes.

At least 1 unit with an organic code was reported in each of 670 counties during the 2004 through 2008 time period. The average number of units with an organic code per county for the entire time period was 36.5 and the median was 11 units. On an annualized basis, the numbers are considerably smaller. In comparison, there was an average of 949 units without an organic code per county during these years.

The Contractor examined the data on a county basis by calculating the net underwriting gain (loss) of acreage insured under an organic code and compared the percentage gain (loss) to acreage of the same crops insured without the organic code in the same county.[87] Table 24 shows the 15 counties with the greatest underwriting gain and the 15 with the greatest underwriting loss. Acreage with an organic code performed better in the aggregate in the counties with underwriting gains than did acreage of the same crops in the same counties produced conventionally. Conversely, in the counties with underwriting losses on acreage with an organic code, performance was worse than the performance for crops produced conventionally. Six of the best performing counties are in California, but so are four of the worst performing counties. Eight of the 15 best performing counties had 10,000 acres or more insured under organic codes during this period whereas only 3 of the worst performing counties had this much acreage. This may indicate that greater acreage insured under the organic code led to more favorable insurance experience. There is no other pattern evident in these data. The complete experience data for each state/county combination is included in Appendix E in alphabetical order. A table similar to Table 24 also is included for all state/county combinations.

[87] Gain (loss) is the difference of the total premium and total indemnity.

TABLE 24. Top 15 Counties with Net Underwriting Gain and Top 15 Counties with Net Underwriting Loss, 2004 through 2008

State	County	With Organic Codes				Without Organic Codes			
		Number of Acres	Gain (Loss)	Liability	Percent of Liability	Number of Acres	Gain (Loss)	Liability	Percent of Liability
Washington	Douglas	5	840	13,572	6.2	192	2,536	84,297	3.0
Washington	Yakima	9	699	17,814	3.9	338	6,918	518,346	1.3
Arizona	Graham	3	645	6,314	10.2	0	83	546	15.3
California	Napa	3	573	10,402	5.5	93	11,702	306,412	3.8
Washington	Grant	27	497	24,777	2.0	440	11,826	472,082	2.5
Michigan	Shiawassee	29	423	7,788	5.4	304	4,921	85,178	5.8
Wyoming	Laramie	42	421	3,250	12.9	302	1,416	26,352	5.4
California	Madera	13	381	11,015	3.5	342	11,424	303,743	3.8
California	Kings	7	364	9,576	3.8	177	2,805	55,419	5.1
California	Kern	10	333	12,609	2.6	520	22,634	660,263	3.4
California	Ventura	3	311	5,593	5.6	137	8,335	270,372	3.1
Washington	Benton	20	296	15,301	1.9	279	8,614	271,456	3.2
Colorado	Arapahoe	31	288	1,599	18.0	59	8	4,681	0.2
Colorado	Lincoln	30	257	1,640	15.6	134	(365)	13,934	-2.6
California	Mendocino	6	253	6,499	3.9	24	1,373	33,198	4.1
Total / Average		237	6,582	147,749	4.5	3,342	94,230	3,106,278	3.0
North Dakota	Dunn	9	(218)	748	-29.2	716	(20,122)	81,029	-24.8
Nebraska	Rock	3	(219)	1,459	-15.0	17	309	8,098	3.8
Montana	Roosevelt	31	(235)	2,296	-10.2	1,180	399	85,348	0.5
Wisconsin	Chippewa	3	(244)	727	-33.5	302	(2,364)	86,360	-2.7
Wisconsin	Jackson	5	(247)	1,331	-18.5	101	1,307	32,960	4.0
California	Sonoma	4	(248)	3,167	-7.8	151	14,286	370,338	3.9
Iowa	Winneshiek	8	(251)	2,031	-12.4	626	5,061	219,462	2.3
Utah	Box Elder	41	(255)	2,774	-9.2	159	(137)	17,547	-0.8
Wisconsin	Dunn	3	(295)	795	-37.1	316	(2,448)	84,004	-2.9
California	Merced	3	(325)	3,628	-8.9	291	15,316	480,371	3.2
Texas	Matagorda	2	(331)	799	-41.4	5	(12)	1,632	-0.7
California	Butte	4	(465)	3,164	-14.7	206	2,363	153,826	1.5
Minnesota	Freeborn	5	(486)	1,556	-31.2	866	17,922	329,145	5.4
California	Fresno	27	(685)	23,727	-2.9	1,586	38,878	1,218,801	3.2
Colorado	Alamosa	6	(759)	4,494	-16.9	80	581	67,504	0.9
Total / Average		154	(5,263)	52,698	-10.0	6,603	71,339	3,236,424	2.2

Source: The Contractor's Underwriting Department using USDA, RMA data.

Principal Crops with Organic Common Option Organic Code, 2004 through 2008
The principal crops insured with the organic option code during 2004 through 2008 were not specialty crops as some might suspect. Instead, wheat, corn, and soybeans occupied the top three positions in terms of acres, liability, and premium. These three crops represented about two-thirds of all activity with regard to organic insurance. The remaining one-third of activity with regard to organic insurance represented 78 crop codes.

The prominence of the top three crops perhaps can be explained by their importance in the standard diet. Organic wheat flour most likely is used to produce organic bakery products either commercially or at home. Organic corn flour would occupy a similar position for use in organic ethnic products (such as Mexican) and also for home use. Similarly, organic soybeans would be used to produce oil for commercial production of fried organic foods and for home use. Organic corn and soybean meal would be fed to animals raised organically. These applications represent a large volume of use for the three crops, and even a tiny share of the total market by organic uses would be a larger volume than can be attained by other crops.

The top ten crops insured with an organic code are shown in Table 25. Table 26 contains the insurance experience for the same crops in the same counties that were insured without the organic common option code. Data for all 81 crops is included in Appendix F.

TABLE 25. Insurance Experience for Principal Crops Insured with Organic Common Option Codes, 2004 through 2008

Crop	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Wheat	6,028	655	57,700	14,455	25.1	2,224	36.9	14,006	0.969	0.243
Corn	4,274	236	71,165	9,450	13.3	1,897	44.4	12,914	1.367	0.181
Soybeans	3,976	235	42,834	6,788	15.8	2,058	51.8	12,042	1.774	0.281
Apples	1,137	35	79,141	6,168	7.8	232	20.4	2,991	0.485	0.038
Grapes	715	26	30,793	1,853	6.0	57	8.0	542	0.293	0.018
Tomatoes	197	18	23,752	1,414	6.0	22	11.2	849	0.600	0.036
Almonds	199	10	14,419	1,377	9.6	63	31.7	1,362	0.989	0.094
Flax	871	59	4,622	1,081	23.4	528	60.6	1,784	1.650	0.386
Potatoes	231	10	9,757	970	9.9	82	35.5	1,292	1.333	0.132
Barley	706	51	4,274	909	21.3	333	47.2	827	0.910	0.194
Top Ten	18,334	1,335	338,457	44,465	13.1	7,496	40.9	48,610	1.093	0.144
All other crops	6,549	384	136,431	12,455	9.1	1,851	28.3	14,617	1.174	0.107

* Totals derived by adding whole dollar values and then rounding
Source: The Contractor's Underwriting Department using USDA, RMA data.

Table 26. Insurance Experience for Same Crops Insured Without Organic Common Option Codes, 2004 through 2008

Crop	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate (%)	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Wheat	392,323	38,069	4,354,668	732,403	16.8	100,820	25.7	547,782	0.748	0.126
Corn	527,854	37,726	14,466,069	1,266,692	8.8	104,654	19.8	698,958	0.552	0.048
Soybeans	506,380	34,184	8,079,585	795,669	9.8	132,132	26.1	678,795	0.853	0.084
Apples	10,928	627	1,285,670	62,447	4.9	1,152	10.5	49,767	0.797	0.039
Grapes	27,489	1,358	1,516,957	82,517	5.4	1,606	5.8	20,066	0.243	0.013
Tomatoes	4,923	467	478,623	22,074	4.6	309	6.3	8,708	0.395	0.018
Almonds	12,755	939	1,508,695	89,012	5.9	1,532	12.0	29,742	0.334	0.020
Flax	6,239	454	34,813	5,082	14.6	2,194	35.2	6,607	1.300	0.190
Potatoes	3,129	383	380,135	28,435	7.5	650	20.8	16,089	0.566	0.042
Barley	16,413	2,050	158,375	21,844	13.8	5,275	32.1	23,298	1.067	0.147
Top Ten	1,508,433	116,257	32,263,591	3,106,175	9.6	350,324	23.2	2,079,812	0.670	0.064
All other crops	176,385	21,270	5,193,119	443,424	8.5	42,206	23.9	397,687	0.897	0.077

* Totals derived by adding whole dollar values and then rounding
Source: The Contractor's Underwriting Department using USDA, RMA data.

Net indemnities (premium minus indemnity) for the insured organic production were negative $6.3 million for these years. Corn and soybeans had net indemnities of negative $8.7 million. Grapes and apples accounted for $4.5 million of the gains. The total of the negative net indemnities was $13.8 million, while the crops with positive net indemnities produced a surplus of $7.8 million. Thirty-two of the 81 crops had negative net indemnities, leaving 49 with positive net indemnities (see Appendix F, Table F1). This reinforces the earlier indications of any lack of consistency in the data.

The top ten organically insured crops with gains and the top ten with losses are shown in Table 27. The amount of the gain (loss) and its percent of liability are also shown along with the same data for acreage insured without the organic code. Of the crops with gains on the organic acreage, only oats had negative net indemnities on acreage insured without the organic codes. For eight of the ten crops, the percentage gain relative to the liability exceeded the comparable percentage gain on the acreage without an organic code.

Five of the ten crops with the largest net losses for organic codes also had negative net indemnities for the acreage insured without the organic codes. With the exception of prunes, the percentage loss on the acreage insured with an organic code exceeded the percentage loss on acreage insured without the organic codes. In a number of cases, the percentage loss on the acreage insured with an organic code was much greater than the percentage loss on acreage insured without the organic codes. Data for all crops are included in Appendix G.

TABLE 27. Top Ten Organic Crops with Net Underwriting Gain and Top Ten Crops with Net Underwriting Loss, 2004 through 2008

Crop	With Organic Code			Without Organic Code		
	Gain (Loss)	Liability	Percent of Liability	Gain (Loss)	Liability	Percent of Liability
Apples	3,177	79,141	4.01	12,680	1,285,670	0.99
Grapes	1,311	30,793	4.26	62,452	1,516,957	4.12
Tomatoes	565	23,752	2.38	13,365	478,623	2.79
Wheat	449	57,700	0.78	184,620	4,354,668	4.24
Raisins	353	5,712	6.17	17,347	288,569	6.01
Avocados	337	4,699	7.17	11,397	202,382	5.63
Pears	154	5,076	3.04	3,469	125,226	2.77
Oats	153	2,680	5.72	(613)	19,045	-3.22
Plums	147	1,939	7.57	1,819	48,480	3.75
Fresh Nectarines	93	1,853	5.03	3,295	75,085	4.39
Cotton Ex Long Staple	(228)	510	-44.69	(547)	67,071	-0.82
Valencia Oranges	(297)	3,671	-8.10	(317)	94,924	-0.33
Sweet Corn	(303)	5,014	-6.04	1,053	35,439	2.97
Potatoes	(323)	9,757	-3.31	12,346	380,135	3.25
Prunes	(469)	5,596	-8.39	(18,711)	137,167	-13.64
Rice	(589)	4,386	-13.43	795	129,108	0.62
Flax	(702)	4,622	-15.20	(1,524)	34,813	-4.38
Navel Oranges	(703)	6,247	-11.25	(4,043)	554,061	-0.73
Corn	(3,464)	71,165	-4.87	567,735	14,466,069	3.92
Soybeans	(5,254)	42,834	-12.27	116,874	8,079,585	1.45

Source: The Contractor's Underwriting Department using USDA, RMA data.

Principal States with Common Option Organic Code, 2004 through 2008

Acreage with the organic common option code was reported in 39 states during 2004 through 2008 (Appendix H). The location of organically insured acreage corresponds to the major production locations for the principal crops insured under organic codes (Table 28). Montana, Minnesota, and North Dakota were the top 3 states with organically insured acreage, accounting for slightly less than 40 percent of all acres insured under organic codes but only about 16 percent of the liability. This reflects the relatively low value per acre of wheat in particular and the major commodity crops in general. California and Colorado were the only other states to report more than 100,000 acres for organic insurance coverage during 2004 through 2008. In terms of the insured liability, California was far and away the leader with nearly 30 percent of the total. Washington occupied second place, with about 20 percent of the total liability.

With the exception of Washington, the loss ratio for acreage insured under the organic code in the top ten states exceeded the loss ratio for acreage without the organic code. Among all 39 states, the loss ratio on organic acreage was lower in 10 of the states, most of which had very small acreage under the organic code (Appendix H, Table H1). Among the 39 states, the organic loss ratio was more than double the non-organic in 11 states. However, once the comparisons are beyond the top ten states in terms of acres, the thinness of the data become even more evident.

TABLE 28. Top Ten States with Acreage Insured Under Organic Common Option Codes, 2004 through 2008

State	Organic Net Acres	Non-Organic Net Acres	Organic Liability	Non-Organic Liability	Organic Premium	Non-Organic Premium	Organic Indemnity	Non-Organic Indemnity	Organic Loss Ratio	Non-Organic Loss Ratio	Organic:Non-Organic Ratio
Montana	238,347	16,781,863	19,193	1,534,302	4,396	256,856	5,171	199,886	1.176	0.778	1.511
Minnesota	203,677	25,496,953	37,922	7,023,349	5,993	718,043	9,018	455,235	1.505	0.634	2.373
North Dakota	179,984	14,140,803	17,235	1,985,784	4,236	331,136	5,622	281,443	1.327	0.850	1.562
Colorado	132,099	2,389,744	17,426	399,402	4,770	63,002	4,722	57,001	0.990	0.905	1.094
California	127,698	5,713,354	129,449	6,072,665	9,872	364,466	9,533	191,265	0.966	0.525	1.840
Nebraska	96,998	9,960,420	19,118	2,706,171	2,697	264,835	2,603	130,940	0.965	0.494	1.952
Utah	95,179	306,351	4,522	23,279	1,153	3,752	1,410	3,943	1.223	1.051	1.164
Iowa	84,830	19,308,444	23,858	7,050,279	2,457	520,938	4,286	336,274	1.745	0.646	2.703
Washington	76,891	1,787,562	95,172	1,883,006	5,967	93,890	3,031	66,839	0.508	0.712	0.713
Michigan	62,981	1,916,713	14,672	465,555	2,652	52,796	2,524	38,415	0.952	0.728	1.308
Top Ten	1,298,683	97,802,206	378,567	29,143,793	44,193	2,669,714	47,920	1,761,239	1.084	0.660	1.644
All Other States	365,978	28,338,792	82,162	7,832,212	11,766	855,618	14,210	700,855	1.208	0.819	1.474

Source: The Contractor's Underwriting Department using USDA, RMA data.

Table 29 shows the top ten states in terms of underwriting gain and the worst ten in terms of underwriting loss. With the exception of Arizona, Florida, and Oklahoma, the percentage rate of gain on acreage with an organic code is far smaller than the rate of gain for the same county/crop combinations without the organic code. The percentage rate of loss on organic acreage in the worst performing states is far higher than the rate of loss for the same county/crop combinations without the organic code in the states with underwriting losses.

TABLE 29. Top Ten States with Net Underwriting Gain and Top Ten States with Net Underwriting Loss, 2004 through 2008

State	With Organic Code			Without Organic Code		
	Gain (Loss)	Liability	Percent of Liability	Gain (Loss)	Liability	Percent of Liability
Washington	2,936	95,172	3.1	27,051	1,883,006	1.4
Arizona	637	6,347	10.0	74	14,304	0.5
Wyoming	352	4,411	8.0	1,497	54,123	2.8
California	337	139,192	0.2	173,200	6,368,692	2.7
Florida	155	6,406	2.4	(2,852)	320,854	-0.9
Michigan	128	14,672	0.9	14,381	465,555	3.1
Nebraska	93	19,118	0.5	133,895	2,706,171	4.9
Hawaii	59	4,704	1.3	372	174,407	0.2
Colorado	49	17,426	0.3	6,002	399,402	1.5
Oklahoma	32	551	5.7	(2,154)	18,647	-11.5
Missouri	(157)	1,791	-8.8	4,626	169,724	2.7
South Dakota	(192)	5,821	-3.3	54,312	1,063,111	5.1
Ohio	(250)	1,918	-13.0	(650)	415,221	-0.2
Utah	(258)	4,522	-5.7	(191)	23,279	-0.8
Texas	(831)	15,676	-5.3	(4,190)	958,716	-0.4
Montana	(774)	19,193	-4.0	56,970	1,534,302	3.7
North Dakota	(1,387)	17,235	-8.0	49,693	1,985,784	2.5
Iowa	(1,830)	23,858	-7.7	184,664	7,050,279	2.6
Wisconsin	(1,993)	12,304	-16.2	5,050	1,263,387	0.4
Minnesota	(3,024)	37,922	-8.0	262,808	7,023,349	3.7

Source: The Contractor's Underwriting Department using USDA, RMA data.

Influence of Coverage Level

The Contractor attempted to determine if differences in the coverage level had any influence on the performance of acreage insured with an organic code relative to acreage insured without the organic code. Table 30 provides the percentage distribution of business by coverage level percentage for acreage with and without an organic code as well as the loss ratio for each coverage level. Generally, acreage with an organic code had a greater proportion of the premium at coverage levels between 50 to 60 percent. Acreage with organic codes had 21 percent of the premium in this range whereas acreage without an organic code had 12 percent. With the exception of the 55 percent and 60 percent coverage levels, loss ratios by coverage level are consistently higher for the acreage with an organic code. Weighted loss ratios by coverage level are consistently higher for the acreage with an organic code, although the significance of some of the differences is questionable considering sample size for some of the coverage level categories.

TABLE 30. Contribution of Coverage Level to Realized Loss Ratios for Acreage with and without an Organic Code

Coverage Level (%)	Organic Code			Non-Organic Code		
	Share of Premium (%)	Loss Ratio	Weighted Loss Ratio	Share of Premium (%)	Loss Ratio	Weighted Loss Ratio
50	12.6	0.585	0.073	8.2	0.444	0.037
55	2.3	0.329	0.007	0.1	0.522	0.000
60	5.9	0.722	0.043	3.8	0.873	0.033
65	16.2	1.294	0.209	14.2	0.789	0.112
70	23.1	1.293	0.299	33.3	0.722	0.240
75	32.2	1.115	0.359	31.0	0.695	0.216
80	4.9	1.517	0.074	7.3	0.527	0.038
85	2.9	1.552	0.045	2.1	1.038	0.022
Total	100.0		1.110	100.0		0.698

Source: The Contractor's Underwriting Department using USDA, RMA data.

Although superficially it appears differences in choices of coverage level most likely had no bearing on the performance between practices, the Contractor attempted to develop a more robust test. At the aggregate level, the Contractor interchanged the loss ratios (i.e., the actual loss ratios for coverage levels with organic code were assigned to coverage levels without the organic codes and vice-versa). This comparison does not account for differences in coverage levels among counties or crops, but is intended only as an approximation to performance that might have been observed if the units with organic code experienced, in the aggregate, had the same loss ratios as did the units with non-organic codes at the same coverage level. Results are shown in Table 31. The aggregate loss ratio for acreage with the organic code would have been the same as was actually observed for units without the organic codes. Conversely, the loss ratio would have increased for the acreage without the organic codes when the loss ratios by coverage level for organic acreage are used.

TABLE 31. Contribution of Coverage Level to Realized Loss Ratios for Acreage with and without an Organic Code with Loss Ratios Interchanged

Coverage Level (%)	Organic Code			Non-Organic Code		
	Share of Premium (%)	Loss Ratio	Weighted Loss Ratio	Share of Premium (%)	Loss Ratio	Weighted Loss Ratio
50	12.6	0.444	0.056	8.2	0.585	0.048
55	2.3	0.522	0.012	0.1	0.329	0.000
60	5.9	0.873	0.052	3.8	0.722	0.027
65	16.2	0.789	0.128	14.2	1.294	0.184
70	23.1	0.722	0.167	33.3	1.293	0.430
75	32.2	0.695	0.224	31.0	1.115	0.346
80	4.9	0.527	0.026	7.3	1.517	0.111
85	2.9	1.038	0.030	2.1	1.552	0.032
Total	100.0		0.693	100.0		1.179

Source: The Contractor's Underwriting Department using USDA, RMA data.

The Contractor concludes that any differences in distribution of business among coverage levels were not important in explaining the differences in the aggregate loss ratios between the two categories of acreage. The acreage insured with the organic codes performed worse (had higher losses) overall.

The preceding analysis shows some challenges in analyzing the insurance experience data to "either confirm or refute the existence of significant, consistent, and systemic variations in loss history exist between organic and conventional commodities, either collectively or on an individual crop basis." In most cases, where patterns might have been thought to exist, it was also possible to identify exceptions to those patterns. With the limited data available, artifacts of aggregation and *de facto* sampling errors have the potential to lead to potentially dangerous generalizations. It is also challenging to examine tabular data at a range of scales that reveals patterns pertinent to the objective of confirming or refuting significant, consistent, and systemic variations in loss history between organic and conventional production. The Contractor therefore explored the potential of alternative approaches to expose patterns that may have not been evident in the preceding quantitative insurance performance analysis.

The Contractor initially calculated the loss ratios by crop from data for the counties where organic production for the crop was insured, using aggregate indemnities and premiums in those counties for the years when organic production was reported during the period from 2001 through 2008. For 15 crop codes for a variety of specialty crops, the loss ratios were 0 for both the conventional and the organic insurance (Table 32). The Crop Provisions for many of these crops define specific causes of loss such as wind, excess precipitation, freezes or other events that seemingly are independent of the decision to follow organic practices. Unless organic practices result in a tree that is weaker than a tree resulting from non-organic practices, it is difficult to justify a load on the premium rate for losses due to wind, excess precipitation, freeze, and similar perils.

TABLE **32. Crops with No Reported Indemnities (for either Conventional or Organic Production) in Counties with Insured Organic Production between 2001 and 2008**

Crops	Codes
Citrus	
Citrus II (FL)	246
Citrus III (FL)	247
Orlando Tangelos (AZ/CA)	237
Citrus trees	
Citrus Trees I (TX)	240
Citrus Trees IV (TX)	243
Citrus Trees V (TX)	244
Grapefruit Trees (FL)	208
Orange Trees (FL)	207
All Other Citrus Trees (FL)	211
Processing Freestone Peaches	222
Strawberries	110
Tobacco	
Burley Tobacco	231
Cigar Filler Tobacco	234
Cigar Binder Tobacco	235
Vegetable crops	256

Source: The Contractor's Underwriting Department using USDA, RMA data.

There were also data reported under 14 crop codes with loss ratios for conventional production greater than the loss ratios for the crop produced under organic practices (Table 33). Several of the crops produced organically had no indemnities during these years (i.e., a loss ratio of zero).

TABLE 33. Crops with Aggregate Loss Ratios for Insured Conventional Production Greater than for Insured Organic Production between 2001 and 2008 in Counties with Insured Organic Production

Crop	Conventional Loss Ratio	Organic Loss Ratio
Citrus IV	2.44	0.00
Citrus I	1.65	0.00
Peppers	0.64	0.00
Processing Cling Peaches	0.17	0.00
Sugarcane	0.11	0.00
Mineola Tangelos	0.11	0.00
Cultivated Wild Rice	0.08	0.00
Macadamia Trees	0.06	0.00
Forage Production	0.71	0.51
Pears	0.31	0.26
Citrus VII	4.82	4.04
Sugar Beets	0.37	0.32
Forage Seeding	0.61	0.55
Millet	0.76	0.72

Source: The Contractor's Underwriting Department using USDA, RMA data.

However, in general, the crops that had losses at any time during these years were more likely to have a higher loss ratio for organic production than for conventional production.

The Contractor then graphed the relationship of loss cost ratios for conventional and organic production and loss ratios for conventional and organic production by crop and year, for all crops combined, at a variety of different aggregation levels. In the following figures resulting from this exercise, the red line illustrates a one to one relationship between the conventional loss cost ratio (loss ratio) and the organic loss cost ratio (loss ratio). Any data points falling on this line represent equivalence of the elements with and without the organic code. Data points above this blue line represent worse performance (in terms of loss cost ratio or loss ratio) of organic crops relative to non-organic crops and points below the line represent better performance. The blue line is an ordinary least squares regression of the relationship between loss cost ratio (or loss ratio) for a crop (or crops) with the organic code and without the organic code.

In the following figures, comparing the loss cost ratios and loss ratios for crops that had both organic and conventional experience over the period 2001 to 2008, many of the points are above the blue line, indicating almost the organic crops performed worse in terms of losses relative to non-organic crops. However, it is important to note that as the risk to non-organic production increases, the regression generally predicts better performance for organic production relative to conventional production.

FIGURE 12. Comparison of Organic and Non-organic Insurance Experience for All Crops by Crop during the Period from 2001 through 2008 (each point represents one year for one crop) at the State, Risk Region, County, and Paired Unit Levels*

* Figure 12 includes ten scatter diagrams, five for loss cost ratio and five for loss ratio, showing the range of relationships between values for organic and non-organic insured crops at the crop, state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value, however there are numerous instances where the organic value is lower than the non-organic value at all levels. In all cases, a simple regression line starts above the origin (0, 0) and eventually drops below the x=y line. (Figure 12 Data)

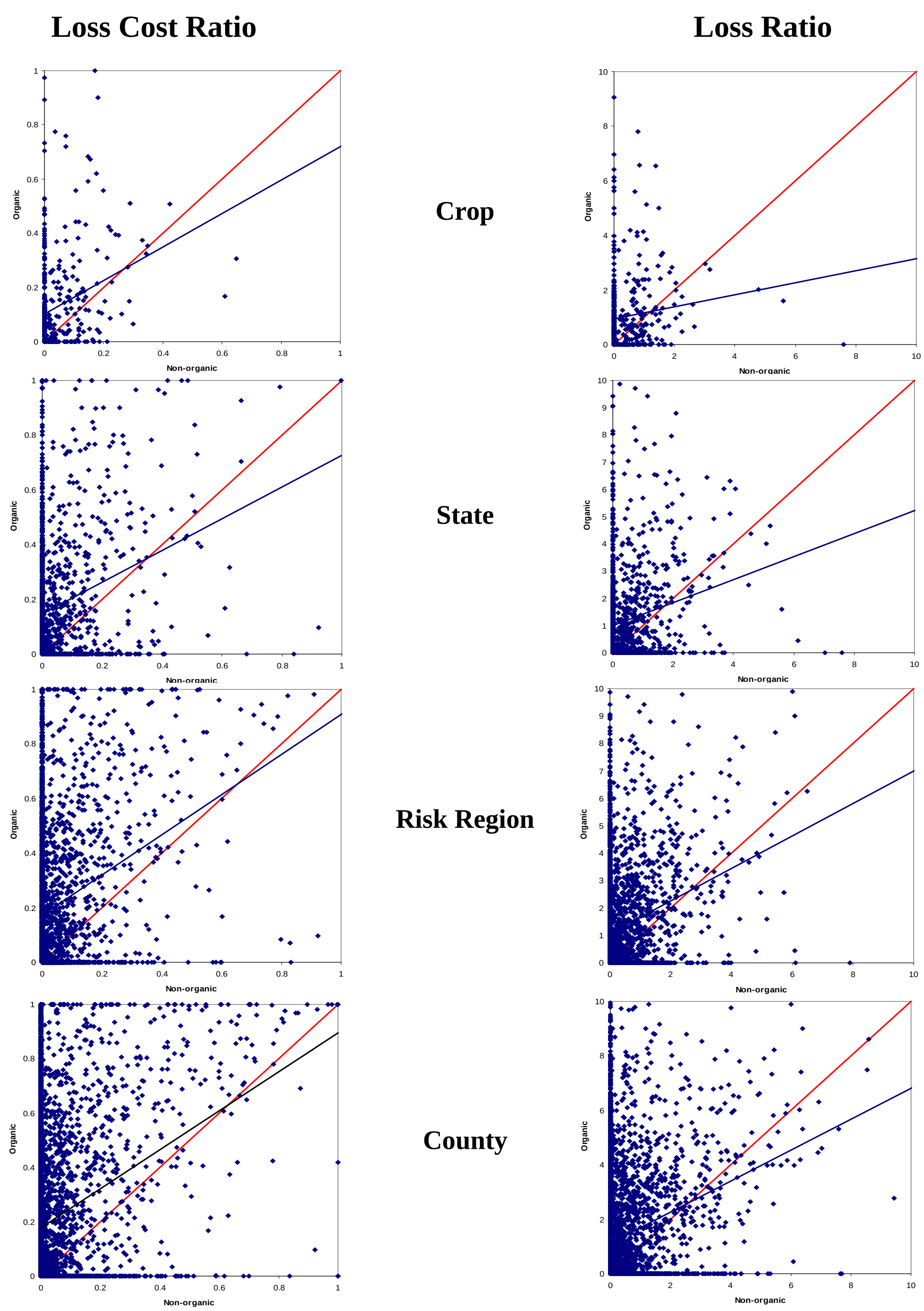
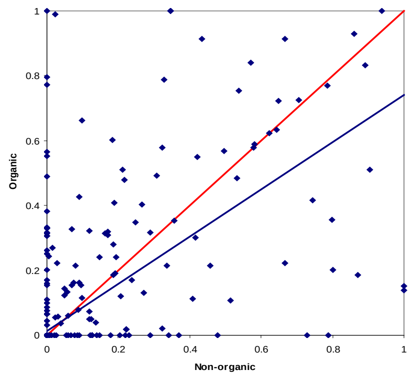


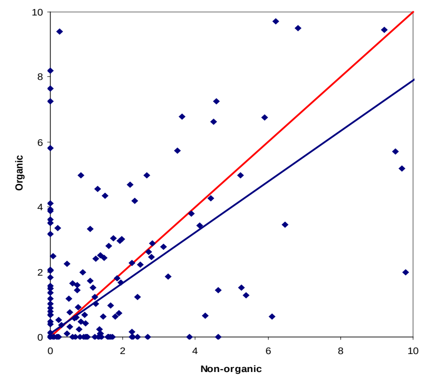
FIGURE 12. **Comparison of Organic and Non-organic Insurance Experience for All Crops by Crop during the Period from 2001 through 2008 at the State, Risk Region, County, and Paired Unit Levels (continued)**

Loss Cost Ratio



Paired Unit

Loss Ratio



The Contractor then examined the organic crops with the most substantial production (i.e., wheat, corn, and soybean) to determine if the patterns observed for all crops were reflected in the performance of each of the major crops (Figures 13 to 15). While the slopes of these comparisons for wheat, corn, and soybean, did in fact reflect the relationship that much of the organic crops performance was worse than the performance of the same crops grown under non-organic practices, again as the risk (defined here as likelihood of severe loss) to non-organic production increases, the regression predicts better performance for organic production relative to conventional production.

One interpretation of this pattern is that the issues with performance of insurance for organic crops cannot be resolved by a simple, across the board increase in insurance premiums (a fixed surcharge), since such an increase would have the effect of lowering the regression line with minimal impact on the slope (i.e., if the premium for organic production is raised across the board, the premium for organic crops in extreme conditions would be excessive relative to the premium for the same crop grown conventionally). Another inference is that while organic guarantees may be too high in some cases, a change to the guarantee structure would not necessarily align the historic performance with the ideal one to one line.

Instead, it is likely a number of factors are interacting to create the performance pattern observed for organic crops relative to their non-organic counterparts. These could include potential rating issues, issues with guarantees including T-yields used for organic production, underwriting issues related to experience with the crop and with organic practices, loss adjustment issues related to uninsurable causes of loss (i.e., poor farming practices), or yield differentials due to practice being adjusted as an insurable loss.

FIGURE 13. Comparison of Organic and Non-organic Insurance Experience for Wheat during the Period from 2001 through 2008 (each point represents one year) at the State, Risk Region, County, and Paired Unit Levels*

* Figure 13 includes eight scatter diagrams, four for loss cost ratio and four for loss ratio, showing the range of relationships between values for organic and non-organic wheat at the state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line starts above the origin (0, 0) and eventually drops below the x=y line at the state, risk region, and county level. At the paired unit level the regression line starts at or very near the origin and stays below the x=y line.
(Figure 13 Data)

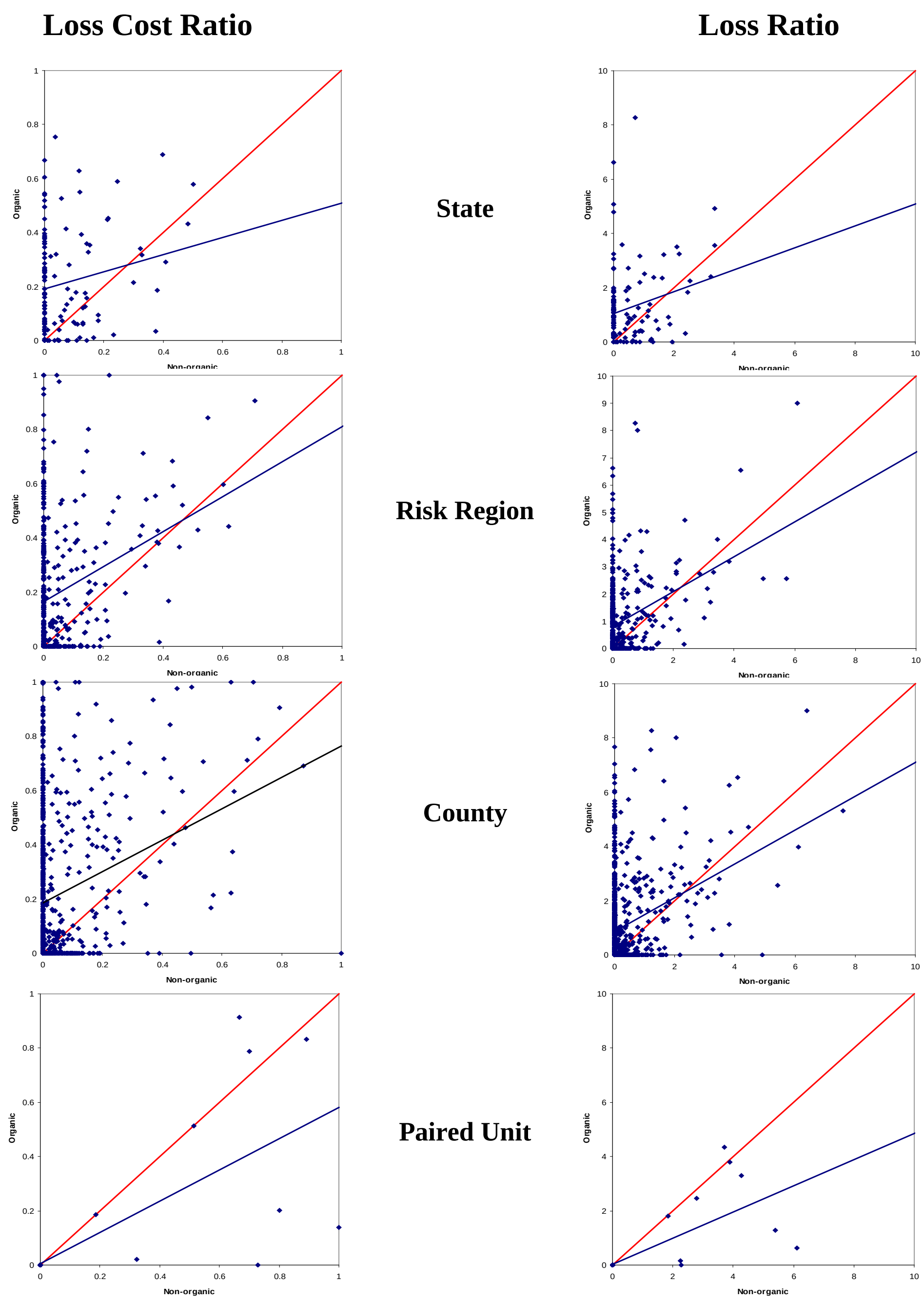


FIGURE 14. Comparison of Organic and Non-organic Insurance Experience for Corn during the Period from 2001 through 2008 (each point represents one year) at the State, Risk Region, County, and Paired Unit Levels*

Figure 14 includes eight scatter diagrams, four for loss cost ratio and four for loss ratio, showing the range of relationships between values for organic and non-organic corn at the state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line in each scatter diagram starts above the origin (0,0) in every case and eventually drops below the x=y line at the state, risk region, and county level for both loss cost ratio and loss ratio. At the risk region and paired unit levels for the loss cost ratio the simple regression line is slightly above the x=y line starts at or very near the origin and stays above the x=y line. At the paired unit level for loss ratio, the regression starts above the origin and drops below the x=y line.
(Figure 14 Data)

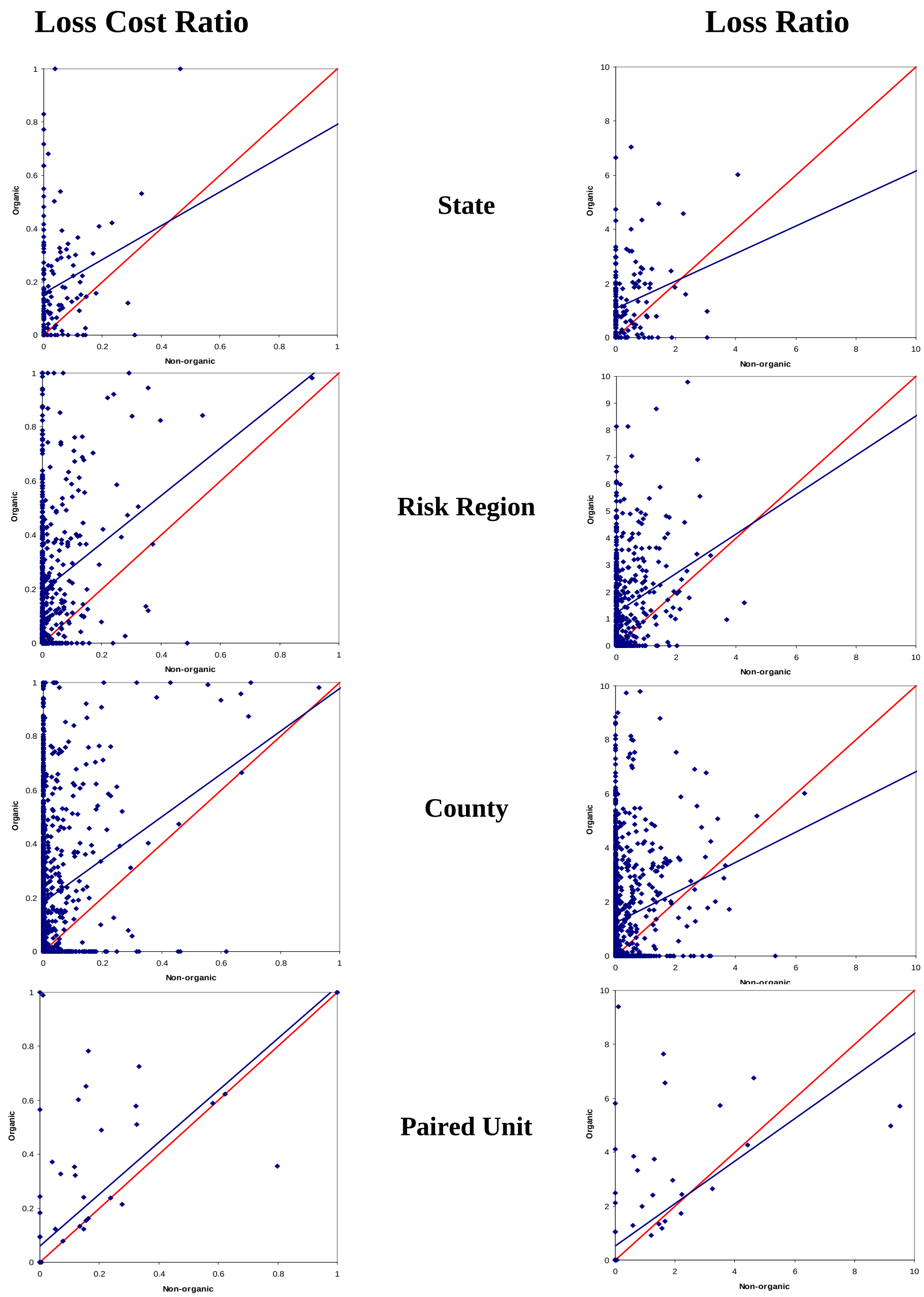
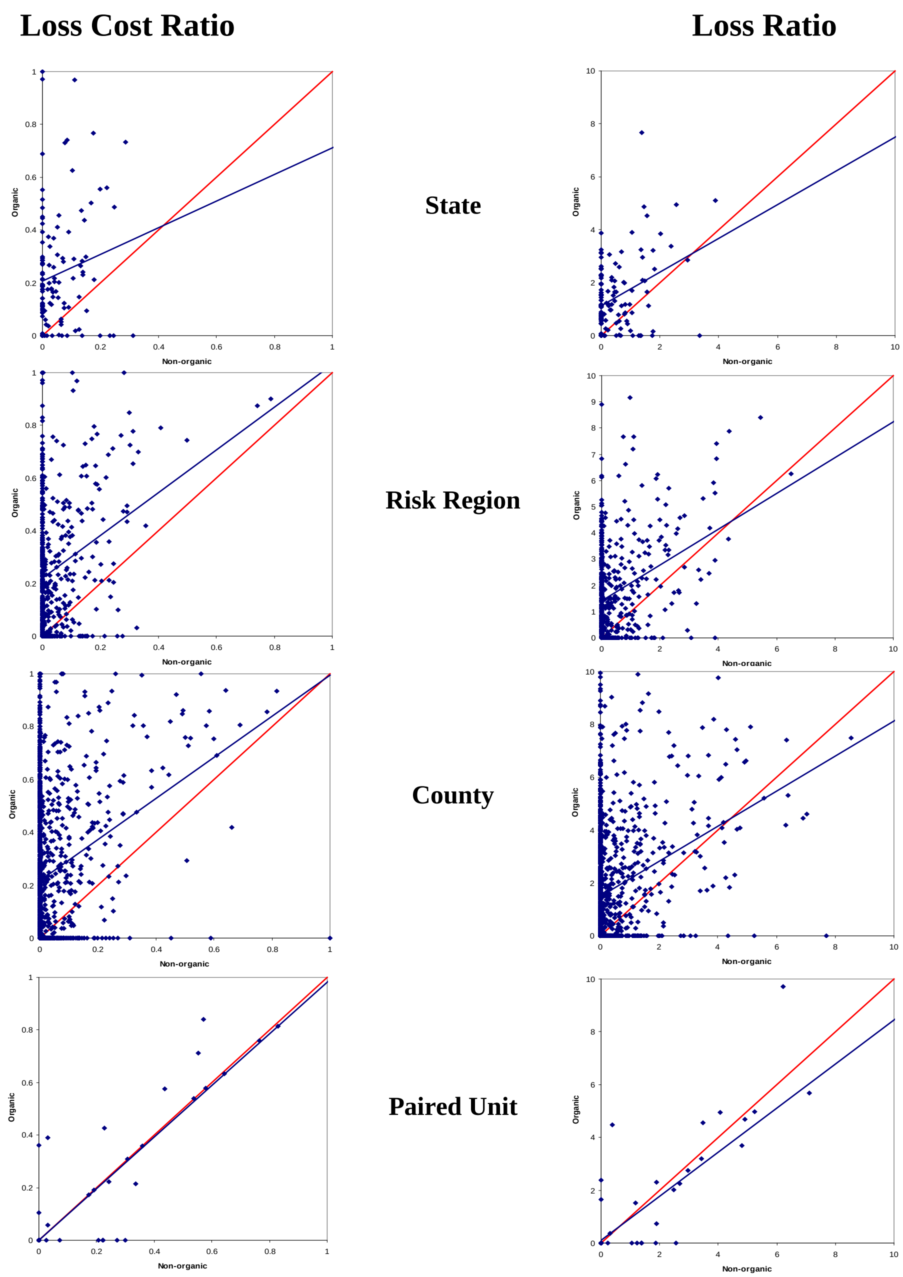


FIGURE 15. Comparison of Organic and Non-organic Insurance Experience for Soybeans during the Period from 2001 through 2008 (each point represents one year) at the State, Risk Region, County, and Paired Unit Levels*

* Figure 15 includes eight scatter diagrams, four for loss cost ratio and four for loss ratio, showing the range of relationships between values for organic and non-organic soybean at the state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels. At the paired unit level, a simple regression line overlies x=y for loss cost ratio and starts at or very near the origin and stays below the x=y line for loss ratio. (Figure 15 Data)



Differentiating between the potential contributors to the insurance performance patterns by crop and year is a task outside the scope of this contract. Rating issues, guarantees, underwriting issues, and loss adjustment create a range of interactions that cannot be revealed through the analysis of historical performance over a relatively short period, regardless of the percentage of total U.S. organic production insured in the most recent year. Furthermore, if organic producers are choosing to insure only if they believe their risk is high and not participating if they perceive their risk is low (regardless of the insurance premium subsidy), then that producer behavior adds another potential complication to the assessment of the cause underlying the differences in insurance performance between organic and conventional production.

Nonetheless, the Contractor expanded the examination of the insurance experience patterns to include a variety of other crops, including rice (Figure 16), barley (Figure 17), apples (Figure 18), all fruits collectively except apples (Figure 19), all vegetables collectively (Figure 20), all vegetables collectively except potatoes (Figure 21), and potatoes (Figure 22). The all fruits except apples group includes production insured as fresh apricots, processing apricots, avocado, blueberries, cranberries, cherries, figs, grapes, table grapes, raisins, grapefruit, lemons, fresh nectarines, peaches, processing cling peaches, processing freestone peaches, fresh freestone peaches, pears, plum, prunes, strawberries, mandarin oranges, Mineola tangelos, sweet oranges, Valencia oranges, and as California citrus, Citrus I, Citrus II, Citrus III, Citrus IV, Citrus V, and Citrus VII. No single fruit predominated in this assemblage. The all vegetables except potatoes group includes production insured as onions, sweet corn for canning and processing, green peas, peppers, fresh market tomatoes, and processing tomatoes. No single vegetable predominated in this assemblage.

FIGURE 16. Comparison of Organic and Non-organic Insurance Experience for Rice during the Period from 2001 through 2008 (each point represents one year) at the State, Risk Region, County, and Paired Unit Levels*

* Figure 16 includes eight scatter diagrams, four for loss cost ratio and four for loss ratio, showing the range of relationships between values for organic and non-organic rice at the state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line starts above the origin (0, 0) and eventually drops below the x=y line at the risk region and county level. At the paired unit level the regression line starts at or very near the origin and stays below the x=y line. (Figure 16 Data)

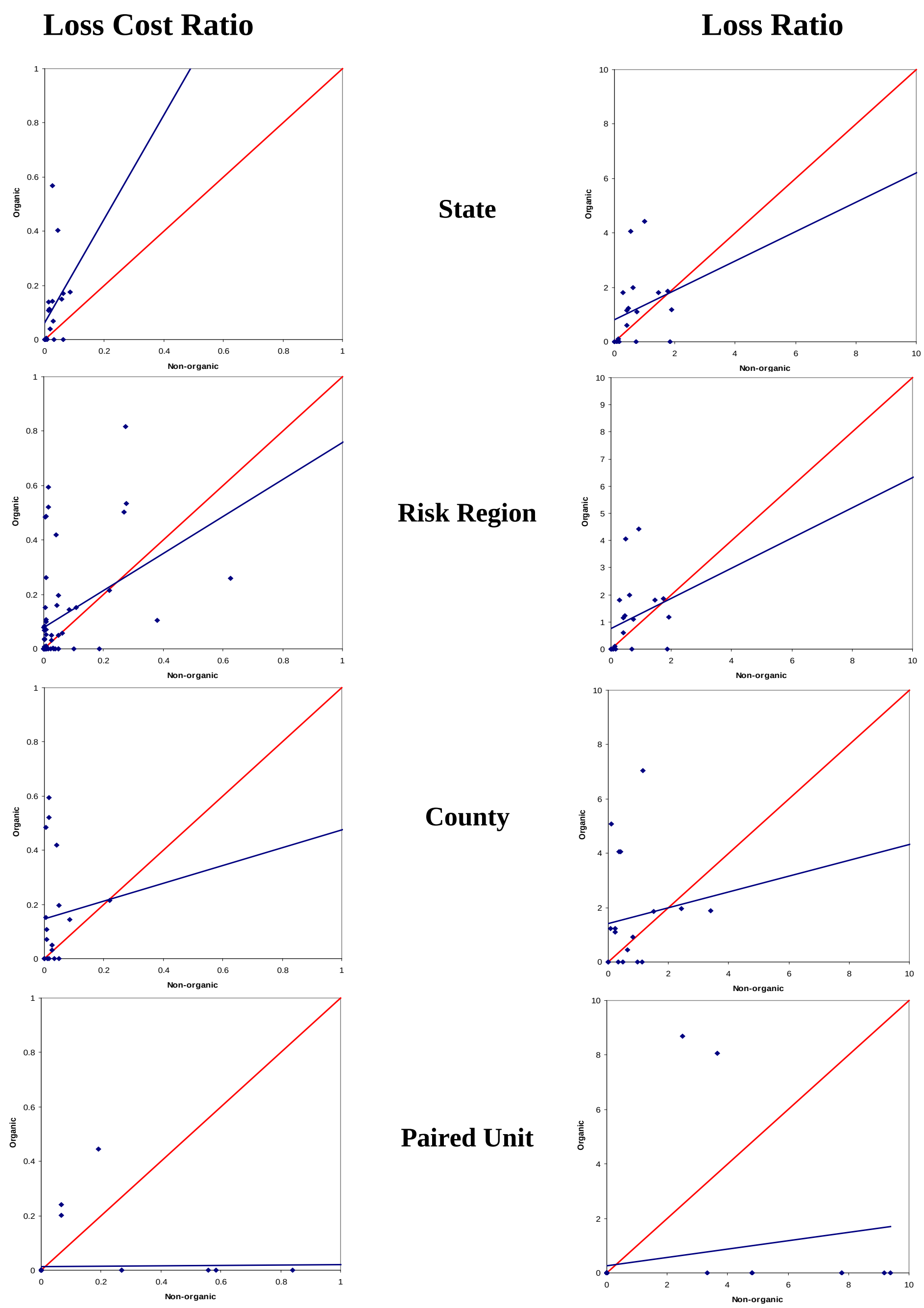


FIGURE 17. Comparison of Organic and Non-organic Insurance Experience for Barley during the Period from 2001 through 2008 (each point represents one year) at the State, Risk Region, and County Levels, by Year

* Figure 17 includes six scatter diagrams, three for loss cost ratio and three for loss ratio, showing the range of relationships between values for organic and non-organic barley at the state, risk region, and county levels (there are not sufficient data to create the diagrams at the paired unit level). In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels graphed. A simple regression line starts above the origin (0, 0) and eventually drops below the x=y line at the state, risk region, and county level. (Figure 17 Data)

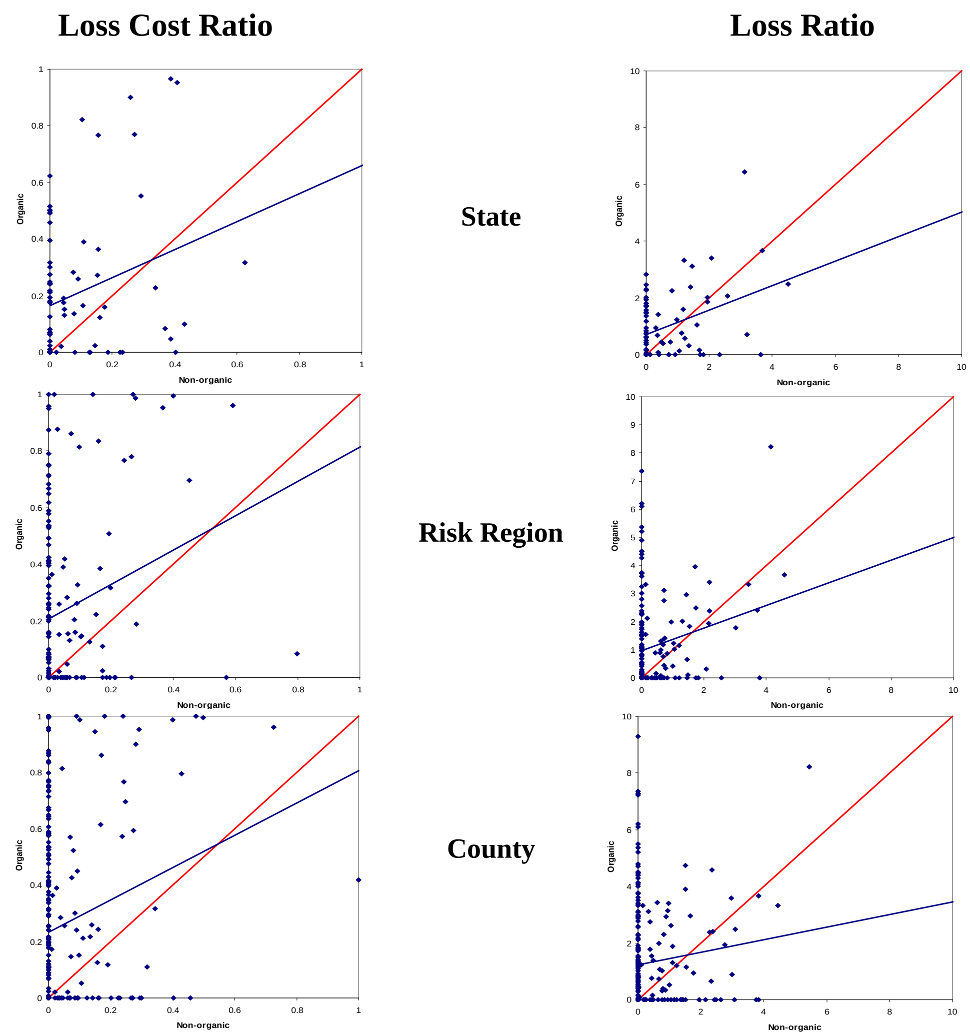


FIGURE 18. Comparison of Organic and Non-organic Insurance Experience for Apples during the Period from 2001 through 2008 (each point represents one year)at the State, Risk Region, County, and Paired Unit Levels *

* Figure 18 includes eight scatter diagrams, four for loss cost ratio and four for loss ratio, showing the range of relationships between values for organic and non-organic apples at the state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line for the scatter diagrams at the state, risk region, and county level starts above the origin (0, 0) and eventually drops below the x=y line. At the paired unit level the regression lines essentially overly the x=y line. (Figure 18 Data)

Loss Cost Ratio **Loss Ratio**

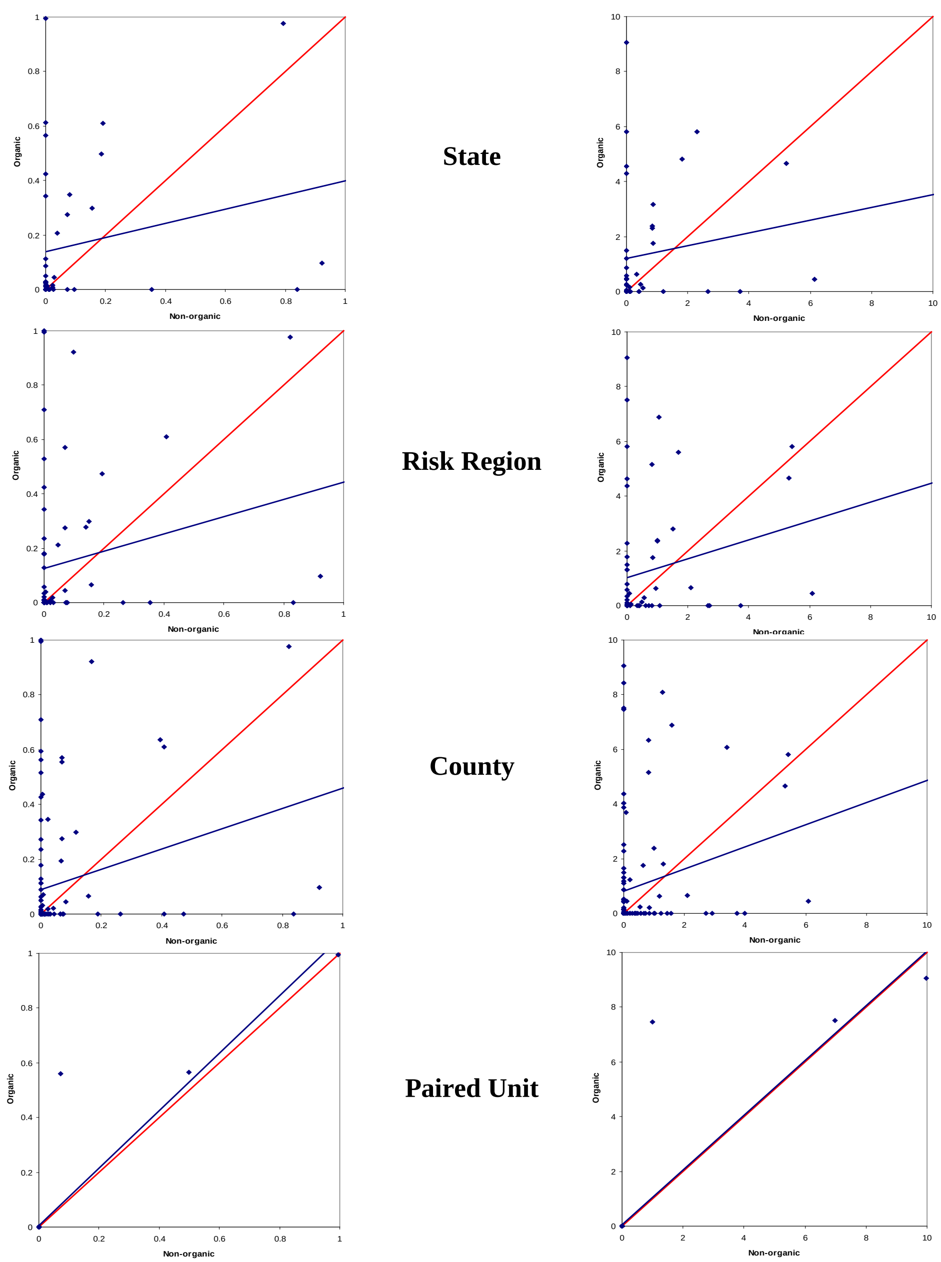


FIGURE 19. Comparison of Organic and Non-organic Insurance Experience for All Fruits Except Apples during the Period from 2001 through 2008 (each point represents one year for one crop) at the Crop, State, Risk Region, County, and Paired Unit Levels*

* Figure 19 includes ten scatter diagrams, five for loss cost ratio and five for loss ratio, showing the range of relationships between values for organic and non-organic fruit (except apples) at the crop, state, risk region, county and paired unit level. In general there are more cases where the organic value exceeds the non-organic value; however there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line for the scatter diagrams at the crop, state, risk region, and county level starts above the origin (0, 0) and eventually drops below the x=y line. At the paired unit level the regression lines essentially overly the x=y line. (Figure 19 Data)

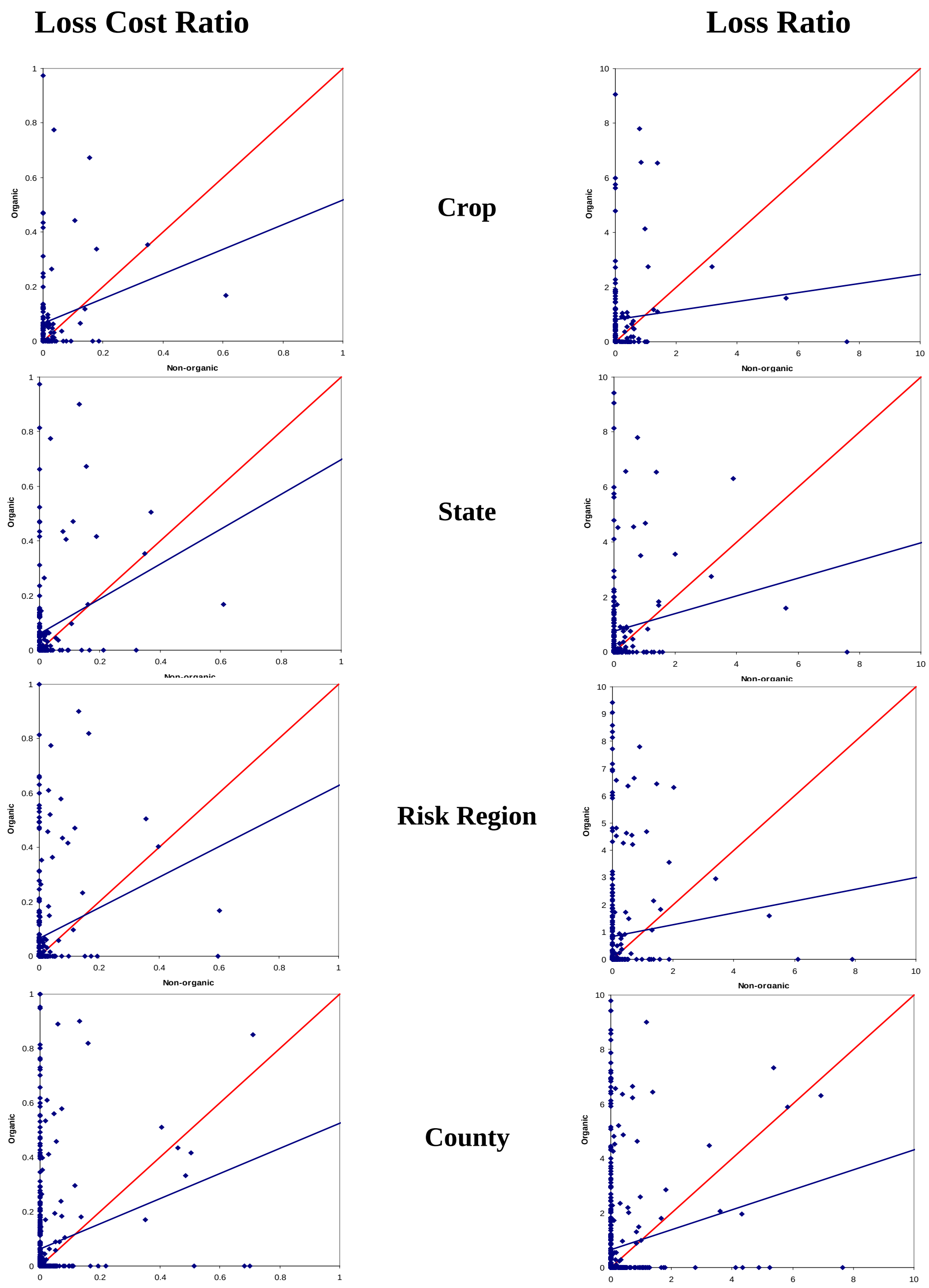
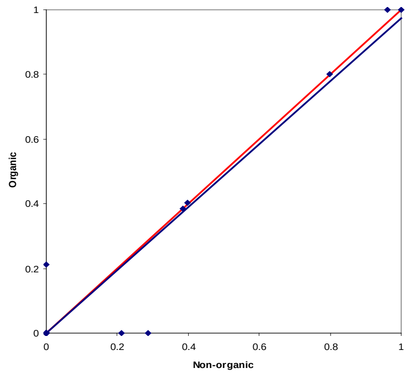


Figure 19. Comparison of Organic and Non-organic Insurance Experience for All Fruits Except Apples during the Period from 2001 through 2008 at the Crop, State, Risk Region, County, and Paired Unit Levels (continued)

Paired Unit

Loss Cost Ratio



Loss Ratio

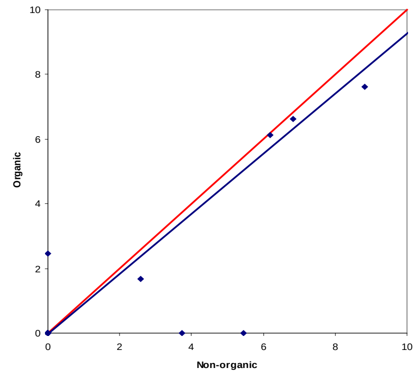


FIGURE 20. Comparison of Organic and Non-organic Insurance Experience for All Vegetables during the Period from 2001 through 2008 (each point represents one year for one crop) at the Crop, State, Risk Region, County, and Paired Unit Levels*

* Figure 20 includes ten scatter diagrams, five for loss cost ratio and five for loss ratio, showing the range of relationships between values for organic and non-organic vegetables at the crop, state, risk region, county and paired unit level. While there are more cases where the organic value exceeds the non-organic value, there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line for the scatter diagrams at the state, risk region, and county level starts above the origin (0, 0) and eventually drops below the x=y line in seven instances, while for the state level in both cases and at the risk region level for loss cost ratio the regression line lies above the line x=y. (Figure 20 Data)

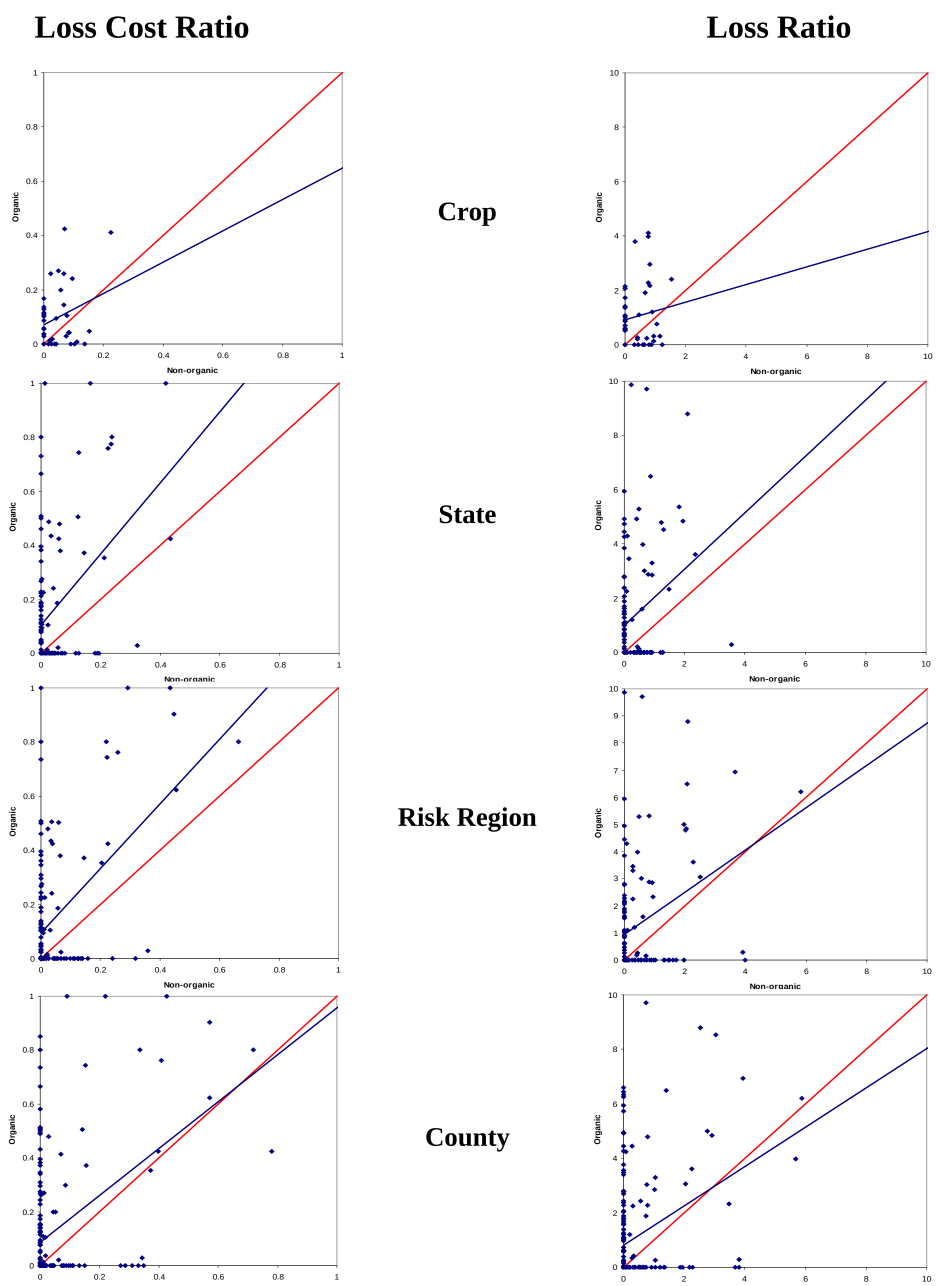


Figure 21. Comparison of Organic and Non-organic Insurance Experience for All Vegetables Except Potatoes during the Period from 2001 through 2008 (each point represents one year for one crop) at the Crop, State, Risk Region, County, and Paired Unit Levels*

* Figure 21 includes eight scatter diagrams, four for loss cost ratio and four for loss ratio, showing the range of relationships between values for organic and non-organic vegetables except potatoes at the crop, state, risk region, and county level. While there are more cases where the organic value exceeds the non-organic value, there are numerous instances where the organic value is lower than the non-organic value at all levels. A simple regression line for the scatter diagrams at the state, risk region, and county level starts above the origin (0, 0) and eventually drops below the x=y line in six instances, while for the loss cost ratio at the state and risk region level the regression line lies above the line x=y. (Figure 21 Data)

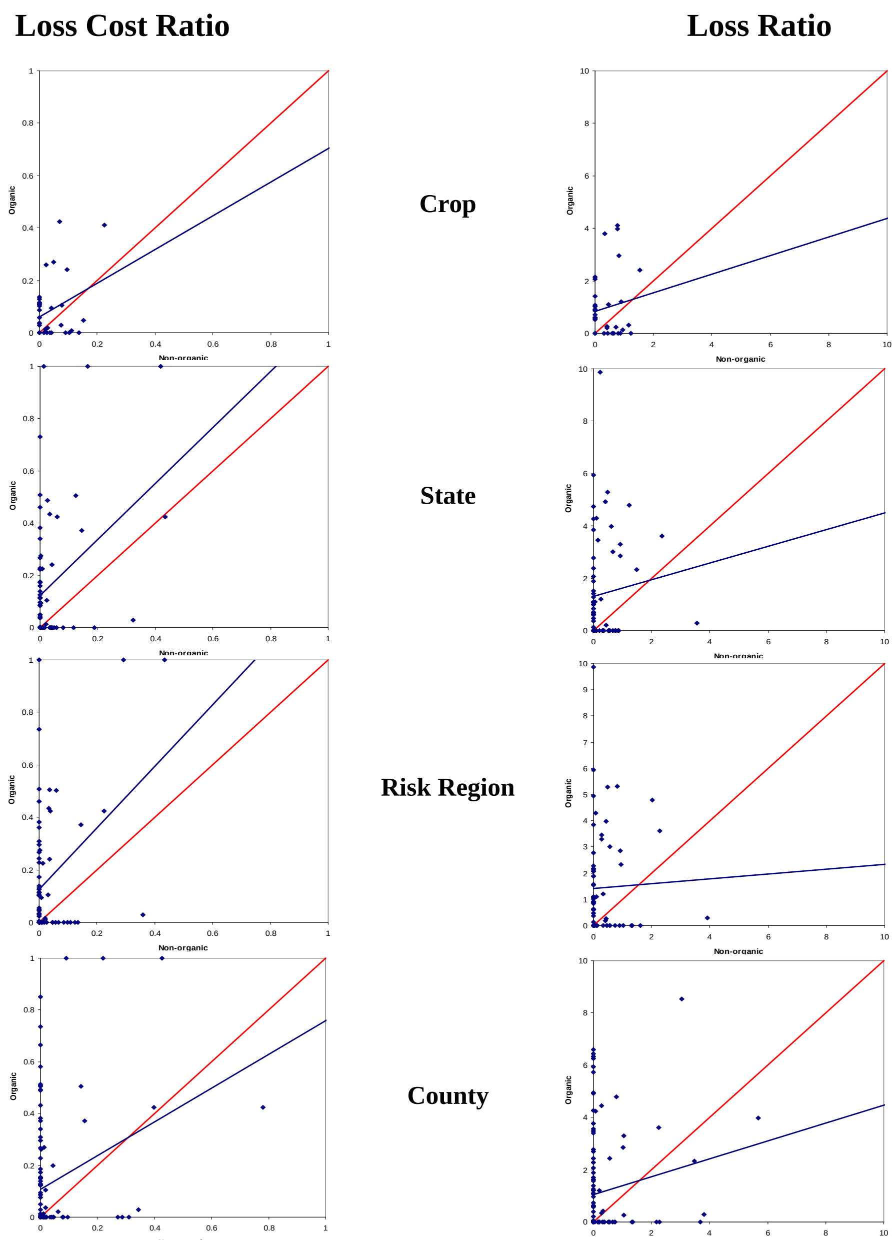
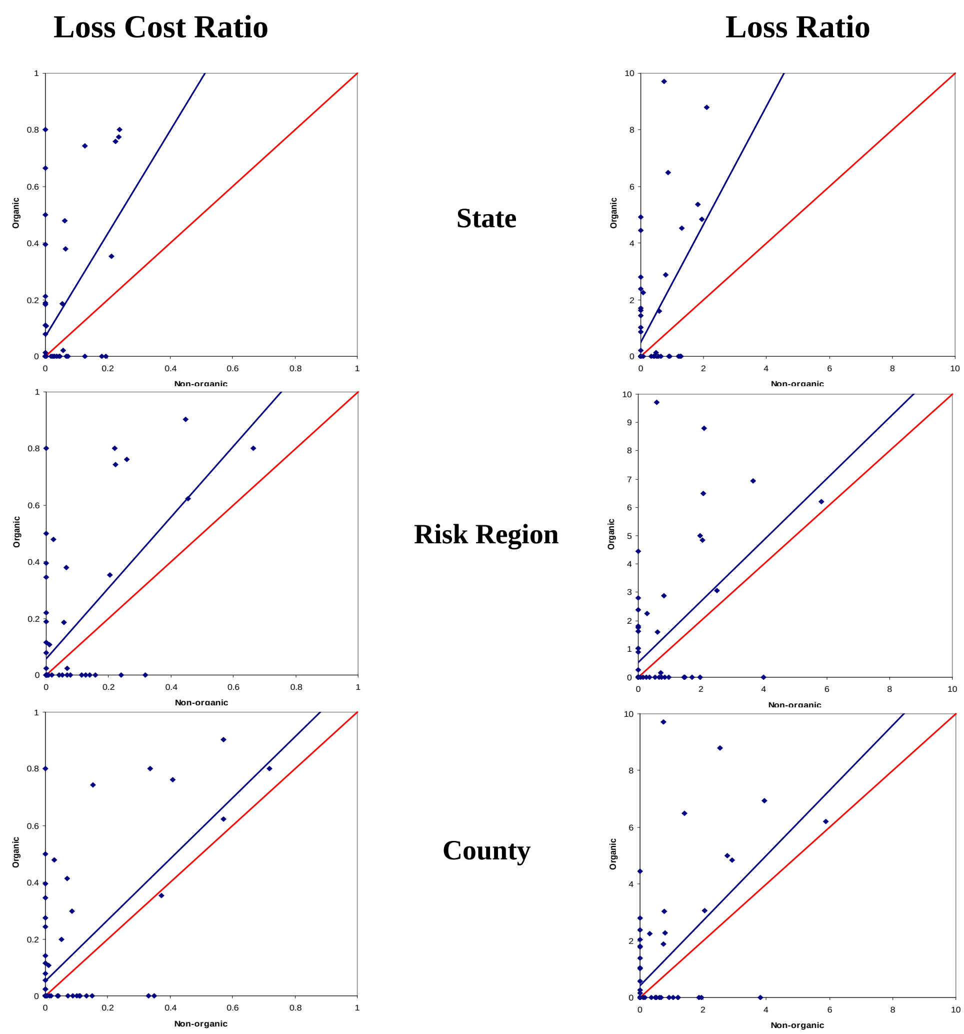


Figure 22. Comparison of Organic and Non-organic Insurance Experience for Potatoes during the period from 2001 through 2008 (each point represents one year) at the State, Risk Region, and County Levels*

* Figure 22 includes six scatter diagrams, three for loss cost ratio and three for loss ratio, showing the range of relationships between values for organic and non-organic potatoes at the state, risk region, and county levels. While there are more cases where the organic value exceeds the non-organic value, there are instances where the organic value is lower than the non-organic value at all levels. A simple regression line for the scatter diagrams at the state, risk region, and county level lies above the line x=y in every case. (Figure 22 Data)



It is important to remember this graphical analysis is a tool to envision a wide-ranging and disparate dataset. There is a great deal of "noise" in these data. There is a potential of cluster sampling, both geographically and by the insureds' perception of potential risk. At the county level, when organic and conventional yields are compared by crop and year, of the more than 5,500 cases, more than 31 percent have insufficient data to run even simple statistical tests of differences such as Student's or Welch's T-tests. Of those yields that can be compared using these tests, 84 percent cannot be demonstrated to be statistically significantly different at the 95 percent confidence level. In the cases where there are significant differences (just 10.8 percent of all the potential comparisons at the county level), there is a predominance of cases where the organic yield is significantly lower than the conventional yield.

There is no question the insurance for organic production is not functioning ideally. In aggregate analyses, the differences in risk responses between organic production and conventional production generally favor conventional production in the lowest risk situations and organic production in the higher risk situations. The organic producers receive a disproportionate amount of the indemnities paid at lower risk levels (as defined by the risk for conventional production). This response to risk levels likely explains some of the bias toward higher yields for conventional production in the crop-county-year combinations having significantly different yields under the two practices. The number of samples of production under lower relative risk levels would be expected to exceed number of samples of production under high risk scenarios. What can not be explained using this logic is the relative responses to risk in the paired unit comparisons.

In the comparison of loss ratios and loss cost ratios at the paired unit level, the intercept of the regression between units with the different codes is generally very close to 0, and the regression line generally lies near or below the one to one line throughout the range of loss ratios and loss cost ratios. This pattern is consistent across crops and crop sectors. However the sample size is limited, with very few observations relative to the magnitude of all insurance experience for the crop during these years. Furthermore, there is a high degree of scatter in the data. Nonetheless, the consistency of this observation when the most precise comparisons possible are made is notable.

Causes of Loss on Acreage with an Organic Code

The primary benefit of insuring qualifying acreage under organic codes (as opposed to insuring it as a conventional crop) is to obtain the coverage for losses due to insects, disease, and weeds. With the insurance in place, acreage on which one of these causes of loss occurs will be covered (if an allowed pesticide[88] was applied and was not effective due to an adverse weather condition and it could not be reapplied either due to label limitations or continuation of the adverse weather conditions). In addition, a condition for which there is no pesticide labeled for use on the crop and/or causative agent, similarly, would be covered. These are the same conditions that apply to conventional acreage. The only difference is the type of pesticide that is considered in making the determination. Losses due to all other causes – drought, wind, excess precipitation, and so forth – are covered exactly the same for crops insured under the organic code as these conditions would be covered under conventional practices.

[88] The term pesticide is used herein in the same manner as it is used by the Environment Protection Agency. It includes all chemicals commonly referenced as pesticides, fungicides, rodenticides, and related terms.

During 2004 through 2008, indemnities for causes of loss 71 (insects) and 81 (plant disease) on acreage insured with an organic code amounted to $0.994 million. Producers paid approximately $2.6 million for the organic coverage. Acreage of the same crops insured without the organic code in the same counties paid $12.5 million in indemnities for these causes of loss during this period. The loss cost on the acreage without an organic code was 0.00036 percent. Thus, for the liability on acreage with the organic code, expected indemnities under the conventional coverage would have been $450 million[89] times 0.00036, or $0.162 million. Thus, acreage with an organic code received excess indemnities of $0.831 million relative to conventional practice. Based on these assumptions and relationships, the current rate premium factor for acreage with an organic code resulted in an over-charge of approximately $1.8 million during these years.

Consequently, while the insurance experience does show in aggregate a pattern of higher losses for organic crops than for conventional crops, this pattern is neither consistent nor systemic. It is difficult to defend a uniform rate premium surcharge, especially in light of the limited added risk associated with use of organic practices to control disease, insects, and weeds.

Relationships of Organic and Non-organic Loss Cost Ratios by Crop and in the Aggregate
This report considers the available data at all levels of aggregation to determine if the data reflect a systemic, consistent, and significant bias between conventional and organic loss experience. This section addresses the analysis at the highest level of aggregation. Table 34 compiles summary statistics for each crop for which an organic code was reported during 2004 through 2008. The table compares loss cost ratios by crop, as well as the respective loss ratios, earned premium rates, for the organic and non-organic practices for the years 2004 through 2008. In addition, the number of units insured for each crop under the organic and non-organic practices for the years 2004 through 2008 is reported. In the case of rice, three comparisons are presented: 2004 through 2005 and 2006 through 2008 as well as the aggregate data for 2004 through 2008, to address the actuarial changes that were made for that crop. The earned premium rate for the organic practice is net of the five percent surcharge.[90]

[89] $450 million is the approximate liability on acreage with an organic code. See Table 7.
[90] The earned premium rate divided by 1.05 to eliminate the effect of the historic 5 percent surcharge applied over the period during which these observations were collected.

Table 34. Summary of Insurance Performance of Organic and Non-organic Production by Crop in all Counties with Organic Production for that Crop

Crop	All Organic Units				All Non-Organic Units				Ratios		Implied Surcharge
	Total Number of Units	Net Earned Premium Rate*	Loss Ratio	Loss Cost Ratio	Total Number of Units	Earned Premium Rate	Loss Ratio	Loss Cost Ratio	Earned Premium Rate	Loss Cost Ratio	
Wheat	6,028	0.239	0.969	0.243	397,088	0.168	0.750	0.126	1.422	1.930	0.36
Blueberries	15	0.092	1.344	0.130	141	0.075	0.428	0.032	1.221	4.025	2.30
Onions	86	0.151	0.905	0.143	590	0.106	0.810	0.086	1.421	1.668	0.17
Oats	886	0.205	0.734	0.158	7,532	0.183	1.176	0.215	1.122	0.735	-0.34
Millet	419	0.281	0.722	0.213	9,842	0.198	0.963	0.191	1.422	1.119	-0.21
Rice 04-05	123	0.095	2.349	0.234	3,576	0.033	0.813	0.027	2.878	8.733	2.03
Rice 06-08	447	0.063	1.158	0.077	6,741	0.038	0.636	0.024	1.662	3.179	0.91
Rice All	570	0.071	1.540	0.114	10,317	0.037	0.676	0.025	1.927	4.606	1.39
Avocado	106	0.113	0.655	0.078	2,979	0.115	0.646	0.074	0.985	1.048	0.06
Cotton	331	0.225	1.149	0.272	52,026	0.250	1.082	0.271	0.901	1.004	0.11
Cotton Ex Long Staple	6	0.106	5.012	0.558	476	0.042	1.195	0.050	2.531	11.151	3.41
Macadamia Nuts	6	0.022	0.771	0.018	403	0.020	1.549	0.031	1.086	0.568	-0.48
Macadamia Trees	8	0.013	0.000	0.000	281	0.011	0.000	0.000	1.203	N/A	N/A
Almonds	199	0.091	0.989	0.094	12,755	0.059	0.334	0.020	1.542	4.793	2.11
Walnuts	72	0.037	3.853	0.151	1,927	0.033	0.102	0.003	1.122	44.422	38.58
Flax	871	0.223	1.650	0.386	6,239	0.146	1.300	0.190	1.526	2.033	0.33
Forage Seeding	77	0.126	0.493	0.065	1,351	0.136	0.489	0.066	0.927	0.980	0.06
Forage Production	120	0.111	0.459	0.054	2,855	0.114	0.639	0.073	0.972	0.734	-0.24
Peaches	3	0.185	0.000	0.000	82	0.177	0.135	0.024	1.044	0.000	-1.00
Prunes	94	0.147	1.542	0.239	2,186	0.142	1.960	0.279	1.037	0.856	-0.17
Raisins	64	0.070	0.160	0.012	5,264	0.079	0.243	0.019	0.882	0.611	-0.31
Corn	4,274	0.126	1.367	0.181	529,179	0.087	0.554	0.048	1.445	3.744	1.59
Sweet Corn, C&P	112	0.046	2.249	0.109	522	0.035	0.162	0.006	1.297	18.903	13.57
Popcorn	43	0.104	1.526	0.167	230	0.058	0.107	0.006	1.785	26.622	13.92
Beans, Processing	27	0.149	2.182	0.341	195	0.104	0.768	0.080	1.432	4.269	1.98
Beans, Dry	400	0.161	1.290	0.217	8,692	0.138	0.823	0.113	1.165	1.917	0.65
Safflower	51	0.145	1.267	0.193	208	0.106	0.949	0.100	1.371	1.922	0.40
Grain Sorghum	133	0.275	1.600	0.462	7,589	0.175	1.109	0.194	1.573	2.384	0.52
Table Grapes	159	0.059	1.260	0.079	3,294	0.049	0.371	0.018	1.223	4.358	2.56
Grapes	715	0.057	0.293	0.018	30,692	0.057	0.287	0.016	1.007	1.079	0.07
Apples	1,137	0.074	0.485	0.038	10,975	0.049	0.795	0.039	1.526	0.978	-0.36
Cultivated Wild Rice	9	0.039	0.000	0.000	39	0.041	0.097	0.004	0.959	0.000	-1.00
Cherries	135	0.064	1.249	0.084	4,465	0.104	1.121	0.117	0.617	0.722	0.17
Cranberries	23	0.087	0.836	0.076	746	0.029	0.222	0.006	2.976	11.767	2.95
Figs	47	0.056	0.642	0.038	76	0.067	0.296	0.020	0.841	1.914	1.28
Hybrid Corn Seed	31	0.108	0.503	0.057	116	0.051	0.832	0.042	2.122	1.347	-0.37
Peas, Green	92	0.085	1.060	0.094	349	0.068	0.522	0.036	1.239	2.645	1.13
Peas, Dry	490	0.227	1.393	0.332	7,785	0.144	1.189	0.171	1.578	1.941	0.23
Mustard	3	0.104	3.029	0.332	3	0.100	0.249	0.025	1.039	13.296	11.79
Peanuts	183	0.070	0.991	0.073	3,019	0.050	0.469	0.023	1.413	3.134	1.22
Sunflowers	278	0.212	1.066	0.238	6,504	0.182	0.769	0.140	1.168	1.701	0.46
Soybeans	3,976	0.151	1.774	0.281	507,750	0.098	0.853	0.084	1.533	3.348	1.18
Potatoes	231	0.095	1.333	0.132	3,165	0.075	0.559	0.042	1.265	3.167	1.50
Tomatoes, Fresh Market & GP	4	0.110	0.000	0.000	9	0.139	0.472	0.066	0.794	0.000	-1.00
Tomatoes, Processing	197	0.057	0.600	0.036	4,923	0.046	0.395	0.018	1.229	1.964	0.60
Pears	328	0.040	0.268	0.011	5,065	0.034	0.187	0.006	1.160	1.746	0.50
Barley	706	0.203	0.910	0.194	16,448	0.138	1.066	0.147	1.470	1.317	-0.10
Plum	123	0.112	0.356	0.042	2,212	0.109	0.655	0.071	1.030	0.588	-0.43
Rye	27	0.163	1.024	0.175	13	0.174	0.145	0.025	0.935	6.932	6.42
Alfalfa Seed	3	0.064	6.312	0.426	1	0.058	7.512	0.432	1.116	0.985	-0.12
Strawberries	16	0.023	0.000	0.000	333	0.025	0.000	0.000	0.942	N/A	N/A
Grapefruit	14	0.047	3.683	0.182	102	0.044	1.055	0.047	1.062	3.893	2.67
Lemons	36	0.057	1.357	0.081	1,226	0.040	0.552	0.022	1.423	3.671	1.58

* Net Earned Premium Rate = Actual Earned Premium Rate divided by 1.05.
N/A = Organic Loss Cost Ratio is 0.00.

Table 34. Summary of Insurance Performance of Organic and Non-organic Production by Crop in all Counties with Organic Production for that Crop (continued)

Crop	All Organic Units				All Non-Organic Units				Ratios		Implied Surcharge
	Total Number of Units	Net Earned Premium Rate*	Loss Ratio	Loss Cost Ratio	Total Number of Units	Earned Premium Rate	Loss Ratio	Loss Cost Ratio	Earned Premium Rate	Loss Cost Ratio	
Mandarins	11	0.069	0.265	0.019	76	0.074	0.354	0.026	0.930	0.730	-0.22
Mineola Tangelos	8	0.062	0.000	0.000	86	0.070	1.140	0.080	0.884	0.000	-1.00
Orange Trees	1	0.018	0.000	0.000	57	0.019	0.000	0.000	0.921	N/A	N/A
Grapefruit Trees	1	0.018	0.000	0.000	6	0.016	0.000	0.000	1.093	N/A	N/A
All Other Citrus Trees	1	0.018	0.000	0.000	4	0.019	0.000	0.000	0.958	N/A	N/A
Navel Oranges	86	0.061	3.414	0.220	7,925	0.055	1.538	0.084	1.122	2.615	1.33
Sweet Oranges	3	0.075	5.082	0.399	13	0.080	1.091	0.087	0.938	4.591	3.89
Valencia Oranges	78	0.066	2.923	0.204	2,333	0.069	1.373	0.095	0.961	2.147	1.24
Fresh Apricots	45	0.109	1.512	0.173	170	0.107	0.798	0.085	1.023	2.034	0.99
Processing Apricots	13	0.096	1.303	0.131	172	0.106	1.490	0.158	0.905	0.830	-0.08
Fresh Nectarines	145	0.082	0.416	0.036	1,922	0.059	0.260	0.015	1.386	2.333	0.68
Processing Cling Peaches	18	0.036	0.000	0.000	323	0.036	0.744	0.026	1.006	0.000	-1.00
Processing Freestone Peaches	1	0.052	0.000	0.000	1	0.052	0.000	0.000	0.999	N/A	N/A
Fresh Freestone Peaches	144	0.069	0.903	0.065	1,600	0.047	0.064	0.003	1.475	21.821	13.79
Flue Cured Tobacco	28	0.053	3.353	0.185	1,592	0.059	2.552	0.151	0.889	1.226	0.38
Burley Tobacco	3	0.092	0.000	0.000	7	0.087	1.194	0.103	1.063	0.000	-1.00
Cigar Filler Tobacco	1	0.061	0.000	0.000	3	0.045	0.000	0.000	1.371	N/A	N/A
Ciger Binder Tobacco	2	0.065	0.000	0.000	4	0.058	10.564	0.614	1.114	0.000	-1.00
Citrus Trees I	4	0.034	0.000	0.000	876	0.036	0.000	0.000	0.941	N/A	N/A
Citrus Trees IV	4	0.045	0.000	0.000	1,461	0.048	0.000	0.000	0.944	N/A	N/A
Citrus Trees V	6	0.045	0.000	0.000	138	0.043	0.000	0.000	1.061	N/A	N/A
Citrus I	13	0.036	0.000	0.000	281	0.030	7.101	0.214	1.190	0.000	-1.00
Citrus II	7	0.039	0.000	0.000	153	0.041	0.078	0.003	0.953	0.000	-1.00
Citrus III	2	0.035	0.000	0.000	1	0.035	0.000	0.000	0.997	N/A	N/A
Citrus IV	23	0.057	0.000	0.000	344	0.039	2.817	0.109	1.486	0.000	-1.00
Citrus V	6	0.066	3.376	0.234	100	0.048	3.420	0.163	1.386	1.436	0.04
Citrus VI	9	0.036	4.039	0.155	208	0.030	17.461	0.526	1.209	0.294	-0.76
Coffee	1	0.020	0.000	0.000	13	0.019	0.000	0.000	1.061	N/A	N/A
All Crops	24,628	0.116	1.121	0.136	1,690,128	0.095	0.707	0.067	1.212	2.019	0.67

* Net Earned Premium Rate = Actual Earned Premium Rate divided by 1.05.
N/A = Organic Loss Cost Ratio is 0.00.

Three ratios are presented in the final columns of the table. The penultimate column, which is the ratio of the non-organic loss cost ratio to the organic loss cost ratio, indicates the loss cost experience of the organic practice was two times higher in aggregate than the non-organic. The ratio of earned premium rate compares the average rates the producers paid for the organic production (again eliminating the historic five percent surcharge) to that of the non-organic production. On average, organic producers paid 21 percent higher premium rates in the same counties where an organic practice code was reported (net of the five percent surcharge). Thus, on average, the existing rating systems are increasing the premium rates for organic practice exclusive of the surcharge, based often on lower average yields for organic production and the impacts of yield ratio and exponent in the existing rating systems. The implied surcharges included in the final column exhibit substantial variation, with some indicating a 100 percent discount for organic because there were no losses for the organic practice for these crops in the available data. This is simply an artifact of the data representing very few years and very few insured units for those crops. An entry of N/A indicates no losses were reported for either practice. In several cases, these are "disaster" type crops such as citrus trees that have limited causes of loss.

Mathematically, the net surcharge implied by the available loss cost ratio data, if the organic practice were to be continued under the existing actuarial structure (i.e., with a flat surcharge across all crops and geography), would be 2.02 divided by 1.21, or approximately 67 percent (i.e. the factor on actuarial table for organic would be 1.67, not 1.05). At the same time, the aggregate loss ratio for insured organic crops from 2004 to 2008 was 1.121. Assuming insurable conditions for organic crops are appropriately captured in the available RMA data, an increase in premiums of the magnitude implied by the ratio of loss cost ratios would drive the insurance performance so the loss ratio for organic crops would be much less than 1.00, implying that under this approach the organic practice would be over-rated. Furthermore, the implied surcharges by crop shown in the final column exhibit substantial variation, including cases where the organic crop would receive a discount (a negative implied surcharge) over crops grown conventionally.[91]

It is also important to consider, these data represent an average of distinctly different rating systems. Table 35 is a subset of Table 34 containing only the APH-based rating system crops.[92] This subset of crops had an average loss cost ratio that was 185 percent greater than the loss cost ratio for the non-organic practice. The premium rating system generated a premium rate that was 52 percent greater on average; hence, the net surcharge under the existing actuarial structure for all crops insured under plan code 90 would be 88 percent considering all data in the aggregate. Experience from the 2009 crop year and additional crop years (when available) will likely modify these estimates.

[91] The variation in observations is striking, with some indicating a 100 percent discount for organic because there were no losses for the organic practice for these crops in the available data. This is simply an artifact of the data representing very few years and very few insured units for those crops. An entry of N/A indicates no losses were reported for either practice.

[92] Certain crops, such as dry beans or dry peas, were rated under the yield-dependent plan code 90 system in some parts of the country and under the flat rated plan code 86 in other areas for at least part of this time period. These crops have not been included in the table.

Table 35. Summary of APH Insurance Performance of Organic and Non-organic Production by Crop in all Counties with Organic Production for that Crop

Crop	All Organic Units				All Non-Organic Units				Ratios		Implied Surcharge
	Total Number of Units	Net Earned Premium Rate*	Loss Ratio	Loss Cost Ratio	Total Number of Units	Earned Premium Rate	Loss Ratio	Loss Cost Ratio	Earned Premium Rate	Loss Cost Ratio	
Wheat	6,028	0.239	0.969	0.243	397,088	0.168	0.750	0.126	1.422	1.930	0.36
Oats	886	0.205	0.734	0.158	7,532	0.183	1.176	0.215	1.122	0.735	-0.34
Millet	419	0.281	0.722	0.213	9,842	0.198	0.963	0.191	1.422	1.119	-0.21
Rice A	123	0.095	2.349	0.234	3,576	0.033	0.813	0.027	2.878	8.733	2.03
Rice B	447	0.063	1.158	0.077	6,741	0.038	0.636	0.024	1.662	3.179	0.91
Rice All	570	0.071	1.540	0.114	10,317	0.037	0.676	0.025	1.927	4.606	1.39
Cotton	331	0.225	1.149	0.272	52,026	0.250	1.082	0.271	0.901	1.004	0.11
Macadamia Nuts	6	0.022	0.771	0.018	403	0.020	1.549	0.031	1.086	0.568	-0.48
Almonds	199	0.091	0.989	0.094	12,755	0.059	0.334	0.020	1.542	4.793	2.11
Flax	871	0.223	1.650	0.386	6,239	0.146	1.300	0.190	1.526	2.033	0.33
Corn	4,274	0.126	1.367	0.181	529,179	0.087	0.554	0.048	1.445	3.744	1.59
Sweet Corn, C&P	112	0.046	2.249	0.109	522	0.035	0.162	0.006	1.297	18.903	13.57
Popcorn	43	0.104	1.526	0.167	230	0.058	0.107	0.006	1.785	26.622	13.92
Safflower	51	0.145	1.267	0.193	208	0.106	0.949	0.100	1.371	1.922	0.40
Grain Sorghum	133	0.275	1.600	0.462	7,589	0.175	1.109	0.194	1.573	2.384	0.52
Cranberries	23	0.087	0.836	0.076	746	0.029	0.222	0.006	2.976	11.767	2.95
Mustard	3	0.104	3.029	0.332	3	0.100	0.249	0.025	1.039	13.296	11.79
Sunflowers	278	0.212	1.066	0.238	6,504	0.182	0.769	0.140	1.168	1.701	0.46
Soybeans	3,976	0.151	1.774	0.281	507,750	0.098	0.853	0.084	1.533	3.348	1.18
Barley	706	0.203	0.910	0.194	16,448	0.138	1.066	0.147	1.470	1.317	-0.10
Rye	27	0.163	1.024	0.175	13	0.174	0.145	0.025	0.935	6.932	6.42
APH Crops	18,909	0.157	1.260	0.208	1,565,381	0.104	0.705	0.073	1.520	2.853	0.88

* Net Earned Premium Rate = Actual Earned Premium Rate divided by 1.05.
N/A = Organic Loss Cost Ratio is 0.00.

These comparisons of loss cost ratios provide a basis for assessing three potential treatments of the organic practice. The first is the continuation of the current practice of including a flat, across-the board surcharge on the actuarial tables. The variability in the crop-by-crop loss ratios and loss cost ratios makes this approach untenable. The second is the inclusion of a surcharge on the actuarial tables, the amount of which is the implied surcharge (derived from the ratio of the two identified columns less one [to reflect the assumed ratio if the crops perform identically under the two practices]). This approach will “force a balance” between the loss cost ratios of organic and conventional production, but only if the historic data accurately reflects the relative risks of the two practices and if the future participation and experience mirrors the past. The Contractor does not believe the first conditions have been met or that the second will be met. The last is treating the organic practice as a separate type/practice with its own base premium rate, based on whatever historical yield data may be available. It also implies other adjustments to the actuarial structures such as reduced transitional yields or reference yields, or imposing additional underwriting constraints.

As the analysis clearly reveals, the aggregate insurance experience for organic production has been very different from that of conventional production over the observations captured in the available data. Although the data provide a noisy picture and are not well suited to aggregate analysis as evidenced by the substantially different implied surcharge, the overall weight of the aggregate performance is too great to dismiss.

The approach applied to organic rating to date, a flat surcharge applied uniformly across all crops and geographies, was a logical starting point for insurance development, especially considering the public policy goals, the required timeframe for action, and the paucity of available data. The variation in performance at all levels of aggregation suggest substantial adjustments will need to be made to establish equitable and sustainable programs for individual organic crops and geographies, which will likely include independent rate assessment (as sufficient data become available) as well as adjustments to the reference yields, T-yields, underwriting, and pricing. A flat increase in organic premium rates based on aggregate insurance experience over a brief period is not appropriate. Organic production is diverse, encompassing a vast array of regions, crops, and risk profiles. Economic theory would postulate that a flat premium rate increase across organic crops, without corresponding equitable adjustments to other components of organic programs, will undermine the insured pool; poor producers may opt into the insurance scheme and better producers will opt out.

SECTION VI. RATING ANALYSIS FOR ORGANIC AND CONVENTIONAL CROPS BASED ON INSURANCE EXPERIENCE DATA

This section of the report addresses portions of Section 5.4.1.1. of the Statement of Work in the contract requiring the Contractor to determine "an actuarially-sound rate or rate differential for organic commodities relative to the same commodities grown under conventional non-organic practices," and contributes to the analysis that "… will either confirm the existence of significant, consistent, and systemic variations in loss history between organic and conventional commodities (collectively or on an individual crop basis) or refute such variation" required in that same section of the contract. It also addresses the requirement the Contractor "provide all datasets used for the analysis as well as documentation of the sources of those data, necessary formulas for the analysis, and logic used to compute the final results and reach any conclusions. The data and methods will be sufficiently detailed and complete so that RMA can reapply the methodology over time using current and updated data."

V.A. Introduction

The analysis presented herein evaluates whether significant, consistent, and systemic variations in yield risk and/or loss history experience between organic and conventional commodities (collectively or on an individual crop basis) exist. The null hypothesis is that organic and conventional production face the same insurance risk (expected loss) in a given locale on a per acre basis. The null hypothesis does not test whether the current RMA organic adjustment of 5 percent (premium multiplied by 1.05) is appropriate. Data available for this exercise are limited and therefore the conclusions of the actuarial analysis should be considered tentative and further study is recommended as more data become available.

Data used to test the null hypothesis were gathered from RMA Type 11 (acreage record), Type 15 (yield record), and Type 21 (loss line record) datasets from crop years 2001 through 2008 (Appendix I). The Type 11 and 21 files were utilized to evaluate insurance experience and the Type 15 files were used to compare yield variability between conventional and organic production. The experience and yield datasets were grouped by policy into two non-mutually exclusive groups: (1) paired observations, policies which insured both conventional and organic units,[93] and (2) all observations. The paired datasets allow outcomes (insurance experience and yield variability) from both conventional and organic acreage grown under the same policy, which is presumably located relatively close together and tended in a similar manner while experiencing similar growing conditions, to be directly tested.

Ideally, in assessing the impact of production practices on yields and yield variability, all variables other than the practices being studied would be controlled. Variables controlled would include, but not be limited to, factors such as soil mineral content, soil quality, slope, aspect, temperature, precipitation, planting date, yield potential of the seed, etc. To the extent possible, this is the approach taken in published studies comparing organic and conventional production.

The 'all observations' dataset in this study introduces potential asymmetries in the sampling[94] that generates the all conventional and organic groups. In contrast the paired dataset "matches"

[93] This group consists of the policies included in the discussion of the previous section.
[94] Since all observations are included, the "sampling" is a result of a producer's decision to participate in the insurance program. This is influenced by the producers perception of the cost and efficacy of the program.

elements of practices (i.e., soil types, experience, microclimate, etc.) that help to focus the analysis primarily on the differences between non-organic and organic production practices. Consequently, a paired dataset of sufficient size is the preferred dataset for the analysis. Unfortunately, the breadth of the paired dataset is limited. The second grouping includes all units in a given county for each crop for which there was organic production. In other words, if there were organic wheat production in a county, then all organic and conventional units would be included, but if there were no organic corn insured in a county, conventional corn units would be excluded. Analysis is focused on insurance experience and yield variability.

The paired insurance experience data are used to compare the loss ratio of conventional and organic units insured under the same policy. The datasets are parsed to evaluate the frequency and severity of indemnity payments across all units based on production practice and to compare loss ratios when both types of units (conventional and organic) under the policy receive an indemnity payment in a given year. The analysis of the "all observation" loss history data looks at differences in expected loss ratios (organic loss ratio minus conventional loss ratio) across crop and state combinations.

The analysis of yield variability focuses on the expected temporal standard deviation of yield across producers for a given crop and region. The RMA Actual Production History (APH) continuous rating function for major commodities has a negative non-zero exponent which means premium rates are inversely related with yield magnitude. This result is consistent with expected temporal standard deviation of yields being independent of expected yield. Previous research by the Contractor has also found that for major commodity crops in major production areas, standard deviation tends to be independent of expected yield. Therefore, if organic and conventional have similar expected temporal standard deviations, the RMA continuous rate function presumably handles additional risk due to differences in expected yield. The paired yield dataset is used to evaluate the ratio of temporal standard deviation across producers and the all observation dataset is used to look at pooled risk estimates by crop and risk region.

Analysis of yield standard deviation and expected loss history indicates an extremely wide range of outcomes across crops and regions. This result, compounded by the sparse data, given the task at hand, leads the Contractor to conclude there are not significant, consistent, and systemic variations in yield risk and/or loss history experience between organic and conventional production methods. However, there is also no indication the current five percent load for organic production is not actuarially sound.

V.B. Data Description and Discussion

Appropriate data handling is essential to performing credible analysis. In this section, the Contractor provides a detailed discussion of data collection, assessment procedures, and quality control measures employed in organizing datasets for the analysis of organic and conventional insurance risk. Research was conducted to identify and explore existing sources of regional and farm-level data. Production and experience data were identified at the farm level.

Data used to test the null hypothesis were gathered from RMA Type 11 (acreage record), Type 15 (yield record), and Type 21 (loss line record) datasets from crop years 2001 through 2008. The Type 11 and 21 files were utilized to evaluate insurance experience and the Type 15 files were used to compare yield variability between conventional and organic production. RMA historical record files have been used by the Contractor for many research efforts in the past and the data have proven to be reliable and robust. The yield data are discussed next followed by the loss experience data.

Historical Yield Data

The Contractor split RMA Type 15 records into two datasets depending on whether they are coded as conventional or organic. Table 7 provides the database fields and corresponding entries that were used to identify organic records by crop year. In all, 34,706 organic records were found based on the following organic coding criteria that if any of the three fields has an organic entry, the record is collected in the organic dataset. Conventional (non-organic) yield records were extracted for matching county/crop/crop year combinations. For conventional, roughly 6.9 million records were identified. Record counts by crop year for organic and conventional production are provided in Table 36.

TABLE 36. Type 15 Record Counts[95]

Year	Organic	Conventional
2001	777	165,392
2002	2,093	477,739
2003	2,656	558,127
2004	1,768	216,652
2005	4,349	919,632
2006	6,313	1,268,279
2007	7,749	1,534,780
2008	9,001	1,723,366
Total	34,706	6,863,967

Source: The Contractor's Rating Department using RMA data.

Datasets were kept separate but cleaned and aggregated in the same fashion. Quality control procedures were applied to the Type 15 data files. The first step was to identify and remove duplicate records.[96] Next, reported crop years from each file are limited to a range of 20 years. For example, for the 2008 file crop, reported years are limited to 1988 through 2007. For this formal rate analysis, the total number of actual yields reported (yield observations) is counted for each record and only records with four or more actual yield observations are utilized.[97] Further data quality assurance procedures were then implemented on qualifying records to identify data entry errors. Entry errors that are outliers can skew results if not handled appropriately. Entry errors were removed from the dataset. One screening method involves calculating yield standard deviation across years for a particular record. If the record's yield standard deviation is less than one, the record is removed.

[95] While the counts for Organic did not include the uniquely coded 702 entries for rice, a follow-up review of insurance experience showed no substantive or significant effects of this exclusion the rating analysis.
[96] The most likely cause of duplicate records is duplication of production history as a basic unit is disaggregated into optional units.
[97] An "actual yield" is a yield reported by a producer, i.e., a yield that actually "occurred," as opposed to a transitional or proxy yield.

Record-level data were aggregated to the policy level using an acreage weighted average and the resultant data are policy-level yield histories with at least four years of reported yields.[98] Pooling the data spatially and across crops both may obfuscate differences between organic and conventional data. However, the Contractor believes geographic pooling is more likely to hide differences between practices than pooling across crops, particularly given the use of relative risk measures which account for unit of measure differences across crops. It is likely there are policies which include the same historical yields across multiple crop year files. The presence of this situation reduces the degrees of freedom in the statistical results and could bias results. Previous research by the Contractor has indicated cross-year merging on RMA Type 15 files is difficult and not certain to produce correct results due to procedures private companies use to report data to RMA and the procedures RMA uses to mask (randomize) policy numbers before sending the data to the Contractor. However, it is likely the duplicates are not exact, for example, the 2005 file may include yields from 2000 through 2004 while the 2006 crop year file includes 2000 through 2005. No efforts were taken to remove policies which show up in multiple crop year data files for the paired dataset (the bias should apply equivalently to organic and conventional) but exact yield observation duplicates were removed in the analysis of the all observations dataset as detailed later. Table 37 includes counts of policies with four or more actual yields by crop year.

TABLE **37. Type 15 Policy Counts – 4 or More Actual Yields**

Year	Organic	Conventional
2001	68	34,583
2002	262	101,976
2003	399	112,672
2004	381	41,029
2005	234	179,798
2006	246	237,413
2007	305	278,277
2008	334	308,998
Total	2,229	1,294,746

Source: The Contractor's Rating Department using RMA data.

Table 38 includes the number of policies with four or more actual yields by crop.

[98] A minimum of four actual values was used to provide a reasonable sample size for estimation of mean and standard deviation. Ideally, a minimum of six actual values would have been implemented, but the four actual value cut-off was used to increase the number of paired observations.

Table 38. Crop Policy Counts

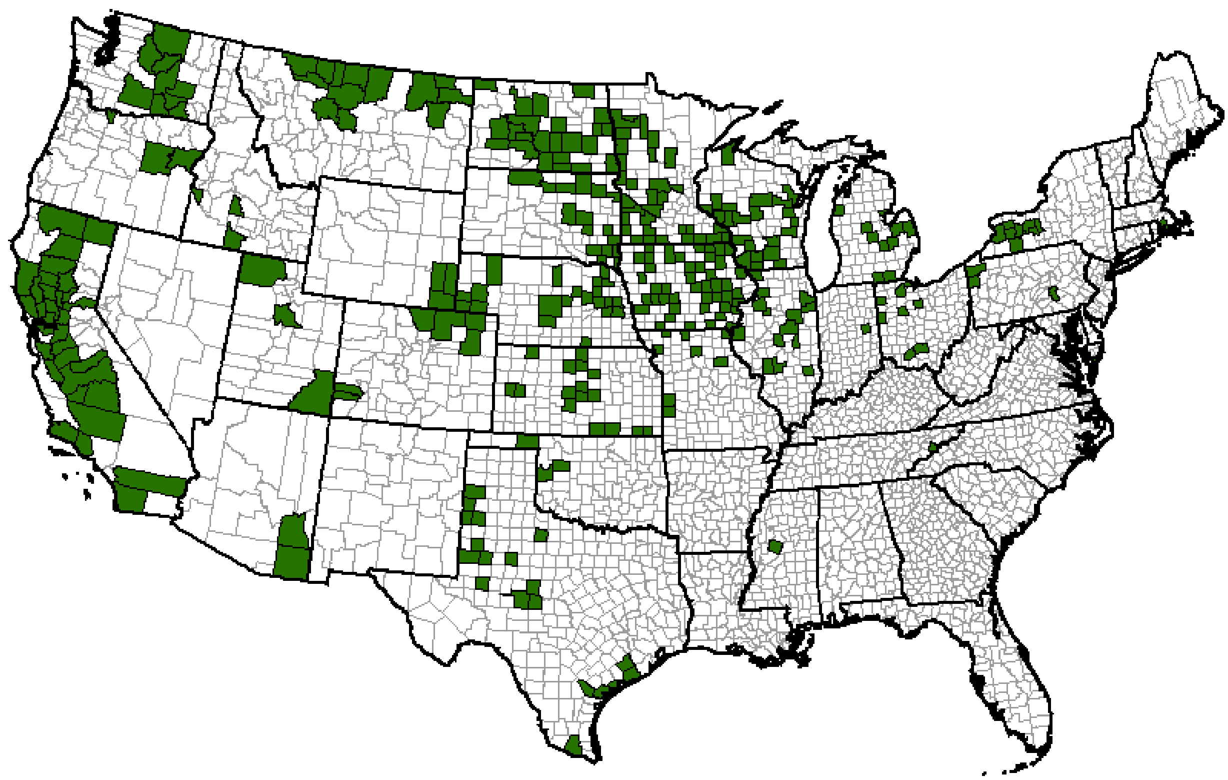
Crop	Policy Count	
	Organic	Conventional
Wheat	460	245,394
Soybeans	407	400,818
Corn	380	429,109
Apples	173	9,419
Oats	93	13,818
Grapes	70	26,608
Pears	64	6,633
Barley	56	29,229
Flax	51	3,621
Millet	40	5,087
Almonds	38	13,084
Rice	37	2,528
Plums	32	3,259
Dry Beans	31	10,069
Sunflowers	30	17,458
Cotton	28	23,719
Grain Sorghum	25	11,767
Table Grapes	22	3,964
Tomatoes	19	2,051
Fresh Apricots	16	187
Fresh Freestone Peaches	15	2,046
Navel Oranges	14	7,747
Fresh Nectarines	14	1,855
Walnuts	14	1,980
Valencia Oranges	10	4,545
Potatoes	10	2,532
Processing Apricots	9	142
Forage Production	8	976
Peanuts	8	1,181
Avocados	6	3,509
Figs	6	407
Onions	5	595
Processing Cling Peaches	4	649
Prunes	4	1,021
Fresh Market Tomatoes	4	12
Rye	4	9
Peaches	3	91
Cultivated Wild Rice	3	36
Dry Peas	3	1,422
Lemons	2	504
Mandarins	2	31
Sugar Beets	2	241
Cranberries	2	947
Minneola Tangelos	1	219
Macadamia Nuts	1	32
Sweet Corn	1	311
Popcorn	1	346
Safflower	1	416

Source: The Contractor's Rating Department using RMA data.

Figure 23 indicates which counties in the Type 15 dataset contained an organic policy with at least four years of reported actual yields.

FIGURE 23. Yield Data All Observations County Map*

* Figure 23 shows a map of the Unites States divided into states and then subdivided into counties. Counties containing at least one organic policy with at least four years of reported actual yields are colored green. California has the largest land area colored green. Iowa has the largest number of counties colored green. States west of the Mississippi River, except Arkansas, Nevada, and New Mexico all have at least one, county colored green, while east of the Mississippi River, only Illinois, Indiana, Michigan, Mississippi, New York, Ohio, Pennsylvania, and Wisconsin have at least one such county.



Source: The Contractor's Rating Department using RMA data. (Figure 23 Data)

A specific policy will be in both conventional and organic datasets for a given crop year if the policy had both types of production and sufficient historical observations.

Historical Experience Data

The Type 11 and 21 files are joined to merge indemnity, liability, and premium information at the unit level and then aggregated so insurance experience can be evaluated at a policy (enterprise unit) level. Organic records were extracted from the 2001 through 2008 Type 11 files. In all, 32,384 organic records were found[99]. Conventional (non-organic) yield records were also extracted for matching county/crop/year combinations and added in with the organic records with the two being flagged separately. For conventional, roughly 6.0 million records were found.

[99] Numbers of records do not match numbers from the Type 15 files since not all units in the Type 15 file are reported for insurance.

Type 21 indemnity records were also gathered for all county/crop/year combinations found in the organic records. Records were flagged as organic based on the same criteria as the Type 11 records. There were 10,427 organic records and just under 1.2 million conventional records. At this point, all units with both organic and conventional records in the same year at the type and practice level were eliminated from the Type 11 and Type 21 dataset due to an issue that can arise when a loss occurs for such a unit (a record is in effect a component of a unit). There is no allowance that permits organic practice to be defined as a unit separate from the non-organic practice. In addition, there is no requirement the production to count on any particular record be tagged identically to a quantity insured. Therefore, when a loss occurs and the loss adjuster often times has only a total quantity of harvested production, the production to count must be allocated to the multiple Type 11 records. This process introduces the possibility for error. Any Type 21 organic record from a unit with conventional acreage may contain conventional data also. Thus, there is no certainty whether the loss data on a record with an organic code really is limited to the production from the organic acreage. However, for units comprised entirely of either conventional or organic production records, there is a high degree of certainty the corresponding production to count is from the same production method. In total, 3,628 records were eliminated from the Type 11 data with 1,589 being coded organic and 2,039 being coded as conventional. From the Type 21 data, 592 records were eliminated with 263 being coded as organic and 329 being coded conventional. The raw Type 11 and Type 21 records formed the basis of the policy loss data. In this context, a policy was defined to include crop, crop year, insurance plan, type, practice, and coverage level. Organic units and/or organic acreage within a policy were segregated from conventional units/acreage.

Policy-level (including crop, year, plan, type, practice, and coverage level) acreage, liability, and premium were calculated from the Type 11 records while policy-level indemnity was calculated from the Type 21 records. The policy-level Type 11 data was then joined to the policy-level Type 21 data. The resultant data was a policy loss record flagged as conventional or organic including policy acreage, liability, premium, and indemnity. If a policy had both conventional and organic units, it would be in the data twice with the production methods segregated. Loss ratios (indemnity/premium) and loss cost ratios (indemnity/liability) were also calculated.

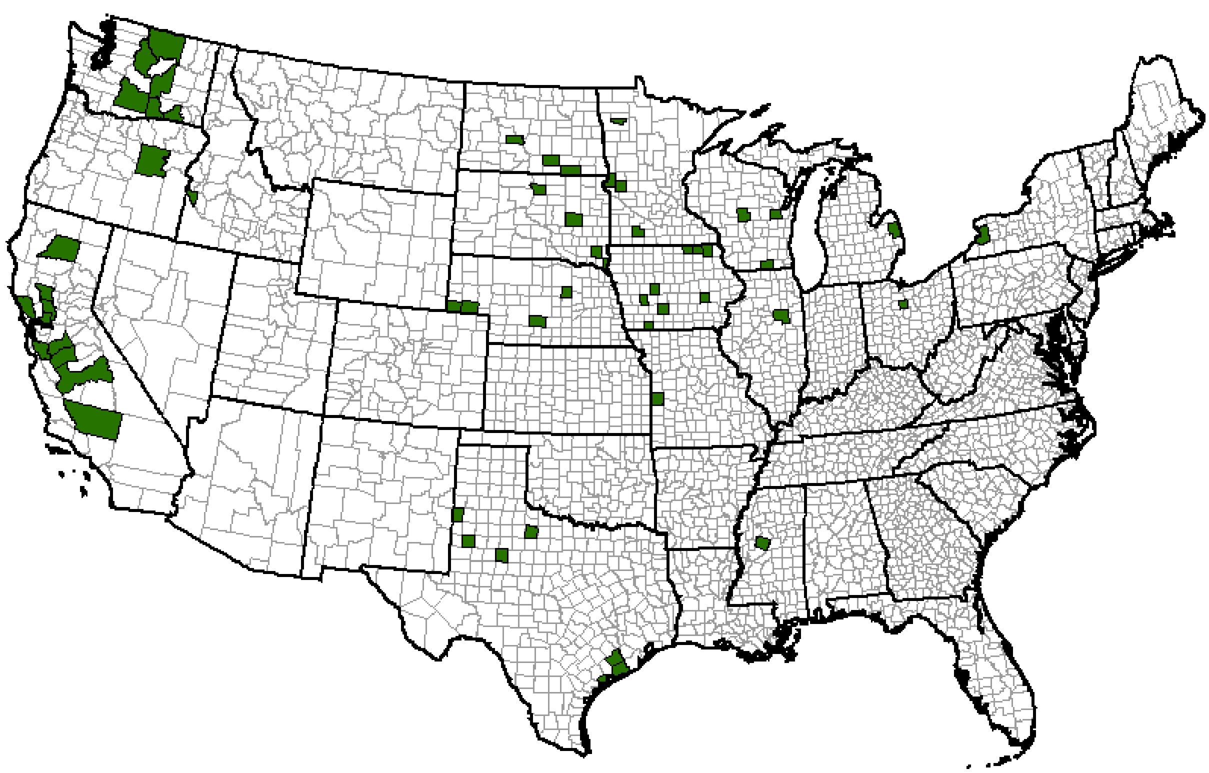
Once the policy-level loss records were calculated, policies (including crop, year, plan, type, practice, and coverage level) with both organic and conventional data were identified and subset. The total number of policies with both organic and conventional data was 2,820.

Policies identified from Type 11 data as having both conventional and organic production in a given crop year were used to develop a subset of the Type 15 yield history files to create the paired yield history dataset. Policies included in the paired yield dataset were also merged so the paired observations had historical yields reported from the same years. For example, the crop year 2008 yield history file included a policy with multiple units where at least one unit was conventional and at least one unit was organic. After separation of the unit data into the conventional and organic data and aggregation to the policy level, the policies in each file are required to have reported at least four years of data and to have reported for the same years. If the conventional aggregated unit(s) had records for 2002 through 2007 but the organic aggregated unit(s) only had records for 2003 through 2007, the 2002 conventional observation was dropped in the paired dataset.

Figure 24 illustrates which counties had policies with both conventional and organic units as well as having both units report at least four years of actual yields.

FIGURE **24. Yield Data Paired Observations County Map***

* Figure 24 shows a map of the Unites States divided into states and then subdivided into counties. Counties containing at least one policy with an organic unit reporting actual yields and a non-organic unit reporting actual yields in the same year for the same crop? are colored green. California has the largest land area colored green followed by Washington. Only 53 counties have at least one or more such policies, including counties in California, Idaho, Illinois, Iowa, North and South Dakota, Minnesota, Michigan, Missouri, Nebraska, New York, Ohio, Oregon, Texas, Washington, and Wisconsin.



Source: The Contractor's Rating Department after RMA data. (Figure 24 Data)

The next section discusses the methods used to evaluate the yield and loss experience datasets to determine if conventional and organic have significant, consistent, and systemic differences in production risk.

V.C. Actuarial Methods

Yield variability is evaluated by looking at the temporal variability of paired historical observations as well as the pooled risk across producers in a risk region for a particular crop. Loss experience data are evaluated by looking at the typical loss ratio for conventional and organic producers for a given crop in a given state and the frequency and severity of loss as well as the relative loss amounts given both the conventional and organic units had a loss for a given policy. The analysis is based on confidence intervals derived from the empiric data. The distributions evaluated in this analysis tend to be strongly non-normal. Some distributions are censored at zero and positively skewed (median < mean). Due to non-normality, standard confidence interval tests may not produce reliable results. The APH premium rates are a function of expected temporal variability. Therefore, comparing temporal variability is relevant as an element of this analysis. Incorporating information about localized historical weather variation into this analysis is beyond the scope of this project. The next section discusses how confidence intervals on the non-normal datasets were performed.

Confidence Interval Estimation Procedures

Confidence intervals on the non-normal datasets were estimated through a log-transform on the original data X where $Y = \log(X)$.[100] The data are log-transformed and a confidence interval is estimated for the transformed distribution mean and the confidence interval is then back-transformed (anti-log) to form an interval for the original dataset. Let $E\left[X\right]=\theta$, $E\left[\log\left(X\right)\right]=\overline{Y}$, and the sample variance of Y be s^2.[101] The confidence interval for $\log\left(\theta\right)$ is estimated as

$$\overline{Y}+\frac{s^2}{2}\pm z_\alpha \cdot \sqrt{\frac{s^2}{n}+\frac{s^4}{2\left(n-1\right)}} \qquad \text{(V.C.1)}$$

where z is the area under the standard normal distribution with α significance.[102] The log-normal transformation is used to improve confidence interval estimates given left censored, positively skewed datasets. Another approach which minimizes the influence of outliers is focusing on the distribution median rather than the mean. The median is the point at which 50 percent of observations are greater than the value. Order statistics can be used to form a robust, non-distribution specific, and computationally straight forward confidence interval about the median. Assuming the data are independently and identically distributed, an exact confidence in an interval about the median can be determined. Sort the data such that $X_{(1)}$ is the smallest observation and $X_{(2)}$ is the next smallest etc.

$$X_{(1)}, X_{(2)}, ..., X_{(n)} \qquad \text{(V.C.2)}$$

The probability the median, θ, is between the k^{th} observation from each end of the distribution is

$$Pr\left[X_{(k+1)} \le \theta \le X_{(n-k)}\right] = 1 - Pr\left[\theta < X_{(k+1)}\right] - Pr\left[\theta > X_{(n-k)}\right] \qquad \text{(V.C.3)}$$

[100] The standard confidence interval around a sample mean, assuming normality, is calculated as $\overline{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$

[101] Recall $E\left[X\right] = e^{\left(E\left[Y\right]+\frac{Var\left[Y\right]}{2}\right)}$

[102] The confidence interval estimation procedures were taken from "Confidence Intervals for the Mean of a Log-Normal Distribution" by Ulf Olsson, published in the *Journal of Statistics Education* Volume 13, Number 1 (2005), www.amstat.org/punlications/jse/v13n1/olsson.html

The component $Pr\left[\theta < X_{(k+1)}\right]$ is the probability that there are no more than *k* observations less than the median. Since the median is the 50th percentile $Pr\left[\theta < X_{(k+1)}\right]$ can be re-written as a binomial cumulative distribution function with the probability of success equal to one half. A confidence interval defined by the *k* + 1 and n – *k* observations has confidence level equal to

$$1-2\cdot Binomial\left(k,\frac{n-1}{2},0.5\right) \qquad \text{(V.C.4)}$$

where *Binomial* is the binomial distribution function. The result is a confidence interval with an exact confidence level which is distribution independent. The implementation of the confidence interval procedures for the yield history data analysis is discussed next.

Yield Variability Analysis

Yield variability among the paired observations is evaluated by looking at the ratio of organic to conventional temporal yield variability. The null hypothesis is the expected value of the temporal standard deviation ratio is equal to one. Empiric data are used to form a 95 percent confidence interval around the sample mean ratio. If the confidence interval includes 1, then the null hypothesis cannot be rejected. In addition, if the median of the distribution is not significantly different from one, this implies half the observations show a ratio less than one and half show a ratio greater than one. A median equal to one indicates the ratios are not consistent. Yield variability among all observations is evaluated by first decomposing producer-level variability, then pooling producer residuals by crop and RMA risk region and testing for variance homogeneity between each group, and finally evaluating the distribution of variance ratios across groups.

The RMA APH continuous rating function, which does not assume yields are normally distributed, has a non-zero negative exponent, which means premium rates are inversely related with yield magnitude. This result is consistent with expected temporal standard deviation of yields being independent of expected yield. Previous research by the Contractor has also found, for commodity crops in major production areas, standard deviation tends to be independent of expected yield.[103] Therefore, if organic and conventional have similar expected temporal standard deviations, regardless of whether the mean yield (and therefore coefficient of variation) is the same, it is likely a rate difference of zero is appropriate because the continuous rate function presumably handles changes in risk due to differences in expected yield.

The procedures for evaluating temporal standard deviation differ by dataset. For the paired dataset (recall the paired dataset includes historical yield observations for both conventional and organic acreage insured under a common policy) the ratio of organic and conventional standard deviations is estimated for each policy. If 100 policies were identified with both conventional and organic units with at least 4 years of historical data, there would be 100 temporal standard deviation ratios. The all observations dataset variance comparison is performed by pooling policy-level residuals at the crop/risk region level and comparing the variability between

[103] In some arid areas there are substantial differences in variability and expected yield between dryland and irrigated acres.

conventional and organic production methods as well as looking at the distribution of the ratio of the variances across state/crop combinations. Comparisons between production methods are performed using relative measures (i.e., ratios) to reduce the obfuscation of absolute differences due to the spatial and cross-crop aggregation. Modeling differences would be less problematic statistically than comparing ratio, but would force conclusions to be drawn from substantially smaller sample sizes, because spatial and cross-crop aggregation would be inappropriate in these comparisons due to disparities in yield magnitude.

Summary statistics for the paired dataset, including expected yield ratios, are provided in Tables 39 though 41. Each observation is a policy which had two or more units and at least one unit was coded as organic and at least one unit was coded as conventional. Additionally, at least four years of actual yield observations from the same years were required for the conventional and organic units after aggregation to the policy level. The standard deviation ratios are presented as organic divided by conventional (Table 39) and as conventional divided by organic (Table 40).

TABLE 39. Paired Observations Standard Deviation Ratio (Organic/Conventional) Summary Statistics

Year	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
2001	0.989	0.993	0.998	0.998	1.002	1.007	0.013	2
2002	0.813	1.006	1.174	1.121	1.243	1.368	0.216	5
2003	0.260	0.880	1.015	1.102	1.276	2.449	0.496	29
2004	0.097	0.744	1.048	1.264	1.740	3.438	0.862	34
2005	0.271	0.847	0.976	1.249	1.730	3.011	0.808	12
2006	0.214	0.725	0.953	1.263	1.606	2.961	0.870	13
2007	0.636	0.868	1.129	1.190	1.408	2.450	0.493	14
2008	0.427	0.855	1.051	0.984	1.154	1.347	0.293	8
All Years	0.097	0.813	1.016	1.184	1.350	3.438	0.673	117

Source: The Contractor's Rating Department using RMA data.

TABLE 40. Paired Observations Standard Deviation Ratio (Conventional/Organic) Summary Statistics

Year	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
2001	0.993	0.998	1.002	1.002	1.007	1.011	0.013	2
2002	0.731	0.805	0.852	0.922	0.994	1.230	0.197	5
2003	0.408	0.784	0.986	1.142	1.136	3.848	0.712	29
2004	0.291	0.575	0.954	1.627	1.345	10.300	2.096	34
2005	0.332	0.579	1.024	1.260	1.181	3.689	1.029	12
2006	0.338	0.623	1.049	1.310	1.379	4.665	1.157	13
2007	0.408	0.711	0.891	0.965	1.153	1.572	0.355	14
2008	0.743	0.868	0.953	1.144	1.177	2.342	0.519	8
All Years	0.291	0.741	0.985	1.281	1.230	10.300	1.305	117

Source: The Contractor’s Rating Department using RMA data.

Notice the median value for all years in Tables 39 and 40 show organic production to be more variable than conventional while the mean value for all years shows organic to be more variable in Table 39 and conventional to be more variable in Table 40. The discrepancy in the mean value is due to the effect of positive tail outliers when a ratio truncated at zero is being evaluated. Confidence interval tests performed using all years of data and the summary statistics of the log transformed data are provided in Table 41.

TABLE 41. Log-Transformed Data Summary Statistics – Paired Yield Data

	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
Organic	-2.332	-0.207	0.016	-0.001	0.300	1.235	0.631	117
Conventional	-1.235	-0.300	-0.016	0.001	0.207	2.332	0.631	117

Source: The Contractor’s Rating Department using RMA data.

The log-transformed confidence intervals for the organic to conventional and conventional to organic standard deviation ratios using all years of data are calculated as

$$-0.001+\frac{0.631^2}{2}\pm 1.96\cdot\sqrt{\frac{0.631^2}{117}+\frac{0.631^4}{2\left(117-1\right)}}=\left(0.323,0.073\right) \qquad \text{(V.C.5)}$$

and

$$0.001+\frac{0.631^2}{2}\pm 1.96\cdot\sqrt{\frac{0.631^2}{117}+\frac{0.631^4}{2\left(117-1\right)}}=\left(0.325,0.075\right) \qquad \text{(V.C.6)}$$

The anti-log of the confidence intervals produces intervals of (1.08, 1.38) which imply that the expected ratios are significantly different from 1.0 at a 95 percent confidence level. The results directly conflict each other. With organic in the numerator it appears the organic standard deviation is significantly greater than the conventional but the results are the opposite when organic is in the denominator. Thus, due to the difficulty of modeling ratios, the log-transform might not suitably address the non-normality of the dataset. The Contractor investigated a number of alternative approaches and determined, in light of the available data, that the log-transformation was the most appropriate technique despite its shortcomings.

The median values of the distribution are consistent and show a slight increase in variability for organic production. A non-parametric, distribution free estimate of the confidence intervals around the median values are calculated by finding the k^{th} and $(n-k)^{th}$ values which define a roughly 2.5 percent upper and lower tail. With organic in the numerator, a 95.85 percent confidence interval around the median of the all data sample is (0.981, 1.095), and with conventional in the numerator, the 95.85 percent confidence level is (0.913, 1.019). Both intervals indicate the median standard deviation ratio is not different from 1.0 with 95 percent confidence regardless of which production method is in the numerator. These results are consistent with each other and indicate that half the population of organic producers with both conventional and organic units experience higher variability on their organic acreage while half experience higher variability on their conventional acreage.

The ratio of mean yields for the paired dataset is provided in Table 42.

TABLE 42. Paired Observations Average Mean Yield Ratio (Organic/Conventional) Summary Statistics

Year	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
2001	0.970	1.002	1.034	1.034	1.066	1.098	0.091	2
2002	0.922	0.958	0.972	0.990	1.043	1.053	0.057	5
2003	0.512	0.732	0.897	0.913	0.979	2.214	0.332	29
2004	0.456	0.785	0.959	1.103	1.359	2.887	0.514	34
2005	0.258	0.529	0.852	0.819	1.066	1.446	0.390	12
2006	0.305	0.634	1.018	0.960	1.095	1.586	0.374	13
2007	0.128	0.745	0.942	0.835	1.014	1.114	0.284	14
2008	0.571	0.943	1.046	1.036	1.117	1.508	0.267	8
All Years	0.128	0.769	0.946	0.968	1.085	2.887	0.394	117

Source: The Contractor's Rating Department using RMA data.

The paired data mean yield ratio summary statistics indicate organic tends to have lower yield than conventional but the 95 percent confidence interval around the mean for all years, calculated as

$$0.968 \pm 1.96 \cdot 0.394 = (0.196, 1.74) \tag{V.C.7}$$

indicates the ratio of mean yields is not significantly different from 1. The confidence interval assumes the underlying data are normally distributed, which is not the case for the mean ratio data. However, the confidence interval is so wide (due to variability) it is very likely improved confidence interval estimation procedures would still fail to reject the null hypothesis that the expected mean ratio is equal to 1.

Yield variability among all observations is evaluated by first decomposing producer-level variability then pooling producer residuals by crop and RMA risk region and testing for variance homogeneity between each group; then evaluating the distribution of variance ratios across groups. The Type 15 data include observations from the crop years 2001 through 2008. Since the same historical yield will be included for multiple crop years, e.g., the 2001 observation being included in the 2002 through 2008 yield history files, exact duplicates are removed from the datasets. Duplicates are identified by reporting organization, company, policy number, crop identification, state, county, type, practice, organic flag, and aggregated yield and acreage. Approximately 25 percent of the total yield observations were removed as duplicates.

Producer yield variance is decomposed into two components: (1) regional variability, and (2) the remaining or residual farm-level variability. The decomposition removes variability due to region-wide events such as drought or excessive rain which affect both conventional and organic production. By removing a common component, regional variation, the statistical tests are likely to produce more reliable results. The variance decomposition is accomplished by subtracting the county yield from the farm yield. This generates a deviation from the region yield, d_t^f , for each farm *f* and for each year *t* in the RMA yield history dataset. Farm *f*'s average deviation from the region, $\overline{d}^f$, can then be calculated for each farm. These expressions can be presented mathematically as:

$$d_t^f = yld_t^f - Yld_t^C \tag{V.C.8}$$

and

$$\overline{d}^f = \frac{1}{T_f}\sum_{t=1}^{T_f} d_t^f = \overline{yld}^f - \overline{Yld}^C \tag{V.C.9}$$

The county yield is calculated as an acre weighted average across all producers (both organic and conventional) in the dataset. After constructing d_t^f and $\overline{d}^f$, the remaining farm variability can be constructed as:

$$e_t^f = d_t^f - \overline{d}^f = (yld_t^f - \overline{yld}^f) - (Yld_t^C - \overline{Yld}_t^C) \tag{V.C.10}$$

The remaining farm residual, e_t^f , can be viewed as the difference between the farm's deviation from its average yield $(yld_t^f - \overline{yld}^f)$ and the county's deviation from its average yield $(Yld_t^C - \overline{Yld}_t^C)$ over the same time period. Each farm's deviation from its mean is adjusted by the amount by which the county deviated from its average. The total variation in farm yields has been decomposed into variation that occurred at the county level and the remaining farm-level variation around the county yields.

Farm residuals are pooled by production practice, crop, and risk region. Bartlett's test for variance homogeneity is used to test the null hypothesis that the variability between the groups (conventional and organic) is the same.[104] The Bartlett's test assumes the underlying data are normally distributed and is sensitive to departures from normality. That is, if the samples are from non-normal distributions, Bartlett's test may simply be testing for non-normality. However, the variance decomposition procedure has a substantial normalizing effect on the residuals.

In order for a crop/risk region combination to be included, data from at least five organic producers was required. This resulted in 99 crop/risk region combinations. Of those, 57 had a significant difference (95 percent confidence level) between the variability of the pooled conventional and organic residuals. The 57 combinations with a statistically significant difference can further be subset by whether the organic or conventional had the larger variability. Roughly half the combinations had a greater variability among the organic pooled residuals. These general results tend to hold as more organic producers were included in a given crop/risk region combination in order to be included in the analysis. When at least 20 organic producers are required, there are 10 combinations, 6 of which have a statistically significant difference in variability. Four show a larger conventional variability and two show a larger organic variability. A results summary is provided in Table 43.

Table 43. Variance Homogeneity Test Results

Minimum Number of Organic Policies	Crop/Risk Region Combinations	Number of Combinations with Significant Differences (95% Confidence)	Conventional Variability Significantly Greater	Organic Variability Significantly Greater
5	99	57	27	30
10	40	24	13	11
15	22	14	8	6
20	10	6	4	2

Source: The Contractor's Rating Department using RMA data.

The variance homogeneity tests clearly indicate there is not a systemic or consistent difference in variability between conventional and organic production. Another approach to looking at the pooled dataset is to evaluate the distribution of the variance ratios across crop/risk region combination. For the group of crop/risk regions with a minimum of 5 organic policies there are 99 variance ratios. The variance ratio distribution is estimated twice: once with organic in the numerator and then again with organic in the denominator. Summary statistics are provided in Table 44.

[104] Snedecor, George W. and Cochran, William G. (1989), Statistical Methods, Eighth Edition, Iowa State University Press.

Table 44. Variance Ratio by Crop and Risk Region Summary Statistics

Variance Ratio (Conventional/Organic)							
Minimum Number of Organic Policies	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation
5	0.252	0.632	1.005	1.246	1.381	9.910	1.193
10	0.333	0.665	1.012	1.175	1.354	5.649	0.916
15	0.333	0.823	1.043	1.120	1.337	3.132	0.649
20	0.414	0.881	1.089	1.295	1.276	3.132	0.859
Variance Ratio (Organic/Conventional)							
Minimum Number of Organic Policies	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation
5	0.101	0.724	0.995	1.219	1.582	3.966	0.762
10	0.177	0.739	0.988	1.198	1.505	3.002	0.683
15	0.319	0.748	0.960	1.214	1.215	3.002	0.755
20	0.319	0.784	0.918	1.117	1.142	2.414	0.730

Source: The Contractor's Rating Department using RMA data.

The results are similar to those seen in Tables 39 and 40. The median of the distributions consistently show conventional production tends to be more variable but the means of the distributions contradict each other. The yield variability analysis did not produce consistent results; in one case implying conventional production is more variable than organic and in the other that organic is more variable than conventional. As noted earlier, modeling differences would be less problematic statistically than modeling ratios, but would force conclusions to be drawn from substantially smaller sample sizes, because spatial and cross-crop aggregation would be inappropriate. Loss experience analysis is discussed next.

Loss Experience Analysis

The paired insurance experience data are used to compare the loss ratio of conventional and organic units insured under the same policy. The datasets are parsed to evaluate the frequency and severity of indemnity payments across all units based on production method and to compare loss ratios when both units (conventional and organic) under the policy receive an indemnity payment in a given year. The analysis of the "all observation" loss history data looks at differences in expected loss ratios (organic loss ratio – conventional loss ratio) across crop and state combinations.

Paired data look at frequency and severity (relative to premium rate) of indemnity payments. There are 2,819 total paired observations. The frequency of an indemnity payment (LR > 0) for conventional and organic production methods are 0.398 and 0.319, respectively. Units insured as conventional are more likely to have received an indemnity payment between 2001 and 2008 relative to organic acreage grown by the same insured. The severity of indemnity payments, average loss ratio given the loss ratio was greater than zero, are 3.717 and 3.092 for conventional and organic, respectively. This means the expected indemnity amount is greater for conventional (measured as a percent of premium) than for organic. Another pertinent statistic is the percentage of organic/conventional units that had an indemnity payment when the paired conventional/organic unit also had an indemnity payment. The percent of organic observations receiving an indemnity when their paired conventional observation experienced a loss was 0.547 and the percentage of conventional observations experiencing a loss when their paired organic observation received an indemnity payment was 0.681. These percentages are consistent with conventional having an overall higher indemnity frequency when grown by the same producer under presumably the same environmental conditions.

The Contractor compared loss ratios for paired observations where both the conventional and organic observations had a loss. Summary statistics for the ratio of loss ratios (relative loss ratio) are provided in Table 45 and a scatter plot of the paired loss ratios is presented in Figure 25.

TABLE 45. Paired Loss Experience Relative Loss Ratio Summary Statistics (Organic/Conventional)

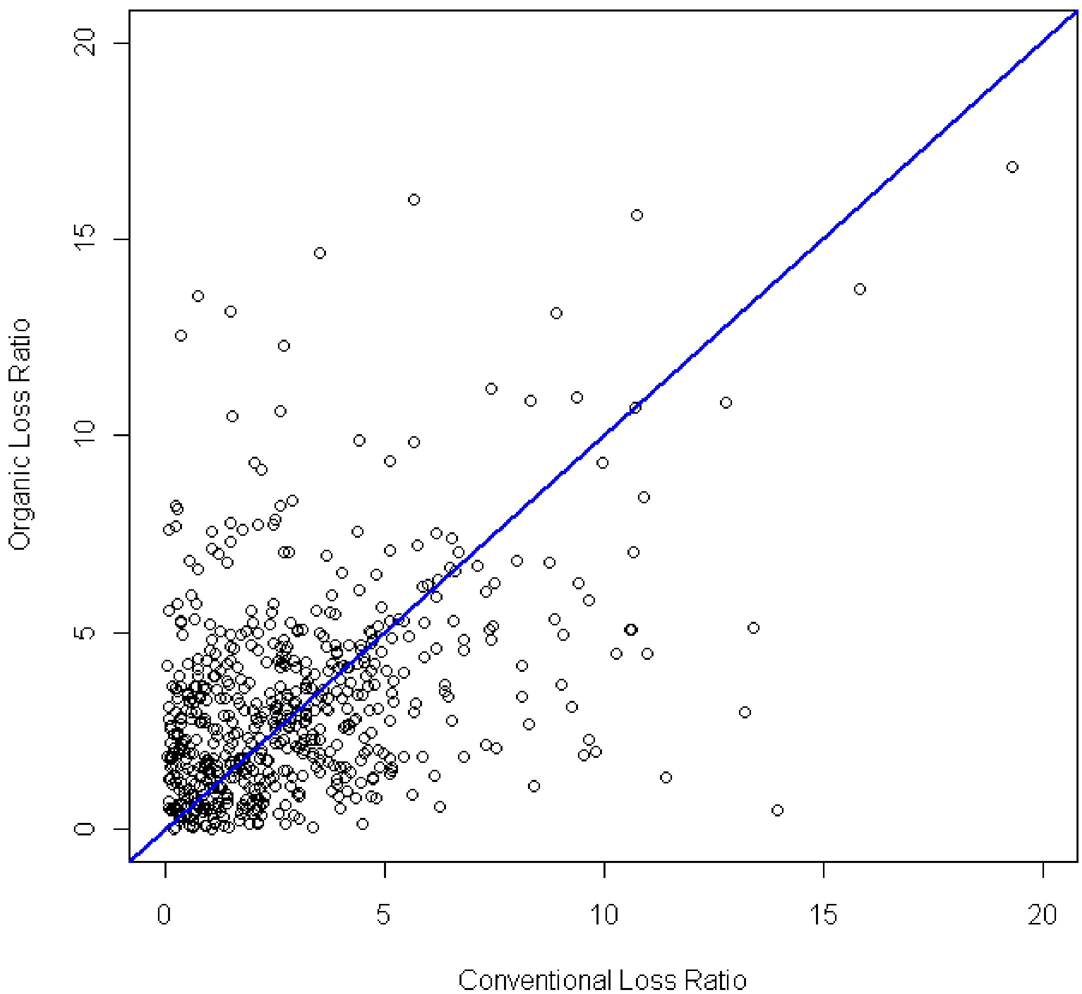
Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
0.018	0.613	1.053	2.956	2.294	106.700	7.591	614

Source: The Contractor's Rating Department using RMA data.

The median of the relative loss ratios is approximately 1.0 while the mean of the distribution is substantially greater. In this case, greater than the 3rd quantile (75th percentile), indicating a heavily skewed distribution. The blue line in Figure 25 is a 45 degree line and observations located on that line had an organic loss ratio equal to the conventional loss ratio. If the data point lies above the blue line the organic observation had a greater loss ratio than the paired conventional observation.

FIGURE 25. Loss Ratio Scatter Plot*

* Figure 25 shows a scatter diagram of loss ratios for paired observations where both the conventional and organic observations had a loss. Most of the values fall below 5,5. Only about 25 of the more than 600 values are above 10 for either the conventional or organic production. The median of the loss ratios is approximately one.

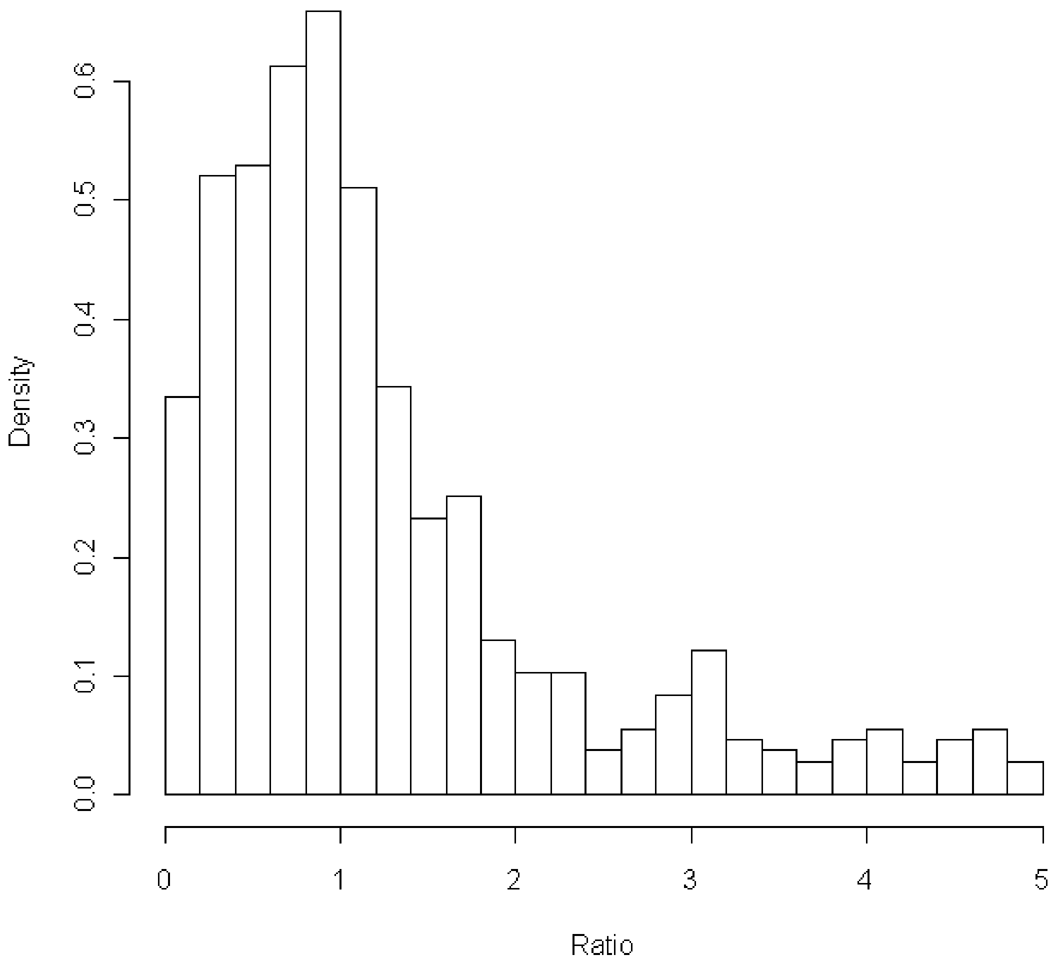


Source: The Contractor's Rating Department using RMA data. (Figure 25 Data)

Outliers on both sides of the blue line in Figure 25 can be seen. A histogram of the relative loss ratios is provided in Figure 26.

FIGURE **26. Relative Loss Ratio Histogram***

* Figure 26 shows a histogram of the relative loss ratios for paired observations where both the conventional and organic observations had a loss. The histogram was truncated at a value of five to eliminate distortion of the plot from individual outliers with higher relative values. The histogram peaks for the class with relative values between 0.8 and 1.0. The tail beyond a loss ratio value greater than 2.0 generally has values less than one fifth the value of the peak class value.



Source: The Contractor's Rating Department using RMA data. (Figure 26 Data)

The heavily skewed distribution indicated by the summary statistics in Table 43 can be seen in Figure 29. To perform hypothesis tests on the mean, the data were log-transformed and additionally, the inverse of the ratio (conventional/organic) was tested. Summary statistics for the log-transformed relative loss ratios are provided in Table 46.

Table 46. Log-Transformed Data Summary Statistics – Paired Experience Observations

Numerator	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
Organic	-4.010	-0.490	0.051	0.179	0.830	4.670	1.238	614
Conventional	-4.670	-0.830	-0.051	-0.179	0.490	4.010	1.238	614

Source: The Contractor's Rating Department using RMA data.

Organic numerator anti-log confidence interval around the mean is (2.259, 2.93) and the conventional numerator anti-log confidence interval is (1.579, 2.048). These results contradict each other. The confidence interval about the median is (0.8725, 1.004) with conventional in the numerator and (0.9957, 1.146) with organic in the numerator. The tests do not provide evidence of a systemic, consistent, or significant difference in loss history.

The all observations experience data were evaluated by examining the loss ratio from 2001 through 2008 for conventional and organic practices at the crop/state level. Indemnities and premiums were summed across all observations by crop, state, and production practice. The difference in loss ratio between conventional and organic for each state/crop combination then was pooled and evaluated. In order for a state/crop combination to be included in the analysis, a minimum number of organic observations was required. Results were evaluated with the minimum sets of 5, 10, 25, and 50 observations. Summary statistics are provided in Table 47.

Table 47. Summary Statistics for Loss Ratio Differences

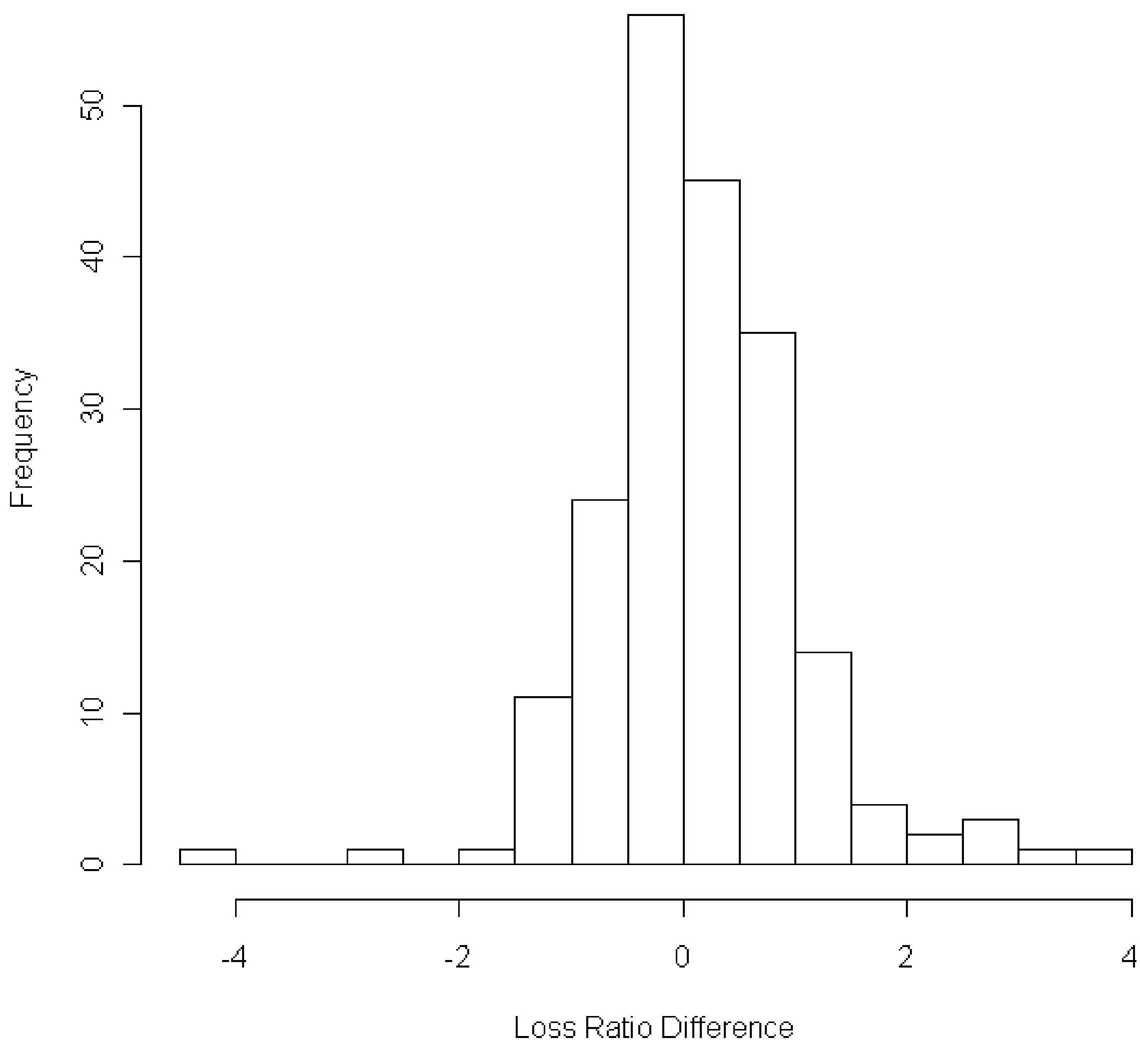
Minimum Number of Organic Policies	Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum	Standard Deviation	Number of Observations
5	-4.071	-0.325	0.068	0.146	0.572	3.766	0.925	199
10	-4.071	-0.306	0.133	0.136	0.586	3.766	0.903	156
25	-1.405	-0.207	0.145	0.200	0.550	3.416	0.685	98
50	-1.126	-0.208	0.228	0.226	0.584	3.416	0.654	69

Source: The Contractor's Rating Department using RMA data.

Summary statistics presented in Table 47 indicate the distributions of loss ratio differences are reasonably symmetric (normality in all cases is strongly rejected by Anderson-Darling and Cramer-von-Mises tests) and standard confidence intervals around the mean indicate the means are not significantly different from zero in all cases. Figure 27 presents a histogram of the differences for the group with five or more organic policies in each state/crop combination.

Figure 27. Loss Ratio Difference Histogram*

* Figure 27 shows a histogram of the loss ratio differences for each state/crop combination for the group with five or more organic policies for the state/crop combination. The distribution of loss ratio differences is relatively symmetric although not normal by Anderson-Darling and Cramer-von-Mises tests. Standard confidence intervals around the mean indicate the mean is not significantly different from zero.



Source: The Contractor's Rating Department using RMA data. (Figure 27 Data)

Analysis of the paired experience data indicate units without organic codes (conventional units) in paired observations were more likely to receive an indemnity payment and the average payment (measured as a percentage of the premium), given a payment was received, was higher. However, when both paired observations received an indemnity payment, the 50th percentile of that distribution indicated the payments were not significantly different. Furthermore, analysis of all observations shows organic to have a slightly higher loss ratio but the difference is not statistically significant.

V.D. Concluding Remarks

The paired dataset is the preferred dataset for hypothesis testing since the observations are grown under presumably the same conditions, in the same year, in presumably relatively close locations. The 'all observations' dataset is less reliable due to the generally large discrepancy between the number of producers growing conventional and the number of producers growing organic for a given crop/region combination. Exact confidence intervals require information regarding the underlying distribution, which is not known; hence the Contractor used accepted procedures to form intervals and acknowledges the reported intervals reflect those procedures more than any attribute of the data itself. However, the Contractor believes the confidence intervals are reliable enough to fail to reject the null hypothesis that production risk differences are statistically significant, and found little evidence supporting suggestions they are consistent, or systemic.

The paired yield data tests were performed on the median values of the distributions and indicated there is no consistent difference in temporal standard deviation. The all observation yield data analysis utilized Bartlett's test of variance homogeneity and while the test demonstrated statistically significant differences in production risk, the differences showed conventional as more variable as often as they showed organic being more variable. Again, no consistent result was found. The paired loss ratio dataset showed conventional paired observations were more likely to receive an indemnity payment and the average payment (measured as a percentage of the premium), given a payment was received, was higher. However, when both paired observations received an indemnity payment, the 50^{th} percentile of that distribution indicated the payments were not significantly different. Furthermore, analysis of all observations shows organic to have a slightly higher loss ratio, but the difference is not a statistically significant difference.

Currently, RMA typically uses a multiplicative load of 1.05 on organic contracts (there are a few minor exceptions) and it is important to note the analysis presented in this section did not directly test if 1.05 is appropriate. Furthermore, it should be noted the failure to reject the null hypothesis that production risks are the same does not imply that 1.05 is an actuarially unsound value. Based on the currently available data, it is not possible to develop an appropriate multiplicative adjustment rate factor that applies to all organic crops using a statistically rigorous approach. Further study is recommended as more data become available.

SECTION VI. DISCUSSION

The Food, Conservation, and Energy Act of 2008 called for "a review of the underwriting, risk, and loss experience of organic crops covered by the Corporation and loss experience of organic crops covered by the Corporation, as compared with the same crops produced in the same counties and during the same crop years using nonorganic methods." It specifies the review shall "to the maximum extent practicable, be designed to allow the Corporation to determine whether significant, consistent, or systemic variations in loss history exist between organic and non-organic production." Section 12023 of the Food, Conservation, and Energy Act further required RMA to contract for "a review of the underwriting, risk, and loss experience of organic crops covered by the Corporation, as compared with the same crops produced in the same counties and during the same crop years using nonorganic methods" RMA awarded Contract Number AG-645S-C-09-0003 to address the review identified in the Food, Conservation, and Energy Act.

In this report, the Contractor was charged with evaluating currently available data and their application to the rating paradigm currently used for organic crops. Specifically, the Contractor was required to

- Provide RMA a risk analysis for organic producers that can be used to establish a risk relationship between organic and conventional practices (Statement of Work Section 5.4.1.2.1.);
- Include yield relationships between organic and conventional practices (Statement of Work Section 5.4.1.2.2.);
- Present, discuss, and defend the yield differential that merits establishment of a separate APH database (Statement of Work Section 5.4.1.2.3.); and
- Identify collectable information that would be beneficial for future annual reports which may be used to refine the risk relationship between organic and conventional practices as more data is collected (Statement of Work 5.4.1.2.4.);

The Contractor conducted an analysis of the underwriting, risk, and loss experience of organic crops covered by FCIC as compared with the same crops produced in the same counties and during the same crop years using non-organic methods. The Contractor explored a wide variety of mechanisms to consider the risk and loss experience in the context of the underwriting requirements for the organic production. The review includes an extensive evaluation of the experience data accumulated by RMA.

The review exposes some challenges in analyzing the insurance experience data comparing organic and conventional commodities, either collectively or on an individual crop basis. In most cases, where patterns might have been thought to exist, it was also possible to identify significant exceptions to those patterns. With the limited data available, artifacts of aggregation and of sampling have the potential to lead to potentially dangerous generalizations.

The Contractor also conducted a rating review using data for conventional and organic production in the same counties. Data used to test the null hypothesis that organic and conventional production are confronted by the same insurance risk (expected loss) in a given locale were gathered from RMA Type 11, Type 15, and Type 21 datasets from crop years 2001 through 2008. The experience and yield datasets were grouped by policy into a set of paired observations and a set of all observations. The paired dataset allows outcomes from acreage insured under the same policy, which is presumably located relatively close together and otherwise managed similarly, but grown under both conventional and organic methods to be directly tested. The paired dataset is the preferred dataset for the analysis. However, the existence of policies with units managed under organic practices and units managed under non-organic practices raises the question: "Why would a producer manage a crop under both practices?" It is possible the producer is not convinced organic farming would save on input costs, increase revenues, or provide appropriate risk management. It is also possible there are differences in the land itself or crops grown nearby that effect this behavior. The producer may be new to organic production, which would increase the risk to the organic crop, or may have planted the conventional crop on marginal land, which would increase the risk to the conventional crop. Or, the behavior may simply recognize that the market for organic products is small and production using non-organic methods is a method for reducing total revenue risk. Such differences support Lampkin's contention that comparisons of organic and non-organic production are challenging at best.[105] Unfortunately, the breadth of the paired dataset is limited. The second grouping includes all units in a given county for each crop for which there was organic production. Attributes (mean and variance in the case of the yield dataset) were evaluated across all policies in order to compare "typical" organic production and "typical" conventional production.

The results of the rating analysis do not provide sufficient evidence to reject the null hypothesis that organic and conventional production methods face the same insurance risk. There is not proof of a significant, consistent, and systemic difference in insurance experience or yield variability between organic and conventional production. The data indicate a wide range of relationships between conventional and organic production. The data are not robust enough to dig deep into specific situations for crop by crop or state by state results. The high degree of variability in the results leads to a failure to reject the null hypothesis statistically.

RMA currently requires separate yield databases for organic and non-organic acreage but requires all acreage be insured within the same unit as defined by the Basic Provisions. However, the Basic Provisions require only that "[the insured] must: (1) Provide a complete harvesting and marketing record of each insured crop by unit including separate records showing the same information for production from any acreage not insured." The requirement is by unit, not by any characteristic that might affect the unit indemnity. Better data to evaluate the impact of the organic codes most likely will not be available until the system is converted to establish the organically certified or transitional acreage as a separate unit. When this is done, the data for a unit will clearly be distinguishable from other (non-organic) units. In the present system, acreage insured under an organic code may be commingled with acreage without such codes, and the utility of the experience data is compromised.

The organic surcharge is not appropriate for some crops insured under the Federal crop insurance programs. Table 32 includes several crops for which the loss ratio is zero for both organic and non-organic practice when compared in the same counties and years. In particular, damage to trees is not likely to differ materially between trees bearing a crop produced organically and trees

[105] Lampkin, N.H., 1994, Researching Organic Farming Systems, The Economics of Organic Farming, N.H. Lampkin and S. Padel, eds., CAB International, Wallingford, UK.

bearing a crop produced non-organically. For example, the causes of loss stated in the Crop Provisions for Texas Citrus Trees are:

(a) Excess precipitation;
(b) Excess wind;
(c) Fire, unless weeds and other forms of undergrowth have not been controlled or pruning debris has not been removed from the grove;
(d) Freeze;
(e) Hail;
(f) Tornado; or
(g) Failure of the irrigation water supply if caused by an insured peril or drought that occurs during the insurance period.

The only justification for an organic surcharge for Texas Citrus Trees would be evidence that trees on acreage following organic practices are structurally weaker, or that organic producers are more likely to fail to clear weeds and other forms of undergrowth from the grove. The Contractor is not aware of any evidence supporting such a belief. Similar considerations should apply to other insured crops where the causes of loss are limited to very specific perils that occur rarely and are catastrophic when they do occur.

A universal surcharge for all organic production is not appropriate. The data demonstrate numerous instances in which the experience differs substantially among crops and states. Although experience in the aggregate displays higher losses for units with an organic code, there are many crops and many states where experience on units with organic practice is better than experience on non-organic units. This suggests the organic practice is not a consistent performer relative to non-organic practice. Surcharges, if deemed necessary, should be tailored to the state/crop combination, as can be supported by data. RMA should continue to apply its standard methodology for ratemaking to the organic practice data when evaluating rate adequacy. Any deviation from the Actuarial Procedures should be documented by an Addendum to that document so interested parties are aware of the process.

The Contractor and RMA agree the data for analyzing insurance performance for crops grown under organic practices at the county level are relatively thin, especially when compared to available data for crops produced under conventional practices; and both believe this pattern will not change substantially in the near future.

SECTION VII. RECOMMENDATIONS

This section summarizes the detailed information in the report and organizes that summary around the section of the contract calling for recommendations. The Contractor reviewed the risk and loss experience of organic commodities insured under RMA plans of insurance as compared with the risk and loss experience of the same commodities produced in the same counties and during the same crop years using non-organic methods. The Contractor's review refutes the existence of significant, consistent, and systemic variations in loss history between organic and non-organic commodities on an individual crop basis. When data for all crops in all areas are aggregated, the collective insurance experience for organic production has been very different from the insurance experience for non-organic production over the observations captured in the available data. Although the data provide a noisy picture and are not well suited to aggregate analysis, the overall weight of the aggregate performance is too great to dismiss.

The Contractor consequently considered approaches to develop a recommendation for actuarially appropriate rates based on the available data. Since the research refutes the existence of significant, consistent, and systemic variations in loss history between organic and non-organic commodities both collectively and on an individual crop basis, public policy precludes the option simply to maintain the existing surcharge.

Based on the Contractor's research and analysis, it appears the organic insurance pool is subject to adverse selection by a subset of unusually high-risk producers. If the premium rates were raised by the value implied by the available aggregate data, the most likely outcome would be to assure this adverse selection would be exacerbated in future years, perpetuating and intensifying the current issues with the programs. It is clear from the literature and research completed for this report that issues such as pricing, reference yields, T-yields, and good farming practices need to be addressed collectively on a regional/crop basis, and cannot be addressed effectively until more representative data become available.

The issues affecting loss performance in the organic program to date are more complex than a simple question of the appropriateness of rates or premium sufficiency. The report addresses the relationship of actual yields to reference yields by crop and for major crops by state, identifying a substantial range of discrepancies between the two variables. Obviously, this analysis also is data dependent; no conclusions can be reached if data are too sparse to support them. However, there are a number of examples that demonstrate the T-yields and reference yields are likely too high (or perhaps too low in certain circumstances). The data, while limited, are consistent with the findings of the literature review that there is no systemic and consistent relationship of organic to non-organic yields and yield variability. The analysis of the data and the literature review are compelling in one regard: there can be no consistent relationship of rates or of program yield components (reference yields and T-yields) for organic production relative to non-organic production that applies to all crops and states. Blanket recommendations for all crops cannot be supported given the inconsistency of the data, and there are limited data to support specific recommendations for any given crop.

The Contractor notes again that the aggregate insurance performance of organic crops has been inferior to that of conventional crops. RMA has a statutory responsibility to maintain actuarial soundness of the crop insurance program. The data currently available are too sparse and noisy to draw sound actuarial/statistical conclusions to support premium rate revisions at any acceptable level of aggregation. It is clear from the aggregate loss cost ratios and loss ratios that “organic” is different from “non-organic.” Unfortunately the data at less than national aggregate becomes very unstable. The organic and conventional experience comparison at the national crop level suggests considerable deviations from non-organic rates in many cases, with both substantial discounts and increases in the rates, if the data are to be believed. The Contractor does not believe such substantial departures from non-organic rates are justified, and does not believe the data is reliable enough or representative of the true underlying distributions to support these substantial deviations from rates for non-organic production.

The Contractor notes that participation in organic coverage has shown steady growth in recent years. The Organic Survey will provide an important dataset for further analysis. If the Organic Survey yield data can substantiate the median yields evident in the experience dataset, reference and T-yields should be adjusted by crop/region as soon as practical. The additional experience data collected over the next two years is a second important data element. At the end of that period, it is likely rate adjustments for major crops in major production regions can be made using existing adjustment procedures by type/practice. Holding adjustments in abeyance during that period likely provides a least cost alternative for including “organic” in the safety net and at the same time supporting the collection of substantial data.

Estimates of the ratio of the average actual yields certified by producers relative to the respective reference yields, by crop for all crops (Table 18) and by crop/state for those crops with the greatest number of observations (Tables 19 through 21) are provided. The reference yield is used since it is the basis of premium rates established for plan code 90 crops, which account for the majority of the organic experience. In both the aggregate and for the major crops insured with organic practice, the average of actual yields certified by producers is approximately 65 percent of the reference yield. There is substantial variation among states within crops and among crops as evidenced in this and other information contained in the report. Since the data at lower levels of aggregation is noisy and inconsistent, the remaining assessment focuses on the aggregate data contained in these tables.

The risk analysis clearly indicates inappropriate transitional yields are a significant source of the higher loss costs observed for the organic practice. About one-third of all unit type 15 records contained no actual yield (i.e., the guarantee is based solely on transitional yields), while a typical record containing any actual yields had at least one transitional yield. The average of the actual yields is lower than the reference yield, which is adopted as indicative of a “normal” yield for the non-organic practice. This observation addresses contract section 5.4.1.2.2 to address the yield relationships between the organic and conventional practices.

These data also address contract section 5.4.1.2.3 in that they show yield differentials meriting establishment of separate APH databases for organic production *currently exist*. The average actual yield *to date* for the organic practice is lower than the reference yield by about one-third. Mixing of yields from organic and non-organic acreage within the same unit within the current reporting structure may have resulted in inappropriate average yields for both practices. Separate APH databases for organic production should address that issue.

The Contractor is not convinced the data reflect a consistent outcome that will exist for all time; merely that it exists *currently*. Hence, the Contractor recommends that, in the future, RMA continue to analyze and compare organic average yields with both the appropriate reference yields and the non-organic yields to determine if the relationship changes as producers become more adept at following organic processes and as the available inputs to sustain the practice change.

With regard to contract section 5.4.1.2.1 of the SOW, the Contractor makes five recommendations, the first three of which specifically address the risk relationship. These recommendations were developed in the context of the data in aggregate by crop, a position that may be less supportable as the data are disaggregated to the state, risk region, and county levels.

1. The Contractor recommends RMA impose no premium differential for crops for which the Crop Provisions specify a very limited set of causes of loss that clearly are independent of management or other variable circumstances, as well as all crop policies that are not based on individual coverage. For example, insured trees generally do not merit a premium differential. The Contractor was not able to identify any rationale or reasons why a tree grown with organic practices would not be able to withstand winds or be more susceptible to freeze than a tree grown with non-organic practices. These crops include those insurable under the Florida Citrus Fruit Crop Provisions (09-026); the Texas Citrus Tree Crop Provisions (99-025); the Macadamia Tree Crop Provisions (99-024); the Nursery Crop Provisions (08-073); the Florida Fruit Tree Provisions (08-0014); the Hawaii Tropical Trees Pilot Crop Provisions (09-0265); all crops included under the Common Group Risk Plan (GRP), Basic Provisions. 09-102; all crops included under the Group Risk Income Protection Basic Provisions (05-GRIP-BASIC; and all acreage included under the Pasture, Forage, and Rangeland programs.

2. For the crops for which the guarantee is not based on APH procedures (dollar plans, etc.), the Contractor recommends RMA make no adjustments to rates until some threshold value of units is represented in the experience dataset. The Contractor recommends the threshold value be set at 500 organic units. For those crops for which the **guarantee is not based on APH procedures and which meet the threshold**, the Contractor recommends a premium differential (increase or decrease). Inasmuch as these plans do not use T-yields, the implicit differential (surcharge or discount) from Table 34 could be used initially as the initial rate differential, with further adjustment made as data permit. The crops included under this recommendation include all crops insurable under plan code 50 (Dollar Amount of Insurance); plan code 51 (Fixed Dollar Amount of Insurance); and plan code 55 (Yield Based Dollar Amount of Insurance).

   The Contractor further recommends the maximum reference amount of insurance for organic crops insured under plan codes 50 and 51 be reduced by one-third. The thresholds at which reductions in the guarantee are made under plan code 55 should be reviewed to determine if the "break-points" presently established are reasonably consistent with the one-third reduction on a county-crop basis.

3. As a result of the confounding effects of T-yields on insurance experience for crops whose guarantee is based on APH procedures, these crops need to be treated with an alternate approach. Regardless of the extent of the experience data, for plan code 25 (Revenue Assurance); plan code 42 (Income Protection); plan code 44 (Crop Revenue Coverage); plan code 45 (Indexed Income Protection); and plan code 90 (Actual Production History) crops, the Contractor recommends transitional yields be reduced by 35 percent. This recommendation is based specifically on the role T-yields have played in the experience data collected to date. In the short term, following this recommendation will result in continuing to use the same premium rating parameters as are established for non-organic practices. The effect of this will be to insure organic production at the same premium rate and cost as that charged for non-organic practices <u>for the same yield</u>. The Contractor believes it is critical that the transitional yields be reduced to a level consistent with the experience before any effort to adjust rates is made. This approach will sharply reduce the frequency and severity of losses for the organic practice and reduce loss ratios. It will also encourage participation with the consequent development of a richer, deeper dataset.

4. The Contractor further recommends the organic practice be established as a separate type/practice, as appropriate on the actuarial documents, to facilitate the reduction in the transitional yields. As data permit, on a continuing basis, other attributes of the insurance offer can be adjusted as experience indicates.

5. To achieve the greatest ability to accrue relevant data, Crop Provisions should be modified to allow organic practice as a separate insurance unit. Presently, if both organic and non-organic acreage are included within the same insurance unit (primarily because both are in the same section), there is a reasonable degree of doubt as to whether harvested production to count is assessed against the appropriate acreage within the unit on the Production Worksheet and hence on the type 21 record. In addition, the production from non-organic acreage may offset wholly or partially any losses on organic acreage (or vice-versa) such that the true risk relationship on such units cannot be identified. Organic acreage already can be designated as a separate optional unit in certain circumstances such as planting in a different section than plantings of non-organic acreage. There is no reason to restrict producers who happen to have acreage of both practices within the same section.

Based on the data guidelines provided in the contract, external data are much less likely to inform insurance program adjustments than are experience data generated by the program. Accordingly, information collected for such adjustments will be largely controlled by RMA regulations, policies, and procedures. Nonetheless, the Contractor does recommend the data from the USDA NASS organic survey, when available, be analyzed to identify causal forces and factors in the insurance experience that may not be evident in the insurance data. However, since such data are not currently available, the Contractor is unable to specify the degree to which such information may be useful for future annual reports. Outside sources were used by the Contractor in the context of developing a base of knowledge about organic practices. However, outside sources were not specifically utilized for developing recommendations. Accordingly, there is no need for RMA to rely in the future upon the outside data sources used by the Contractor. For future annual reports, the emphasis would be on examining and explaining the insurance experience of organic practice and making appropriate adjustments as that experience is accrued.

If the agency cannot hold rate adjustments in abeyance for the additional time required to collect further experience data, the Contractor suggests judgmental adjustments be made for those crops for which new and higher organic price elections are offered. The availability of more appropriate price elections will likely entice participation by a much less biased producer population, and major crops offer better organic experience datasets than other crops, lending potentially useful insight into judgmental rate adjustments.

However, the Contractor believes adverse selection in the experience pool by high risk producers may have distorted the loss experience data, which would strongly argues against simply using the loss-cost-ratio-implied surcharge to quantify any judgmental adjustments. An initial surcharge of 10 percent may be sufficient if action needs to be taken to maintain the integrity of the program while additional experiential data is gathered. Again, timing of the implementation of judgmental rates to lessen the impact on the adverse selection is important. Introduction of these rates at the same time as the new price elections are rolled out seem logical.

Delaying the introduction of a new rating structure, new reference yields, and new prices until sufficient data are available has the potential to reduce the impact of adverse selection going forward. As the agency adds price elections for other organic crops, a judgmental rate increase (or discount) may be warranted for those crops afforded the new price election until credible loss cost based rate determination is possible.

Appendix A

Insured Organic Crops 2004 through 2007

TABLE A1. 2004 Organic Crops Insured Under FCIC Plans of Insurance

Barley	Onions
Corn	Peanuts
Cotton	Popcorn
Dry Beans	Potatoes
Dry Peas	Processing Beans
Flax	Raisins
Flue Cured Tobacco	Rice
Forage Seeding	Safflower
Grain Sorghum	Soybeans
Green Peas	Sunflowers
Hybrid Corn Seed	Sweet Corn
Millet	Wheat
Oats	

Source: The Contractor's Underwriting Department using USDA, RMA data.

TABLE A2. 2005 Organic Crops Insured Under FCIC Plans of Insurance

Alfalfa Seed	Grapes
Almonds	Green Peas
Apples	Hybrid Corn Seed
Barley	Macadamia Trees
Cherries	Millet
Citrus I	Oats
Citrus IV	Onions
Citrus Trees I	Peaches
Citrus Trees IV	Peanuts
Citrus Trees V	Pears
Citrus V	Plums
Citrus VII	Popcorn
Corn	Potatoes
Cotton	Processing Apricots
Cranberries	Processing Cling Peaches
Cultivated Wild Rice	Prunes
Dry Beans	Raisins
Dry Peas	Rice
Figs	Rye
Flax	Safflower
Flue Cured Tobacco	Soybeans
Forage Production	Sunflowers
Forage Seeding	Sweet Corn
Fresh Apricots	Table Grapes
Fresh Freestone Peaches	Tomatoes
Fresh Nectarines	Walnuts
Grain Sorghum	Wheat

Source: The Contractor's Underwriting Department using USDA, RMA data.

TABLE **A3. 2006 Organic Crops Insured Under FCIC Plans of Insurance**

Almonds	Lemons
Apples	Macadamia Nuts
Avocados	Macadamia Trees
Barley	Mandarins
Blueberries	Millet
Cherries	Mineola Tangelos
Citrus I	Mustard
Citrus II	Navel Oranges
Citrus III	Oats
Citrus IV	Onions
Citrus Trees I	Orlando Tangelos
Citrus Trees IV	Peaches
Citrus Trees V	Peanuts
Citrus VII	Pears
Corn	Plums
Cotton	Popcorn
Cranberries	Potatoes
Cultivated Wild Rice	Processing Apricots
Dry Beans	Processing Beans
Dry Peas	Processing Cling Peaches
Figs	Prunes
Flax	Raisins
Flue Cured Tobacco	Rice
Forage Production	Safflower
Forage Seeding	Soybeans
Fresh Apricots	Strawberries
Fresh Freestone Peaches	Sunflowers
Fresh Market Tomatoes	Sweet Corn
Fresh Nectarines	Table Grapes
Grain Sorghum	Tomatoes
Grapefruit	Valencia Oranges
Grapes	Walnuts
Green Peas	Wheat
Hybrid Corn Seed	

Source: The Contractor's Underwriting Department using USDA, RMA data.

TABLE A4. 2007 Organic Crops Insured Under FCIC Plans of Insurance

Alfalfa Seed	Grapes
Almonds	Green Peas
Apples	Hybrid Corn Seed
Avocados	Lemons
Barley	Macadamia Nuts
Blueberries	Macadamia Trees
Burley Tobacco	Mandarins
Cherries	Millet
Cigar Binder Tobacco	Mineola Tangelos
Citrus I	Mustard
Citrus II	Navel Oranges
Citrus III	Oats
Citrus IV	Onions
Citrus Trees I	Peanuts
Citrus Trees IV	Pears
Citrus Trees V	Plums
Citrus V	Popcorn
Citrus VII	Potatoes
Corn	Processing Apricots
Cotton	Processing Beans
Cotton Ex Long Staple	Processing Cling Peaches
Cranberries	Prunes
Cultivated Wild Rice	Rice
Dry Beans	Rye
Dry Peas	Safflower
Figs	Soybeans
Flax	Strawberries
Flue Cured Tobacco	Sunflowers
Forage Production	Sweet Corn
Forage Seeding	Sweet Oranges
Fresh Apricots	Table Grapes
Fresh Freestone Peaches	Tomatoes
Fresh Market Tomatoes	Valencia Oranges
Fresh Nectarines	Walnuts
Grain Sorghum	Wheat
Grapefruit	

Source: The Contractor's Underwriting Department using USDA, RMA data.

Appendix B

Referenced RMA Bulletins

The text in the report provides the essential information concerning the research project; the full bulletin provides context for the referenced sections, but is not essential to the analysis of the report. The referenced bulletins are available on the USDA RMA Web-site. These bulletins are provided in portable document format (PDF). Links to these bulletins are provided below.

- **MGR-01-004 - Organic Farming Practices-Implementation of the Section 123 of Agricultural Risk Protection Act of 2000 (ARPA)**
- **MGR-02-001 - Written Agreements – 2002 Crop Year**
- **MGR-02-015 - Written Agreements – 2003 Crop Year**
- **MGR-03-009 - Written Agreements – 2004 and Succeeding Crop Years**
- **MGR-04-004 - Written Agreement Experience Criteria – 2004 and Succeeding Crop Years**

Appendix C

Loss Units by State and Crop

TABLE C1. Number of Loss Units by State and Crop, 2004 through 2008

State	Wheat	Onions	Oats	Millet	Rice	Avocado	Cotton	Almonds	Walnuts	Flax	Forage Seeding	Forage Production	Prunes	Corn	Sweet Corn	Popcorn	Beans, Processing	Beans, Dry	Safflower	Grain Sorghum
California	12		2		77	25		76	19		2		40	0					0	
Colorado	311	11		62										11				30		
Idaho	13													4				7		
Illinois	10		3											88		2				
Indiana														24		1				
Iowa	4		11											353		3				
Kansas	178		2	2										33						67
Michigan	40	0	17											168			1	51		
Minnesota	98		44	0						9	3	4		404	2		4	15		
Missouri	9				0									30		5				2
Montana	747		5							33		0								
Nebraska	76		15	84										113		9		1		
New York	3		0											24	3		4	1		
North Dakota	455		129	0						463	2	6		36				37	2	
Ohio	10		0											48						
Oklahoma	58		0																	
South Dakota	43		18	5						23	0	0		49						
Texas	58	10			48		142							3			1	0		2
Utah	94											1						13	17	
Washington	6	0												0	23			0		
Wisconsin	11		7								11	3		445	4		2			
Wyoming	164		21	6								7		21				12		
Grand Total	2,400	21	274	159	125	25	142	76	19	528	18	21	40	1,854	32	20	12	167	19	71

TABLE C1. Number of Loss Units by State and Crop, 2004 through 2008

State	Table Grapes	Grapes	Apples	Cherries	Peas, Green	Peas, Dry	Peanuts	Sunflowers	Soybeans	Potatoes	Tomatoes, Processing	Pears	Barley	Plum	Rye	Navel Oranges	Valencia Oranges	Fresh Nectarines	Fresh Freestone Peaches	Grand Total
California	38	52	218	0						1	22	0	5	15		33	27	14	16	694
Colorado			0					3		65			7							500
Idaho			0							0			22							46
Illinois									92											195
Indiana									13											38
Iowa									391				0							762
Kansas								9	21				17							329
Michigan			15						197	1			9							499
Minnesota					8			27	643	0			39							1,300
Missouri									65											111
Montana						159							64							1,008
Nebraska								26	103				4							431
New York			0						15				0							50
North Dakota						71		47	69	4			138		15					1,474
Ohio									45											103
Oklahoma													0							58
South Dakota						2		18	69				3							230
Texas							35		5	1										305
Utah													0							125
Washington		12	37	16	16					6		16	2					3	3	140
Wisconsin					6				313	1			21							824
Wyoming													5							236
Grand Total	38	64	270	16	30	232	35	130	2,041	79	22	16	336	15	15	33	27	17	19	9,458

Appendix D

Reference and T-Yield Data

Table D1 contains the underlying data used for the analysis of T-yields and to compare average actual yields under organic practices with the reference yields for the same crops in the same counties. The column headers are crop code, state FIPS, county FIPS, practice (code), total records, number of records with no actuals, percent no actuals, total number of actuals, average number of actuals, average of actual yields, reference yield, ratio (of average of actual yields to reference yield) . There are more than 2,600 rows of data. The ratio of the average of the actual yields to the reference yield overall is about two-thirds. Corn, soybeans, and wheat, that collectively account for a large share of the organic acreage, also have an average actual yield that is about two-thirds of the reference yield. These three crops had about four certified yields on average for each unit with actual certified yields. While reference yields, on average, tend to exceed the production potential of acreage used for organic production by about 50 percent (reference yield should be reduced by one-third on average), differences among states exist. However, it should be noted, this difference in some cases is based on a relatively small number of observations.

TABLE D1. Data for Calculating Use of T-Yields and to Compare Reference Yield, by Crop, State, County, Practice, and Type; sample only below, see data link for full data set (Table D1 Data)

Crop Code	State FIPS	County FIPS	Practice	Type	Total Records	Number Records with No Actuals	Percent No Actuals	Total Number of Actuals	Average Number of Actuals	Average of Actual Yields	Reference Yield	Ratio
11	06	011	002	011	1	1	100%	0	0.0	0.0	76	0.00
11	06	013	002	011	1	1	100%	0	0.0	0.0	68	0.00
11	06	019	002	011	1	1	100%	0	0.0	0.0	73	0.00
11	06	019	003	011	1	0	0%	2	2.0	31.0	13	2.38
11	06	031	002	011	1	1	100%	0	0.0	0.0	75	0.00
11	06	049	002	012	2	0	0%	6	3.0	76.7	73	1.05
11	06	061	002	011	4	3	75%	2	2.0	91.5	75	1.22
11	06	065	003	011	4	4	100%	0	0.0	0.0	22	0.00
11	06	077	003	011	5	1	20%	8	2.0	0.0	35	0.00
11	06	093	002	012	4	1	25%	5	1.0	86.2	84	1.03
11	06	095	002	011	1	0	0%	1	1.0	33.0	75	0.44
11	06	095	003	011	1	0	0%	7	7.0	38.0	44	0.86
11	06	101	002	011	2	2	100%	0	0.0	0.0	73	0.00
11	06	113	002	011	1	1	100%	0	0.0	0.0	79	0.00
11	08	001	005	997	70	34	49%	79	2.0	14.8	28	0.53
11	08	003	002	012	9	7	78%	3	1.0	54.3	88	0.62
11	08	005	005	997	108	54	50%	220	4.0	12.6	25	0.50
11	08	021	002	012	5	2	40%	3	1.0	43.7	83	0.53
11	08	023	002	012	5	1	20%	4	1.0	92.5	83	1.11
11	08	033	003	011	16	2	13%	77	5.0	14.6	16	0.91
11	08	039	005	997	2	1	50%	3	3.0	15.0	29	0.52
11	08	069	002	997	16	0	0%	72	4.0	67.7	58	1.17
11	08	073	005	997	100	50	50%	183	3.0	15.8	31	0.51
11	08	075	002	997	4	2	50%	2	1.0	43.0	54	0.80
11	08	075	005	997	73	25	34%	363	7.0	27.9	29	0.96
11	08	105	002	012	3	2	67%	3	3.0	103.3	88	1.17
11	08	109	002	012	16	5	31%	31	2.0	83.0	88	0.94
11	08	113	003	011	5	0	0%	40	8.0	15.1	17	0.89
11	08	121	004	997	5	2	40%	3	1.0	22.3	24	0.93
11	08	121	005	997	38	13	34%	119	4.0	22.2	30	0.74
11	08	123	005	997	37	9	24%	129	4.0	14.9	25	0.60

Appendix E

Insurance Experience Data for All State/County Combinations

List of Tables

Table E1 contains the insurance experience data for organic production organized by state and county. The Contractor examined the data on a county basis by calculating the net underwriting gain (loss) of acreage insured under an organic code. The column headers are state (name), county (name), units (number), net acres (hundreds of), liability (thousands of dollars of), premium (thousands of dollars of) Units indemnified (number) indemnity (thousands of dollars of), gain or loss (thousands of dollars of), loss ratio, and loss cost ratio. There are almost 700 rows of data. While the data may indicate that greater acreage insured under the organic code led to more favorable insurance experience, there is no other pattern evident in these data.

TABLE E1. Alphabetical State/County Insurance Experience for All Crops with an Organic Code, 2004-2008; sample only below, see data link for full data set (Table E1 Data)

Appendix Table E1. Alphabetical State/County Insurance Experience for All Crops with an Organic Code 2004-2008

Appendix Table E1. Alphabetical State/County Insurance Experience for All Crops with an Organic Code 2004-2008

State	County	Units	Net Acres (100)	Liability ($1,000)	Premium ($1,000)	Units Indemnified	Indemnity ($1,000)	Gain (Loss) ($1,000)	Loss Ratio	Loss Cost Ratio
Arkansas	Chicot	1	0.1	8.2	0.9	0	0.0	0.9	0.000	0.000
Arkansas	Craighead	1	0.5	8.3	0.2	0	0.0	0.2	0.000	0.000
Arkansas	Drew	1	3.6	23.1	0.8	0	0.0	0.8	0.000	0.000
Arkansas	Independence	1	1.0	6.5	0.3	0	0.0	0.3	0.000	0.000
Arizona	Graham	29	3.3	6,313.8	1,411.1	9	765.8	645.3	0.543	0.121
Arizona	Yuma	3	0.2	32.8	1.4	1	9.2	(7.8)	6.775	0.279
California	Butte	92	7.3	4,494.1	470.6	24	888.0	(417.4)	1.887	0.198
California	Colusa	114	9.8	5,638.4	312.6	9	70.2	242.4	0.225	0.012
California	Contra Costa	9	0.1	40.6	3.5	0	0.0	3.5	0.000	0.000
California	El Dorado	1	0.0	8.0	0.9	0	0.0	0.9	0.000	0.000
California	Fresno	406	26.5	23,727.5	1,914.7	72	2,600.0	(685.3)	1.358	0.110
California	Glenn	61	4.8	1,061.9	44.4	4	68.9	(24.6)	1.554	0.065
California	Kern	130	10.3	12,609.3	811.7	17	479.1	332.6	0.590	0.038
California	Kings	185	6.9	9,576.4	625.6	15	261.5	364.1	0.418	0.027
California	Lake	20	0.5	149.8	6.1	7	18.5	(12.3)	3.008	0.123
California	Madera	172	12.7	11,015.2	849.9	35	468.8	381.1	0.552	0.043
California	Mendocino	164	5.5	6,499.1	360.8	15	108.2	252.6	0.300	0.017

Source: The Contractor's Underwriting Department using data from USDA, RMA

Table E2 contains the insurance experience data for non-organic production in the same counties and for the same crops in Table E1, organized by state and county. The Contractor examined the data on a county basis by calculating the net underwriting gain (loss) of acreage insured without an organic code. The column headers are state (name), county (name), units (number), net acres (hundreds of), liability (thousands of dollars of), premium (thousands of dollars of) Units indemnified (number) indemnity (thousands of dollars of), gain or loss (thousands of dollars of), loss ratio, and loss cost ratio. There are almost 700 rows of data. No pattern is immediately evident in the data.

TABLE E2. Alphabetical State/County Insurance Experience for All Crops with a Non-organic Code, 2004-2008; sample only below, see data link for full data set (Table E2 Data)

TABLE E2. Alphabetical State/County Insurance Experience for All Crops with a Non-organic Code, 2004-2008

TABLE E2. Alphabetical State/County Insurance Experience for All Crops with a Non-organic Code, 2004-2008

State	County	Units	Net Acres (100)	Liability ($1,000)	Premium ($1,000)	Units Indemnified	Indemnity ($1,000)	Gain (Loss) ($1,000)	Loss Ratio	Loss Cost Ratio
Arkansas	Chicot	144	29.7	4,290.6	514.7	1	0.6	514.0	0.001	0.000
Arkansas	Craighead	286	345.5	7,664.8	236.4	3	15.9	220.5	0.067	0.002
Arkansas	Drew	63	67.7	1,053.5	37.6	1	0.8	36.7	0.022	0.001
Arkansas	Independence	91	70.5	950.7	84.6	0	0.0	84.6	0.000	0.000
Arizona	Graham	9	0.3	545.9	88.5	2	5.0	83.5	0.057	0.009
Arizona	Yuma	97	22.4	13,757.7	606.3	15	615.5	(9.2)	1.015	0.045
California	Butte	3,128	2,227.3	226,150.4	11,854.0	394	7,962.0	3,892.0	0.672	0.035
California	Colusa	3,915	3,198.5	222,187.5	8,275.3	150	2,419.1	5,856.2	0.292	0.011
California	Contra Costa	1	0.0	2.5	0.2	0	0.0	0.2	0.000	0.000
California	El Dorado	3	0.0	23.7	4.1	2	10.6	(6.6)	2.620	0.448
California	Fresno	20,564	1,585.7	1,218,801.2	74,584.3	1,933	35,706.3	38,877.9	0.479	0.029
California	Glenn	1,348	1,884.9	103,199.6	3,966.8	66	3,106.1	860.7	0.783	0.030
California	Kern	3,187	520.3	660,263.0	31,998.1	135	9,364.1	22,634.0	0.293	0.014
California	Kings	926	177.2	55,419.4	3,833.6	51	1,028.8	2,804.9	0.268	0.019
California	Lake	137	7.3	6,081.9	141.2	30	230.7	(89.5)	1.634	0.038
California	Madera	3,957	342.2	303,742.6	19,461.2	393	8,036.8	11,424.4	0.413	0.026
California	Mendocino	759	24.4	33,197.7	1,693.5	42	320.9	1,372.6	0.189	0.010
California	Merced	4,334	291.0	480,370.6	27,588.2	675	12,271.9	15,316.3	0.445	0.026
California	Modoc	131	15.3	13,934.1	1,563.0	14	157.0	1,405.9	0.100	0.011
California	Napa	3,533	93.4	306,411.5	14,261.7	176	2,559.8	11,701.8	0.179	0.008
California	Orange	6	2.9	5,307.0	313.1	0	0.0	313.1	0.000	0.000
California	Placer	154	125.1	7,777.5	696.9	43	1,403.6	(706.8)	2.014	0.180

Source: The Contractor's Underwriting Department using data from USDA, RMA

Table E3 organizes the insurance experience from Tables E1 and E2 rank ordered by the net underwriting gain (loss) of acreage insured under an organic code. The column headers are state (name), county (name), units (number), then for units of crops with an organic code, net acres, gain or loss (dollars of) liability (thousands of dollars of), and percent of liability, and finally for the same crops without an organic code in the same counties net acres (hundreds of), gain or loss (thousands of dollars of) liability (thousands of dollars of), and percent of liability. Once again there are almost 700 rows of data. There is no obvious geographic pattern in these data.

TABLE E3. Rank Ordered Listing of Counties with Net Underwriting Gains (Losses) for Crops Insured with the Organic Code, 2004-2008; sample only below, see data link for full data set (Table E3 Data)

TABLE E3. Rank Ordered Listing of Counties with Net Underwriting Gains (Losses) for Crops Insured with the Organic Code, 2004-2008 | **TABLE E3. Rank Ordered Listing of Counties with Net Underwriting Gains (Losses) for Crops Insured with the Organic Code, 2004-2008**

State	County	With an Organic Code				With a Non-organic Code			
		Net Acres (100)	Gain (Loss) ($1,000)	Liability ($1,000)	Percent of Liability	Net Acres (100)	Gain (Loss) ($1,000)	Liability ($1,000)	Percent of Liability
Washington	Douglas	5.4	840.0	13,572.0	6.2	192.2	2,535.6	84,296.6	3.0
Washington	Yakima	8.6	699.4	17,813.6	3.9	337.9	6,918.0	518,345.6	1.3
Arizona	Graham	3.3	645.3	6,313.8	10.2	0.3	83.5	545.9	15.3
California	Napa	3.0	573.4	10,402.3	5.5	93.4	11,701.8	306,411.5	3.8
Washington	Grant	27.1	496.8	24,777.2	2.0	440.0	11,826.5	472,082.4	2.5
Michigan	Shiawassee	28.7	423.4	7,787.9	5.4	303.8	4,920.8	85,178.1	5.8
Wyoming	Laramie	41.7	420.6	3,250.4	12.9	301.8	1,416.2	26,352.5	5.4
California	Madera	12.7	381.1	11,015.2	3.5	342.2	11,424.4	303,742.6	3.8
California	Kings	6.9	364.1	9,576.4	3.8	177.2	2,804.9	55,419.4	5.1
California	Kern	10.3	332.6	12,609.3	2.6	520.3	22,634.0	660,263.0	3.4
California	Ventura	3.0	311.1	5,592.6	5.6	136.9	8,335.0	270,371.9	3.1
Washington	Benton	19.9	296.5	15,301.1	1.9	278.6	8,613.6	271,456.4	3.2
Colorado	Arapahoe	31.0	288.3	1,598.5	18.0	59.0	8.3	4,680.8	0.2
Colorado	Lincoln	30.0	256.6	1,639.8	15.6	133.9	(365.3)	13,933.5	-2.6
California	Mendocino	5.5	252.6	6,499.1	3.9	24.4	1,372.6	33,197.7	4.1
Kansas	Wichita	17.7	226.8	3,332.3	6.8	698.0	(1,573.6)	129,624.9	-1.2
Washington	Walla Walla	2.5	216.4	5,365.0	4.0	139.7	(10,699.8)	166,403.9	-6.4
Utah	San Juan	34.7	183.4	1,017.2	18.0	137.2	(46.2)	5,425.5	-0.9
Nebraska	Kimball	20.9	175.0	1,287.4	13.6	580.5	3,293.5	39,390.5	8.4
Nebraska	Dawson	6.7	163.8	2,017.5	8.1	602.6	10,355.5	255,693.5	4.0
Washington	Okanogan	1.9	160.4	4,158.6	3.9	64.1	5,543.0	112,010.1	4.9
California	Yolo	5.4	159.1	5,518.2	2.9	217.7	3,295.6	186,921.4	1.8
California	Colusa	3.1	146.3	2,799.7	5.2	319.7	3,886.5	128,635.1	3.0

Source: The Contractor's Underwriting Department using data from USDA, RMA

Appendix F

Insurance Experience Data by Crop

TABLE F1. Insurance Experience for Crops Insured with Organic Common Option Codes, 2004-2008

Crop Name	Units Insured	Net acres (100)	Liability ($1,000)	Premium ($1,000)	Units Indemnified	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Alfalfa Seed	3	2.3	112.0	7.6	2	47.7	6.312	0.426
All other Citrus Trees	2	0.0	57.9	0.9	0	0.0	0.000	0.000
Almonds	199	100.8	14,419.0	1,377.2	63	1,362.3	0.989	0.094
Apples	1,137	346.7	79,141.5	6,167.6	232	2,990.9	0.485	0.038
Avocado Trees (FL)	1	0.0	11.2	0.5	0	0.0	0.000	0.000
Avocados	166	34.9	4,699.2	542.9	25	206.2	0.380	0.044
Barley	706	511.8	4,273.5	909.1	333	827.1	0.910	0.194
Blueberries	15	5.5	607.1	58.7	3	78.9	1.344	0.130
Burley Tobacco	3	0.1	16.3	1.6	0	0.0	0.000	0.000
Cherries	135	16.9	3,576.9	241.0	18	300.9	1.249	0.084
Cigar Binder Tobacco	2	0.0	6.5	0.4	0	0.0	0.000	0.000
Cigar Filler Tobacco	1	0.0	0.8	0.1	0	0.0	0.000	0.000
Coffee	1	0.0	4.2	0.1	0	0.0	0.000	0.000
Corn	4,274	2,360.9	71,164.9	9,449.6	1,897	12,913.5	1.367	0.181
Cotton	331	218.6	3,700.3	875.9	138	1,006.0	1.149	0.272
Cotton Ex Long Staple	6	5.9	509.7	56.8	2	284.6	5.012	0.558
Cranberries	23	6.2	1,314.2	119.4	4	99.8	0.836	0.076
Cultivated Wild Rice	9	18.5	1,178.1	48.5	0	0.0	0.000	0.000
Dry Beans	400	223.7	4,263.8	718.7	167	927.2	1.290	0.217
Dry Peas	490	316.9	2,158.7	515.4	233	717.8	1.393	0.332
Early and Midseason Orange Trees (TX)	4	0.3	31.3	1.1	0	0.0	0.000	0.000
Early and Midseason Oranges (FL)	29	10.4	1,017.3	33.7	0	0.0	0.000	0.000
Figs	47	36.2	2,903.6	170.8	10	109.6	0.642	0.038
Flax	871	585.3	4,622.5	1,081.1	528	1,783.5	1.650	0.386
Flue Cured Tobacco	28	2.0	465.3	25.7	9	86.2	3.353	0.185
Forage Production	120	88.0	1,262.5	147.5	15	67.7	0.459	0.054
Forage Seeding	77	44.6	667.0	88.1	16	43.4	0.493	0.065
Fresh Apricots	45	5.2	796.3	91.2	9	137.8	1.512	0.173
Fresh Freestone Peaches	144	13.7	1,750.5	126.5	23	114.2	0.903	0.065
Fresh Market Tomatoes	4	0.3	139.2	16.1	0	0.0	0.000	0.000
Fresh Nectarines	145	12.3	1,852.6	159.8	17	66.5	0.416	0.036
Grain Sorghum	133	49.1	524.0	151.1	71	241.8	1.600	0.462
Grapefruit (CA)	23	8.5	652.1	31.5	4	77.5	2.462	0.119
Grapefruit (fresh) and Late Oranges (FL)	25	6.3	554.6	24.2	1	13.8	0.568	0.025
Grapefruit (Juice) (FL)	2	0.0	3.0	0.1	0	0.0	0.000	0.000
Grapefruit Trees (FL)	4	0.0	605.8	8.1	0	0.0	0.000	0.000
Grapes	715	264.9	30,792.8	1,853.4	57	542.4	0.293	0.018
Green Peas	92	137.5	6,844.6	607.7	31	644.3	1.060	0.094
Hybrid Corn Seed	31	18.2	1,040.8	117.9	6	59.3	0.503	0.057
Late Oranges (Juice) (FL)	24	8.5	781.5	28.4	0	0.0	0.000	0.000
Lemons	53	19.8	3,326.8	195.7	6	183.7	0.939	0.055
Macadamia Nuts	8	10.3	1,226.8	28.3	2	16.1	0.569	0.013
Macadamia Trees	8	10.3	3,473.3	47.2	0	0.0	0.000	0.000
Mandarins (CA)	18	2.5	193.1	14.0	2	2.2	0.155	0.011
Millet	419	225.0	988.2	291.9	158	210.7	0.722	0.213
Mineola Tangelos (CA)	13	4.1	447.3	27.7	0	0.0	0.000	0.000
Murcott and Temple Oranges (FL)	9	1.0	125.4	7.6	1	11.1	1.450	0.088
Mustard	3	2.8	63.9	7.0	1	21.2	3.029	0.332
Navel Oranges	125	49.8	6,246.5	426.1	33	1,128.8	2.649	0.181

TABLE F1. Insurance Experience for Crops Insured with Organic Common Options Codes, 2004-2008 (continued)

Crop Name	Units Insured	Net acres (100)	Liability ($1,000)	Premium ($1,000)	Units Indemnified	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Navel Oranges (FL)	7	0.9	96.3	4.2	0	0.0	0.000	0.000
Oats	886	424.0	2,679.8	576.7	276	423.3	0.734	0.158
Onions	86	18.2	2,060.0	326.3	21	295.2	0.905	0.143
Orange Trees (FL)	11	0.0	2,482.8	41.5	0	0.0	0.000	0.000
Peaches	3	0.2	41.5	8.1	0	0.0	0.000	0.000
Peanuts	183	150.2	4,723.9	347.1	37	343.9	0.991	0.073
Pears	328	36.9	5,076.2	210.7	13	56.4	0.268	0.011
Plums	123	15.6	1,938.9	228.1	15	81.3	0.356	0.042
Popcorn	43	28.4	750.4	82.1	20	125.3	1.526	0.167
Potatoes	231	104.7	9,756.7	969.6	82	1,292.2	1.333	0.132
Processing Apricots	13	3.7	206.9	20.8	5	27.1	1.303	0.131
Processing Beans	27	13.6	346.3	54.1	12	118.0	2.182	0.341
Processing Cling Peaches	18	2.7	321.3	12.0	0	0.0	0.000	0.000
Processing Freestone	1	0.1	7.2	0.4	0	0.0	0.000	0.000
Prunes	94	49.6	5,596.1	865.5	38	1,334.8	1.542	0.239
Raisins	64	116.7	5,711.6	420.0	8	67.3	0.160	0.012
Rice	570	681.2	5,783.3	1,362.6	125	2,097.9	1.540	0.363
Ruby Red and Star Grapefruit Trees (TX)	4	0.3	38.5	1.8	0	0.0	0.000	0.000
Ruby Red Grapefruit Trees (TX)	6	0.2	17.0	0.8	0	0.0	0.000	0.000
Rye	27	19.4	131.4	22.4	12	23.0	1.024	0.175
Safflower	51	155.7	431.2	65.5	19	83.0	1.267	0.193
Soybeans	3,976	2,345.8	42,834.4	6,788.2	2,058	12,042.5	1.774	0.281
Strawberries	16	8.8	2,919.9	71.7	0	0.0	0.000	0.000
Sunflowers	278	177.8	2,302.2	513.2	130	547.2	1.066	0.238
Sweet Corn	112	196.1	5,013.6	242.4	33	545.0	2.249	0.109
Sweet Oranges (CA)	5	0.3	40.3	3.0	1	8.6	2.836	0.214
Table Grapes	159	47.3	8,815.9	549.7	35	692.7	1.260	0.079
Tangelos and Tangerines (FL)	32	4.6	520.1	32.2	0	0.0	0.000	0.000
Tomatoes	197	179.5	23,752.0	1,413.7	22	848.6	0.600	0.036
Valencia Oranges	109	38.6	3,671.4	252.8	26	550.3	2.176	0.150
Walnuts	72	32.7	1,933.4	75.7	18	291.8	3.853	0.151
Wheat	6,028	6,554.2	57,699.8	14,455.1	2,224	14,006.4	0.969	0.243

Source: The Contractor's Underwriting Department using USDA RMA data.

TABLE F2. Insurance Experience for the Same Crops Insured Without Organic Common Option Codes, 2004-2008

Crop Name	Units	Net acres (100)	Liability ($1,000)	Premium ($1,000)	Units Indemnified	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Alfalfa Seed	1	0.6	27.0	1.6	1	11.7	7.512	0.432
All other Citrus Trees	49	0.0	2,532.0	46.7	0	0.0	0.000	0.000
Almonds	12,755	9,386.5	1,508,695.3	89,012.2	1,532	29,741.5	0.334	0.020
Apples	10,928	6,274.3	1,285,670.3	62,446.5	1,152	49,766.9	0.797	0.039
Avocado Trees (FL)	117	0.0	17,264.8	671.7	0	0.0	0.000	0.000
Avocados	3,999	1,238.8	202,382.0	22,837.4	627	11,440.9	0.501	0.057
Barley	16,413	20,499.5	158,375.3	21,844.2	5,275	23,298.3	1.067	0.147
Blueberries	141	79.3	13,774.1	1,038.5	9	444.6	0.428	0.032
Burley Tobacco	7	0.3	52.3	4.5	2	5.4	1.194	0.103
Cherries	4,465	769.2	159,550.2	16,589.4	850	18,590.6	1.121	0.117
Cigar Binder Tobacco	4	0.2	29.3	1.7	2	18.0	10.564	0.614
Cigar Filler Tobacco	3	0.1	25.1	1.1	0	0.0	0.000	0.000
Coffee	13	0.7	181.9	3.5	0	0.0	0.000	0.000
Corn	527,854	377,260.0	14,466,068.6	1,266,692.3	104,654	698,957.9	0.552	0.048
Cotton	51,495	34,199.4	584,437.7	147,886.7	17,943	158,583.1	1.072	0.271
Cotton Ex Long Staple	476	1,226.6	67,070.7	2,811.3	49	3,358.4	1.195	0.050
Cranberries	746	387.3	75,824.6	2,205.6	43	489.5	0.222	0.006
Cultivated Wild Rice	39	115.0	7,138.1	291.9	1	28.3	0.097	0.004
Dry Beans	8,663	4,946.6	101,550.4	14,007.1	2,420	11,531.1	0.823	0.114
Dry Peas	7,785	8,850.7	81,293.4	11,712.5	2,644	13,928.2	1.189	0.171
Early and Midseason Orange Trees (TX)	876	103.0	26,786.3	970.5	0	0.0	0.000	0.000
Early and Midseason Oranges (FL)	981	632.2	38,808.4	1,030.3	55	1,959.0	1.901	0.050
Figs	76	103.1	7,429.5	494.6	5	146.5	0.296	0.020
Flax	6,239	4,541.6	34,812.8	5,082.3	2,194	6,606.5	1.300	0.190
Flue Cured Tobacco	1,592	168.9	45,337.6	2,685.0	386	6,852.4	2.552	0.151
Forage Production	2,847	2,439.9	19,689.1	2,252.5	511	1,441.1	0.640	0.073
Forage Seeding	1,345	433.5	5,793.8	786.4	147	385.5	0.490	0.067
Fresh Apricots	170	40.4	5,966.2	636.2	36	507.7	0.798	0.085
Fresh Freestone Peaches	1,600	702.4	61,408.7	2,864.8	61	183.6	0.064	0.003
Fresh Market Tomatoes	4	2.1	1,001.2	110.3	1	15.9	0.144	0.016
Fresh Nectarines	1,922	768.7	75,085.0	4,450.7	140	1,155.6	0.260	0.015
Grain Sorghum	7,430	3,242.6	51,771.9	9,054.3	2,284	9,967.9	1.101	0.193
Grapefruit (CA)	150	87.3	10,285.5	449.0	15	322.5	0.718	0.031
Grapefruit (fresh) and Late Oranges (FL)	275	289.2	17,210.2	563.8	69	6,509.0	11.545	0.378
Grapefruit (Juice) (FL)	1	0.1	5.0	0.2	0	0.0	0.000	0.000
Grapefruit Trees (FL)	220	0.0	66,643.9	961.0	1	56.8	0.059	0.001
Grapes	27,489	13,582.4	1,516,957.0	82,517.4	1,606	20,065.9	0.243	0.013
Green Peas	349	562.0	12,671.7	864.5	37	451.0	0.522	0.036
Hybrid Corn Seed	114	65.4	5,375.0	262.4	4	231.7	0.883	0.043
Late Oranges (Juice) (FL)	277	145.5	15,543.9	511.3	2	30.0	0.059	0.002
Lemons	1,624	1,048.2	163,970.2	5,933.1	100	2,670.3	0.450	0.016
Macadamia Nuts	498	479.6	87,327.2	1,776.1	52	2,326.6	1.310	0.027
Macadamia Trees	248	249.4	86,897.8	919.5	0	0.0	0.000	0.000
Mandarins (CA)	113	128.8	21,913.1	1,672.8	7	567.3	0.339	0.026
Millet	9,842	5,429.2	29,301.5	5,798.7	3,597	5,584.0	0.963	0.191
Mineola Tangelos (CA)	121	32.8	2,769.5	183.7	11	143.5	0.781	0.052
Murcott and Temple Oranges (FL)	117	16.5	2,799.6	139.5	37	356.3	2.554	0.127
Mustard	3	8.4	167.5	16.8	1	4.2	0.249	0.025
Navel Oranges	10,241	4,020.4	554,061.3	31,562.3	1,284	35,605.4	1.128	0.064

TABLE F2. Insurance Experience for the Same Crops Insured Without Organic Common Option Codes, 2004-2008 (continued)

Crop Name	Units	Net acres (100)	Liability ($1,000)	Premium ($1,000)	Units Indemnified	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Navel Oranges (FL)	22	4.8	518.4	22.7	0	0.0	0.000	0.000
Oats	7,529	3,493.2	19,045.4	3,480.5	2,299	4,093.4	1.176	0.215
Onions	590	428.3	57,302.4	6,082.3	149	4,923.8	0.810	0.086
Orange Trees (FL)	333	0.0	139,516.6	1,993.6	0	0.0	0.000	0.000
Peaches	82	4.7	1,462.6	259.1	10	34.9	0.135	0.024
Peanuts	3,019	2,045.5	72,717.7	3,600.9	134	1,689.2	0.469	0.023
Pears	5,065	979.7	125,226.1	4,266.3	147	797.5	0.187	0.006
Plums	2,212	434.2	48,479.7	5,273.3	405	3,454.0	0.655	0.071
Popcorn	230	144.6	6,539.3	381.6	10	41.0	0.107	0.006
Potatoes	3,129	3,831.4	380,135.4	28,434.6	650	16,088.7	0.566	0.042
Processing Apricots	172	63.4	6,163.2	652.1	53	971.9	1.490	0.158
Processing Beans	195	93.7	3,919.7	407.3	47	312.9	0.768	0.080
Processing Cling Peaches	323	68.4	7,320.0	259.9	29	193.4	0.744	0.026
Processing Freestone	1	0.0	4.3	0.2	0	0.0	0.000	0.000
Prunes	2,186	1,189.6	137,166.5	19,492.6	1,171	38,203.6	1.960	0.279
Raisins	5,264	5,152.5	288,568.8	22,913.2	767	5,565.7	0.243	0.019
Rice	10,317	18,206.0	507,219.2	18,613.4	559	12,586.0	0.676	0.025
Ruby Red and Star Grapefruit Trees (TX)	1,461	283.5	76,254.7	3,674.4	0	0.0	0.000	0.000
Ruby Red Grapefruit Trees (TX)	138	21.1	4,760.1	203.9	0	0.0	0.000	0.000
Rye	13	5.0	43.3	7.5	1	1.1	0.145	0.025
Safflower	208	232.8	1,259.3	132.9	32	126.1	0.949	0.100
Soybeans	506,380	341,836.6	8,079,585.5	795,669.2	132,132	678,795.3	0.853	0.084
Strawberries	333	294.9	106,681.1	2,650.5	0	0.0	0.000	0.000
Sunflowers	6,497	5,292.7	82,462.8	14,990.8	2,144	11,530.3	0.769	0.140
Sweet Corn	520	1,364.4	35,438.9	1,257.2	22	204.0	0.162	0.006
Sweet Oranges (CA)	26	1.8	349.6	27.8	1	13.6	0.488	0.039
Table Grapes	3,294	2,641.2	505,271.0	24,534.4	298	9,110.9	0.371	0.018
Tangelos and Tangerines (FL)	377	70.0	5,363.4	215.1	95	524.4	2.439	0.098
Tomatoes	4,923	4,673.2	478,622.8	22,073.6	309	8,708.4	0.395	0.018
Valencia Oranges	3,012	763.4	94,924.5	6,647.7	354	6,964.5	1.048	0.073
Walnuts	1,927	1,790.5	129,984.9	4,321.3	45	441.7	0.102	0.003
Wheat	392,323	380,685.4	4,354,667.5	732,402.6	100,820	547,782.3	0.748	0.126

Source: The Contractor's Underwriting Department using USDA RMA data.

Appendix G

Organic Crop Underwriting Gain (Loss)

TABLE G1. Organic Crop Net Underwriting Gain (Loss) and Comparable Values for the Non-organic Component of the Crop, 2004-2008

Crop	With Organic Code			Without Organic Code		
	Gain (Loss) ($1,000)	Liability ($1,000)	Percent of Liability	Gain (Loss) ($1,000)	Liability ($1,000)	Percent of Liability
Alfalfa Seed	(40.1)	112.0	-35.8	(10.1)	27.0	-37.5
All other Citrus Trees	0.9	57.9	1.5	46.7	2,532.0	1.8
Almonds	14.9	14,419.0	0.1	59,270.6	1,508,695.3	3.9
Apples	3,176.7	79,141.5	4.0	12,679.7	1,285,670.3	1.0
Avocado Trees (FL)	0.5	11.2	4.9	671.7	17,264.8	3.9
Avocados	336.7	4,699.2	7.2	11,396.6	202,382.0	5.6
Barley	82.1	4,273.5	1.9	(1,454.1)	158,375.3	-0.9
Blueberries	(20.2)	607.1	-3.3	594.0	13,774.1	4.3
Burley Tobacco	1.6	16.3	9.7	(0.9)	52.3	-1.7
Cherries	(59.9)	3,576.9	-1.7	(2,001.2)	159,550.2	-1.3
Cigar Binder Tobacco	0.4	6.5	6.8	(16.3)	29.3	-55.6
Cigar Filler Tobacco	0.1	0.8	6.4	1.1	25.1	4.5
Coffee	0.1	4.2	2.1	3.5	181.9	1.9
Corn	(3,464.0)	71,164.9	-4.9	567,734.4	14,466,068.6	3.9
Cotton	(130.1)	3,700.3	-3.5	(10,696.4)	584,437.7	-1.8
Cotton Ex Long Staple	(227.8)	509.7	-44.7	(547.0)	67,070.7	-0.8
Cranberries	19.6	1,314.2	1.5	1,716.1	75,824.6	2.3
Cultivated Wild Rice	48.5	1,178.1	4.1	263.6	7,138.1	3.7
Dry Beans	(208.5)	4,263.8	-4.9	2,476.0	101,550.4	2.4
Dry Peas	(202.3)	2,158.7	-9.4	(2,215.7)	81,293.4	-2.7
Early and Midseason Orange Trees (TX)	1.1	31.3	3.6	970.5	26,786.3	3.6
Early and Midseason Oranges (FL)	33.7	1,017.3	3.3	(928.7)	38,808.4	-2.4
Figs	61.2	2,903.6	2.1	348.1	7,429.5	4.7
Flax	(702.5)	4,622.5	-15.2	(1,524.3)	34,812.8	-4.4
Flue Cured Tobacco	(60.5)	465.3	-13.0	(4,167.3)	45,337.6	-9.2
Forage Production	79.8	1,262.5	6.3	811.4	19,689.1	4.1
Forage Seeding	44.7	667.0	6.7	400.9	5,793.8	6.9
Fresh Apricots	(46.6)	796.3	-5.9	128.5	5,966.2	2.2
Fresh Freestone Peaches	12.3	1,750.5	0.7	2,681.1	61,408.7	4.4
Fresh Market Tomatoes	16.1	139.2	11.6	94.4	1,001.2	9.4
Fresh Nectarines	93.3	1,852.6	5.0	3,295.2	75,085.0	4.4
Grain Sorghum	(90.7)	524.0	-17.3	(913.5)	51,771.9	-1.8
Grapefruit (CA)	(46.0)	652.1	-7.1	126.5	10,285.5	1.2
Grapefruit (fresh) and Late Oranges (FL)	10.5	554.6	1.9	(5,945.2)	17,210.2	-34.5
Grapefruit (Juice) (FL)	0.1	3.0	3.7	0.2	5.0	3.5
Grapefruit Trees (FL)	8.1	605.8	1.3	904.2	66,643.9	1.4
Grapes	1,311.0	30,792.8	4.3	62,451.5	1,516,957.0	4.1
Green Peas	(36.6)	6,844.6	-0.5	413.5	12,671.7	3.3
Hybrid Corn Seed	58.7	1,040.8	5.6	30.7	5,375.0	0.6
Late Oranges (Juice) (FL)	28.4	781.5	3.6	481.3	15,543.9	3.1
Lemons	12.0	3,326.8	0.4	3,262.8	163,970.2	2.0
Macadamia Nuts	12.2	1,226.8	1.0	(550.5)	87,327.2	-0.6
Macadamia Trees	47.2	3,473.3	1.4	919.5	86,897.8	1.1
Mandarins (CA)	11.8	193.1	6.1	1,105.5	21,913.1	5.0
Millet	81.2	988.2	8.2	214.6	29,301.5	0.7
Mineola Tangelos (CA)	27.7	447.3	6.2	40.2	2,769.5	1.5
Murcott and Temple Oranges (FL)	(3.4)	125.4	-2.7	(216.8)	2,799.6	-7.7
Mustard	(14.2)	63.9	-22.2	12.6	167.5	7.5

Table G1. Organic Crop Net Underwriting Gain (Loss) and Comparable Values for the Non-organic Component of the Crop, 2004-2008 (continued)

Crop	With Organic Code			Without Organic Code		
	Gain (Loss) ($1,000)	Liability ($1,000)	Percent of Liability	Gain (Loss) ($1,000)	Liability ($1,000)	Percent of Liability
Navel Oranges	(702.7)	6,246.5	-11.2	(4,043.2)	554,061.3	-0.7
Navel Oranges (FL)	4.2	96.3	4.3	22.7	518.4	4.4
Oats	153.4	2,679.8	5.7	(612.9)	19,045.4	-3.2
Onions	31.1	2,060.0	1.5	1,158.5	57,302.4	2.0
Orange Trees (FL)	41.5	2,482.8	1.7	1,993.6	139,516.6	1.4
Peaches	8.1	41.5	19.4	224.2	1,462.6	15.3
Peanuts	3.2	4,723.9	0.1	1,911.7	72,717.7	2.6
Pears	154.2	5,076.2	3.0	3,468.8	125,226.1	2.8
Plums	146.9	1,938.9	7.6	1,819.3	48,479.7	3.8
Popcorn	(43.2)	750.4	-5.8	340.6	6,539.3	5.2
Potatoes	(322.6)	9,756.7	-3.3	12,345.9	380,135.4	3.2
Processing Apricots	(6.3)	206.9	-3.0	(319.8)	6,163.2	-5.2
Processing Beans	(63.9)	346.3	-18.5	94.3	3,919.7	2.4
Processing Cling Peaches	12.0	321.3	3.7	66.5	7,320.0	0.9
Processing Freestone	0.4	7.2	5.5	0.2	4.3	5.2
Prunes	(469.3)	5,596.1	-8.4	(18,711.0)	137,166.5	-13.6
Raisins	352.7	5,711.6	6.2	17,347.5	288,568.8	6.0
Rice	(735.2)	18,355.9	-4.0	6,027.4	507,220.2	1.2
Ruby Red and Star Grapefruit Trees (TX)	1.8	38.5	4.8	3,674.4	76,254.7	4.8
Ruby Red Grapefruit Trees (TX)	0.8	17.0	4.8	203.9	4,760.1	4.3
Rye	(0.5)	131.4	-0.4	6.4	43.3	14.9
Safflower	(17.5)	431.2	-4.1	6.8	1,259.3	0.5
Soybeans	(5,254.3)	42,834.4	-12.3	116,873.9	8,079,585.5	1.4
Strawberries	71.7	2,919.9	2.5	2,650.5	106,681.1	2.5
Sunflowers	(34.0)	2,302.2	-1.5	3,460.5	82,462.8	4.2
Sweet Corn	(302.6)	5,013.6	-6.0	1,053.2	35,438.9	3.0
Sweet Oranges (CA)	(5.6)	40.3	-13.8	14.2	349.6	4.1
Table Grapes	(143.0)	8,815.9	-1.6	15,423.5	505,271.0	3.1
Tangelos and Tangerines (FL)	32.2	520.1	6.2	(309.4)	5,363.4	-5.8
Tomatoes	565.1	23,752.0	2.4	13,365.3	478,622.8	2.8
Valencia Oranges	(297.4)	3,671.4	-8.1	(316.8)	94,924.5	-0.3
Walnuts	(216.1)	1,933.4	-11.2	3,879.6	129,984.9	3.0
Wheat	448.7	57,699.8	0.8	184,620.4	4,354,667.5	4.2

Source: The Contractor's Underwriting Department using USDA RMA data.

Appendix H

Comparison of Organic and Non-organic Percentage Loss by Crop

TABLE H1. Organic and Non-organic Insurance Data 2005-2008: By State With Most Organic Insured Acres to Least (All Data Except Loss Ratio in 1,000 units)

State	Organic Acres	Non-organic Acres	Organic Liability	Non-organic Liability	Organic Premium	Non-organic Premium	Organic Indemnity	Non-organic Indemnity	Organic Loss Ratio	Non-organic Loss Ratio
Montana	238.3	16,781.9	19,193.0	1,534,302.2	4,396.2	256,856.0	5,170.6	199,885.5	1.176	0.778
Minnesota	203.7	25,497.0	37,922.3	7,023,348.8	5,993.4	718,042.6	9,017.9	455,234.9	1.505	0.634
North Dakota	180.0	14,140.8	17,235.4	1,985,783.7	4,235.5	331,136.0	5,622.0	281,442.9	1.327	0.850
Colorado	132.1	2,389.7	17,426.3	399,401.9	4,770.4	63,002.5	4,721.6	57,000.5	0.990	0.905
California	127.7	5,713.4	129,448.6	6,072,665.3	9,871.9	364,466.5	9,532.7	191,264.7	0.966	0.525
Nebraska	97.0	9,960.4	19,118.2	2,706,171.1	2,696.7	264,835.3	2,603.3	130,940.0	0.965	0.494
Utah	95.2	306.4	4,521.9	23,279.2	1,152.9	3,752.1	1,410.4	3,943.1	1.223	1.051
Iowa	84.8	19,308.4	23,858.1	7,050,279.0	2,456.8	520,937.8	4,286.4	336,273.6	1.745	0.646
Washington	76.9	1,787.6	95,171.5	1,883,006.3	5,967.1	93,889.8	3,030.8	66,838.9	0.508	0.712
Michigan	63.0	1,916.7	14,671.7	465,555.2	2,652.0	52,795.8	2,524.0	38,414.8	0.952	0.728
Texas	61.8	4,409.1	11,498.2	893,020.1	1,880.4	173,238.3	2,565.4	177,282.6	1.364	1.023
Wyoming	56.1	468.2	4,411.0	54,123.5	933.2	8,352.8	581.3	6,855.7	0.623	0.821
Wisconsin	49.0	4,035.1	12,303.5	1,263,386.8	2,151.2	140,454.3	4,143.8	135,404.6	1.926	0.964
Kansas	42.4	3,972.5	6,758.5	603,459.3	1,056.8	100,653.2	1,211.1	87,901.1	1.146	0.873
South Dakota	40.8	4,914.6	5,820.5	1,063,111.5	1,041.3	132,106.0	1,233.8	77,793.7	1.185	0.589
Illinois	19.5	5,540.8	5,754.1	2,130,470.3	614.1	158,306.3	759.4	60,554.3	1.237	0.383
Idaho	19.4	436.6	2,311.0	94,547.2	299.1	6,952.9	269.3	6,218.3	0.900	0.894
Missouri	12.3	878.0	1,791.0	169,724.4	393.1	22,718.3	550.2	18,092.3	1.399	0.796
New York	12.2	393.8	2,103.5	74,189.4	286.2	5,764.8	261.1	2,697.9	0.912	0.468
Oregon	10.3	563.5	4,125.4	166,449.6	235.7	15,878.9	309.6	34,686.7	1.313	2.184
Ohio	8.8	1,417.2	1,917.6	415,221.2	305.4	40,569.0	555.2	41,219.1	1.818	1.016
Oklahoma	8.1	217.4	550.9	18,647.1	186.1	3,888.4	154.5	6,041.9	0.830	1.554
Virginia	5.6	97.4	1,598.3	39,434.1	267.7	4,716.2	341.2	5,577.0	1.274	1.183
Arizona	3.4	22.7	6,346.6	14,303.6	1,412.4	694.7	775.0	620.5	0.549	0.893
Florida	3.3	121.1	6,405.5	320,854.0	192.7	6,749.4	37.3	9,601.2	0.193	1.423
Indiana	2.7	328.3	660.1	120,468.6	82.6	11,342.9	122.9	5,788.1	1.487	0.510
Hawaii	2.1	73.0	4,704.4	174,406.9	75.6	2,699.1	16.1	2,326.6	0.213	0.862
Maryland	1.8	118.5	531.1	32,075.9	74.7	4,076.1	47.8	2,330.9	0.640	0.572
New Mexico	1.8	15.7	513.7	3,580.9	41.8	322.7	36.7	101.4	0.880	0.314
North Carolina	1.5	51.7	496.3	51,106.3	51.2	5,206.6	59.6	13,238.8	1.163	2.543
Pennsylvania	0.9	91.3	245.2	23,476.9	34.1	3,219.0	31.0	1,622.0	0.908	0.504
Maine	0.6	50.1	155.8	42,476.8	16.6	4,010.0	20.9	2,320.2	1.257	0.579
Georgia	0.5	18.9	828.0	12,058.9	105.3	1,580.9	88.4	1,897.5	0.839	1.200
Vermont	0.4	42.1	87.6	8,143.2	8.7	532.7	7.3	330.1	0.847	0.620
New Jersey	0.3	5.9	49.4	1,362.4	8.0	209.7	17.6	93.3	2.207	0.445
Massachusetts	0.2	25.0	180.2	37,662.8	10.5	847.8	11.8	250.6	1.130	0.296
Arkansas	0.1	29.7	8.2	4,290.6	0.9	514.7	0.0	0.6	0.000	0.001
Connecticut	0.0	0.5	2.9	152.4	0.4	11.1	2.1	8.0	4.737	0.724
New Hampshire	0.0	0.0	3.0	7.1	0.2	0.6	0.0	0.0	0.000	0.000
Grand Total	1,664.7	126,141.0	460,728.7	36,976,004.6	55,959.1	3,525,331.7	62,130.0	2,462,093.9	1.110	0.698
Percent of Non-organic		1.32%		1.25%		1.59%		2.52%		

Source: The Contractor's Underwriting Department using data from USDA, RMA

TABLE H2. Organic and Non-organic Insurance Data 2001-2004: By State with Most Organic Insured Acres to Least (All Data Except Loss Ratio in 1,000 units)

State	Organic Acres	Non-organic Acres	Organic Liability	Non-organic Liability	Organic Premium	Non-organic Premium	Organic Indemnity	Non-organic Indemnity	Organic Loss Ratio	Non-organic Loss Ratio
Montana	48.5	14,594.9	3,005.7	1,310,858.4	561.4	220,167.9	857.6	171,744.0	1.528	0.780
Minnesota	26.4	13,459.1	2,655.3	3,024,849.0	386.5	364,397.1	688.9	221,578.3	1.783	0.608
North Dakota	21.4	8,604.5	1,476.2	1,088,680.5	288.9	181,589.0	647.3	138,716.4	2.241	0.764
Utah	17.5	306.4	1,349.0	23,279.2	227.6	3,752.1	506.9	3,943.1	2.227	1.051
Nebraska	16.4	4,976.2	1,428.1	1,034,220.1	246.6	99,850.7	167.8	49,808.3	0.680	0.499
Colorado	11.4	1,655.8	748.0	204,246.5	122.0	32,791.9	171.2	30,913.5	1.403	0.943
Iowa	8.8	10,812.4	1,365.6	3,828,063.6	145.0	282,872.3	299.3	175,493.1	2.064	0.620
Washington	8.7	1,666.4	11,658.5	1,847,593.8	928.0	91,773.1	543.8	62,900.3	0.586	0.685
Wisconsin	8.0	2,846.7	1,442.6	867,684.0	174.8	93,743.8	479.1	92,817.1	2.741	0.990
Idaho	7.6	61.4	762.1	21,673.5	124.4	1,345.8	168.5	1,384.5	1.355	1.029
California	7.5	5,374.9	6,978.7	5,804,293.8	574.1	342,582.8	750.6	182,758.1	1.307	0.533
Texas	7.1	2,585.7	830.0	506,480.6	145.3	94,223.0	103.0	85,039.8	0.709	0.903
South Dakota	6.8	3,905.0	535.0	760,073.4	58.4	90,491.2	165.0	59,313.0	2.823	0.655
Michigan	5.7	1,525.1	611.6	343,906.2	101.8	39,536.0	244.7	23,830.8	2.405	0.603
Missouri	3.4	413.4	367.4	72,075.0	56.4	7,922.9	87.5	7,744.2	1.552	0.977
Wyoming	3.2	434.3	201.4	45,405.0	33.2	7,245.4	31.3	5,384.7	0.941	0.743
Kansas	2.8	1,855.1	287.6	291,633.9	40.0	41,851.1	127.4	40,398.8	3.182	0.965
Illinois	1.6	2,979.0	234.7	1,026,843.1	26.5	78,513.9	75.0	31,025.6	2.828	0.395
Ohio	1.3	696.0	187.1	178,182.4	18.8	17,545.8	20.5	17,410.2	1.088	0.992
Arizona	1.2	0.4	2,128.7	592.3	392.7	93.0	70.1	17.3	0.179	0.186
New York	1.0	213.2	111.3	39,201.6	10.4	3,148.8	4.9	1,559.9	0.472	0.495
Hawaii	0.3	73.0	214.7	174,406.9	4.1	2,699.1	1.9	2,326.6	0.461	0.862
New Jersey	0.1	1.3	13.2	160.6	1.9	14.7	3.5	29.1	1.893	1.976
Pennsylvania	0.1	57.9	16.9	13,175.0	2.6	1,968.8	8.3	1,345.5	3.157	0.683
Indiana	0.0	13.3	6.3	2,672.6	0.9	225.8	0.0	65.9	0.000	0.292
Oregon	0.0	23.9	38.5	24,776.5	2.4	852.7	8.1	543.8	3.349	0.638
Massachusetts	0.0	2.3	24.2	2,973.8	0.8	83.3	10.2	18.8	13.312	0.226
Grand Total	217.0	79,137.2	38,678.5	22,538,001.3	4,675.5	2,101,281.8	6,242.3	1,408,110.6	1.335	0.670
Percent of Non-organic	0.27%			0.17%		0.22%		0.44%		

Source: The Contractor's Underwriting Department using data from USDA, RMA

TABLE H3. Experience Data for Crops Insured Under Organic Codes and Non-organic Practice, 2001-2008

Year	Units	Acres (1,000)	Liability ($1,000)	Premium ($1,000)	Earned Premium Rate	Units Indemnified	Units Indemnified (%)	Indemnity ($1,000)	Loss Ratio	Loss Cost Ratio
Organic Codes										
2001	193	15	1,305	190	0.145	96	49.7	275	1.45	0.21
2002	880	66	8,299	1,080	0.130	501	56.9	1,934	1.79	0.23
2003	1,130	68	10,775	1,338	0.124	585	51.8	2,528	1.89	0.23
2004	3,209	210	38,215	5,022	0.131	1,365	42.5	6,850	1.36	0.18
2005	3,931	281	57,082	6,800	0.119	1,173	29.8	5,750	0.85	0.10
2006	5,165	356	79,815	9,247	0.116	2,067	40.0	9,975	1.08	0.12
2007	6,070	419	121,999	14,211	0.116	1,973	32.5	12,908	0.91	0.11
2008	6,770	459	170,580	22,125	0.130	2,943	43.5	28,027	1.27	0.16
Total	27,348	1,874	488,070	60,012	0.123	10,703	39.1	68,247	1.14	0.14
Non-organic										
2001	24,337	1,846	219,556	20,293	0.092	6,998	28.8	28,700	1.41	0.13
2002	70,692	5,367	714,466	61,036	0.085	20,712	29.3	71,731	1.18	0.10
2003	79,348	5,737	1,006,831	82,591	0.082	21,001	26.5	86,565	1.05	0.09
2004	210,857	15,796	3,278,246	305,279	0.093	51,411	24.4	229,604	0.75	0.07
2005	265,780	19,903	4,237,676	382,835	0.090	39,597	14.9	191,315	0.50	0.05
2006	297,659	22,481	5,419,454	483,571	0.089	55,783	18.7	277,245	0.57	0.05
2007	337,572	25,734	8,326,062	770,589	0.093	46,067	13.6	345,527	0.45	0.04
2008	400,426	30,792	13,640,947	1,444,867	0.106	156,562	39.1	1,281,958	0.89	0.09
Total	1,686,671	127,655	36,843,239	3,551,061	0.096	398,131	23.6	2,512,645	0.68	0.07
Organic as Percent of Non-organic										
2001	0.79	0.80	0.59	0.93	157.32	1.37	172.98	0.96	102.68	161.54
2002	1.24	1.22	1.16	1.77	152.26	2.42	194.31	2.70	152.47	232.16
2003	1.42	1.19	1.07	1.62	151.34	2.79	195.60	2.92	180.33	272.91
2004	1.52	1.33	1.17	1.65	141.12	2.66	174.46	2.98	181.35	255.91
2005	1.48	1.41	1.35	1.78	131.86	2.96	200.29	3.01	169.21	223.13
2006	1.74	1.58	1.47	1.91	129.85	3.71	213.54	3.60	188.14	244.29
2007	1.80	1.63	1.47	1.84	125.86	4.28	238.19	3.74	202.56	254.95
2008	1.69	1.49	1.25	1.53	122.45	1.88	111.18	2.19	142.77	174.83
Total	1.62	1.47	1.32	1.69	127.57	2.69	165.80	2.72	166.99	212.12

Source: The Contractor's Underwriting Department using data from USDA, RMA

Appendix I

Samples of Type 11, 15, and 21 Data Used in the Rating Analysis

Sample of All Yield Observations (Cleaned)

Table I1 below provides images of a sample of the "all yield observations" data for crop/county combinations which include units flagged as organic. The columns are labeled Rp_Org, Company (code), Stfips (state FIPS), Ctyfips (county FIPS), ID_num (identification number), year, RR (risk region), flag, type, prac (practice), AcWtdAvgYield_pol (actual weighted average yield for the policy, and Acres_pol (acres). The column labeled ID_num does not contain actual policy numbers but rather contain unique identifiers that allow policy level analysis.
(Table I1 Data)

Data Table I1

Rp_Org	Company	Stfips	Ctyfips	ID_num	Cr_id	theYear	RR	flag	type	prac	AcWtdAvgYield_pol	Acres_pol
MJ	951	6	111	1536330	19	2007	926	2	55	2	7372	78.8
MB	998	6	111	204800	19	2007	926	2	55	2	7490	5
MJ	951	6	111	37353	19	2007	926	2	55	2	8008	50
HL	30	6	111	7458023	19	2007	926	2	55	2	8607	65
MJ	951	6	111	1537323	19	2007	926	2	55	2	9927	4
MJ	951	6	111	6650215	19	2007	926	2	55	2	10976	74
OW	718	6	111	4005823	19	2007	926	2	55	2	10985	8.8
HB	349	49	3	3335484	33	2007	928	2	552	2	2.6	74
HB	349	49	3	3260592	11	2007	928	2	11	5	4.447427	268.2
OW	819	49	3	4122115	11	2007	928	2	11	5	11	251.3
OW	718	49	49	3234330	11	2007	928	2	11	3	12	1855.1
OW	819	49	3	3194700	11	2007	928	2	11	2	21	142
OW	819	49	3	4932030	11	2007	928	2	11	5	21	224.2
HB	349	49	3	2978100	11	2007	928	2	11	5	27	39.8
OW	819	49	3	4482438	11	2007	928	2	11	5	32	277.3
OW	718	49	49	3234330	11	2007	928	2	12	2	58	83.6
OW	819	49	3	4619453	11	2007	928	2	11	5	79.91	90
OW	819	49	3	4482484	11	2007	928	2	11	2	80	63
HB	349	49	3	3260684	11	2007	928	2	11	2	100	42
HB	349	49	3	3260800	11	2007	928	2	11	2	111	65
UB	601	49	3	5507146	49	2007	928	2	997	3	118	46.5
OW	819	49	3	3255076	11	2007	928	2	11	2	130	201.6

Sample of Paired Yield Observations

Table I2 below provides images of a sample of the "paired yield observations" data for crop/county combinations which include units flagged as organic. The columns are labeled Stfips (state FIPS), Ctyfips (county FIPS), cr_id (crop id), ip_code (insurance provider code), ID_num (identification number), type, prac (practice), Cavg (average yield under conventional practices), Cstdev (standard deviation of yield under conventional practices), Oavg (average yield under organic practices), Ostdev (standard deviation of yield under organic practices). The column labeled ID_num does not contain actual policy numbers but rather contain unique identifiers that allow policy level analysis. (Table I2 Data)

Data Table I2

"stfips"	"ctyfips"	"cr_id"	"ip_code"	"ID_num"	"type"	"prac"	"Cavg"	"Cstdev"	"Oavg"	"Ostdev"
28	51	21	44	79907	997	2	1066.290355	196.9691459	1170.990616	194.7530915
29	13	81	90	4476784	997	53	33.98383955	9.21042077	32.95236074	9.271758502
19	73	81	25	6959430	997	3	39.81236762	5.504405266	38.70983982	7.527726527
27	125	11	44	217769	997	3	39.29485739	16.51636967	40.99287627	19.39345047
48	415	21	90	5418023	997	3	106.9534943	139.4881548	112.6574032	113.3851235
53	7	89	86	3321146	186	2	6.261304348	1.190518095	5.770910556	1.1976079
53	7	89	86	3321146	187	2	19.09076923	3.998055083	18.28874778	4.969112256
6	11	18	90	4131100	997	2	8962.968553	550.367453	4839.04702	1347.821576
16	27	54	86	3879369	114	2	524.0750659	164.2550732	476.5142857	131.9927539
16	27	54	86	3879369	115	2	794.4630819	311.2677512	483.5	273.9300397
19	121	81	90	45500	997	3	35.89122724	2.949576241	26.0212275	3.519414911
26	151	81	44	14307	997	53	35.70931234	12.17005329	32.71352941	12.21883792
27	120	81	90	4381953	997	3	23.74960077	9.710818709	27.64107929	6.196795051
27	125	81	90	217769	997	3	28.41027858	12.42764027	16.75892857	15.85349593
27	125	81	90	836792	997	3	23.92441601	9.947215063	21.45389596	11.54700538
27	149	81	44	2128884	997	3	32.99880164	7.494632962	31.22096292	9.612025382
27	149	81	90	953769	997	3	22.29272073	10.26576755	49.35554342	5.366563146

Sample of Joined Type 11 and 21 All Observations (Cleaned)

Table I3 below provides images of a sample of the joined "all observations" data for crop/county combinations which include units flagged as organic. The columns are labeled row 11, org_flag11 (yes or no), rp_org, stfips (state FIPS), company, ID_num (identification number), cr_year (crop year), cr_id (crop id), ip_code (insurance provider code), ctyfips (county FIPS), type, prac (practice), coverage_level11, acres, liability, subsidy, premium, indemnity, LR (loss ratio), and LCR (loss cost ratio). The column labeled ID_num does not contain actual policy numbers but rather contain unique identifiers that allow policy level analysis.
(Table I3 Data)

Data Table I3

row11	org_flag11	rp_org	stfips	company	ID_num	cr_year	cr_id	ip_code	ctyfips	type	prac	coverage_level11	acres	liability	subsidy	premium	row21	indemnity	LR	LCR
1531	No	AJ	19	601	2321746	2001	41	90	27	16	3	0.5	84.05	5888	158	158			0	0
901	No	AJ	19	601	2321746	2001	81	90	27	997	2	0.5	66.15	4028	79	79			0	0
1532	No	AJ	19	601	2321761	2001	41	90	27	16	3	0.5	84	6692	159	159			0	0
902	No	AJ	19	601	2321761	2001	81	90	27	997	3	0.5	84	5481	101	101			0	0
1533	No	AJ	20	601	946569	2001	11	90	125	997	3	0.5	71.0622	4278	117	174			0	0
1	No	AJ	20	601	946600	2001	11	90	125	997	3	0.65	60.606	1765	276	467			0	0
903	No	AJ	20	601	946615	2001	11	90	125	997	3	0.5	50.692	1879	101	151			0	0
904	No	AJ	20	601	946638	2001	11	90	125	997	3	0.5	485.8977	21741	1015	1515			0	0
91	No	AJ	20	601	1359907	2001	11	90	125	997	3	0.65	60.606	2868	194	328			0	0
905	No	AJ	20	601	1371400	2001	11	90	125	997	3	0.5	18.315	409	29	29			0	0
1534	No	AJ	29	601	102700	2001	41	44	45	16	3	0.7	90.45	15947	1724	2921			0	0
906	No	AJ	29	601	102700	2001	81	44	45	997	3	0.7	165.15	16733	2086	3536			0	0
92	No	AJ	29	601	109669	2001	41	44	45	16	3	0.55	370.4	57271	4278	6683	437880	8033	1.202005	0.140262
907	No	AJ	29	601	109669	2001	81	44	45	997	3	0.55	202.2	21342	918	1435			0	0
1535	No	AJ	29	601	109992	2001	41	44	45	16	3	0.7	13	2395	168	285	328232	198	0.694736	8.27E-02
93	No	AJ	29	601	109992	2001	81	44	45	997	3	0.7	22.45	2788	181	306	387062	168	0.549019	6.03E-02
1536	No	AJ	29	601	111223	2001	81	25	3	997	3	0.75	510	65307	4098	7451			0	0
94	No	AJ	29	601	111338	2001	41	90	3	16	3	0.75	63.5	10525	711	1292			0	0
2	No	AJ	29	601	111338	2001	81	90	3	997	3	0.75	91	14083	631	1147			0	0

Sample of Type 11 and 21 Joined Paired Observations

Table I4 below provides images of a sample of the joined "all observations" data for crop/county combinations which include units flagged as organic. The columns are labeled rp_org, stfips (state FIPS), company, ID_num (identification number), cr_year (crop year), cr_id (crop id), ip_code (insurance provider code), ctyfips (county FIPS), type, prac (practice), coverage_level11, Orow11, Oacres, Oliability, Osubsidy, Opremium, Orow21, Oindemnity, OLR (loss ratio), OLCR (loss cost ratio), Crow11, Cacres, Cliability, Csubsidy, Cpremium, Crow21, Cindemnity, CLR (loss ratio), and CLCR (loss cost ratio) . The column labeled ID_num does not contain actual policy numbers but rather contain unique identifiers that allow policy level analysis. (Table I4 Data)

Data Table I4

rp_org	stfips	company	ID_num	cr_year	cr_id	ip_code	ctyfips	type	prac	coverage_level11	Orow11	Oacres	Oliability	Osubsidy	Opremium	Orow21	Oindemnity	OLR	OLCR	Crow11	Cacres	Cliability	Csubsidy	Cp
AX	8	631	6941323	2005	17	90	75	50	3	0.5	2212333	83.05	2564	469	699			0	0	670	34.017	1007	155	
AX	26	631	7146323	2006	81	90	91	997	53	0.5	2212347	406.3	34844	1687	2518			0	0	17548	88.3	7504	283	
AX	39	631	7648123	2006	41	90	125	16	3	0.5	2337925	39.4	3684	101	101			0	0	56599	180.5	17771	440	
AX	48	631	7538992	2005	21	90	329	997	2	0.5	2523240	78	13669	1029	1536			0	0	52396	472.95	116890	8382	1
AX	48	631	7538992	2006	21	90	329	997	2	0.5	2337928	98.7	18745	1531	2285			0	0	58017	447.478	134672	10474	1
CA	6	30	6212830	2002	54	86	97	112	997	0.5	2212376	18	9576	324	483			0	0	31718	157.15	70906	2278	[illegible]
CA	6	30	6924738	2002	54	86	97	112	997	0.5	1862443	9.8	5577	175	260	292136	3805	14.634615	0.682266	32679	131.4	84998	2724	4
CA	6	30	7456553	2004	54	86	97	112	997	0.5	2212446	9.8	8523	259	387			0	0	33158	132	124177	3994	
CA	6	30	7472792	2004	87	90	113	997	66	0.5	1862451	375.5	336344	7983	11914			0	0	33310	633.498	630031	11638	1
CA	6	30	7472846	2004	87	90	113	997	66	0.5	2523260	87.261	65675	2005	2992			0	0	116472	739.53	674158	14099	2
CA	46	30	7303746	2004	41	90	127	16	3	0.5	2523330	22	2857	92	137			0	0	178000	291.6	49326	1326	
CA	53	30	7411753	2004	54	86	71	114	2	0.5	2212591	83.1	126965	4845	7232			0	0	181811	1377.5	5855463	212833	3
CA	53	30	7411753	2004	54	86	71	115	2	0.5	2338092	159.9	395592	15098	22534			0	0	107198	2544.1	8823976	320730	4
CU	48	101	7538992	2004	21	90	329	997	2	0.5	1862564	60.1	11720	798	1191			0	0	116421	398.478	92257	5979	
DX	31	445	7728630	2004	17	90	105	50	3	0.5	2338113	36.993	840	108	154			0	0	124763	112.233	2546	312	
ET	16	349	3334569	2006	11	90	71	12	3	0.5	2338116	339.2	8404	1303	1944	41003	3829	1.96965	0.455616	124901	10	425	29	
ET	31	445	7728630	2005	17	90	105	50	3	0.5	2523395	29.997	807	125	177			0	0	252310	132.534	3565	493	
HK	26	232	567353	2005	16	90	11	997	3	0.5	2212887	5.5	264	21	32			0	0	166202	50.1	3381	167	