



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.



Weekly Farm Economics: County Yield Variability and ARC-CO

Nick Paulson, Gary Schnitkey, and Jonathan Coppess

Department of Agricultural and Consumer Economics
University of Illinois

Carl Zulauf

Department of Agricultural, Environmental and Development Economics
Ohio State University

February 6, 2024

farmdoc daily (14): 25

Gardner Policy Series

Recommended citation format: Paulson, N., C. Zulauf, G. Schnitkey, and J. Coppess. "County Yield Variability and ARC-CO." *farmdoc daily* (14): 25, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 6, 2024.

Permalink: <https://farmdocdaily.illinois.edu/2024/02/county-yield-variability-and-arc-co.html>

Recent articles have focused on comparing the price protection provided by the Price Loss Coverage (PLC) and Agriculture Risk Coverage (ARC) programs (see *farmdoc daily* from [January 16, 2024](#), [January 23, 2024](#) and [January 30, 2024](#)). Today we shift focus to the yield component of the county-level ARC (ARC-CO) program, providing an historical perspective on the variability of county-level yields and how it might contribute to ARC-CO payments being triggered in 2024.

If current USDA price projections hold for the 2024/25 marketing year (\$4.50 for corn and \$11.30 for soybeans), county yield losses exceeding 7% for corn and 15% for soybeans would be required to trigger ARC-CO payments. Prices higher than current forecasts would imply even greater yield losses would be required to trigger ARC-CO payments. Prices lower than current forecasts would imply lower yield losses required to trigger ARC-CO payments. If prices are low enough, ARC-CO can trigger payments even when yields are above county benchmark levels.

Below we illustrate the price and yield combinations that would result in ARC-CO payments and provide some examples for corn and soybeans for counties in Illinois. Counties that exhibit more yield variability (higher yield risk areas) will tend to trigger larger and more frequent ARC-CO payments, potentially making it a more attractive option for producers in higher yield risk counties compared to those in lower yield risk counties.

Background

ARC-CO is a county revenue program which triggers payments when county revenue falls below a revenue guarantee equal to 86% of benchmark revenue for the county. The 86% guarantee implies that

We request all readers, electronic media and others follow our citation guidelines when re-posting articles from farmdoc daily. Guidelines are available [here](#). The farmdoc daily website falls under University of Illinois copyright and intellectual property rights. For a detailed statement, please see the University of Illinois Copyright Information and Policies [here](#).

payments will be triggered only for price and yield combinations which result in revenue losses of at least 14% relative to the county benchmark.

County revenue is equal to the national marketing year average price multiplied by a measure of average county yield. Benchmark revenue equals the ARC benchmark price multiplied by the county's benchmark yield. The ARC benchmark price is based on the Olympic average of MYA prices over a 5 marketing year period preceding the program year. For 2024, the 2018 to 2022 marketing year prices are used. Benchmark yield is based on the Olympic average of trend-adjusted county yields over the 5 crop years which correspond to the marketing years used to determine the benchmark price.

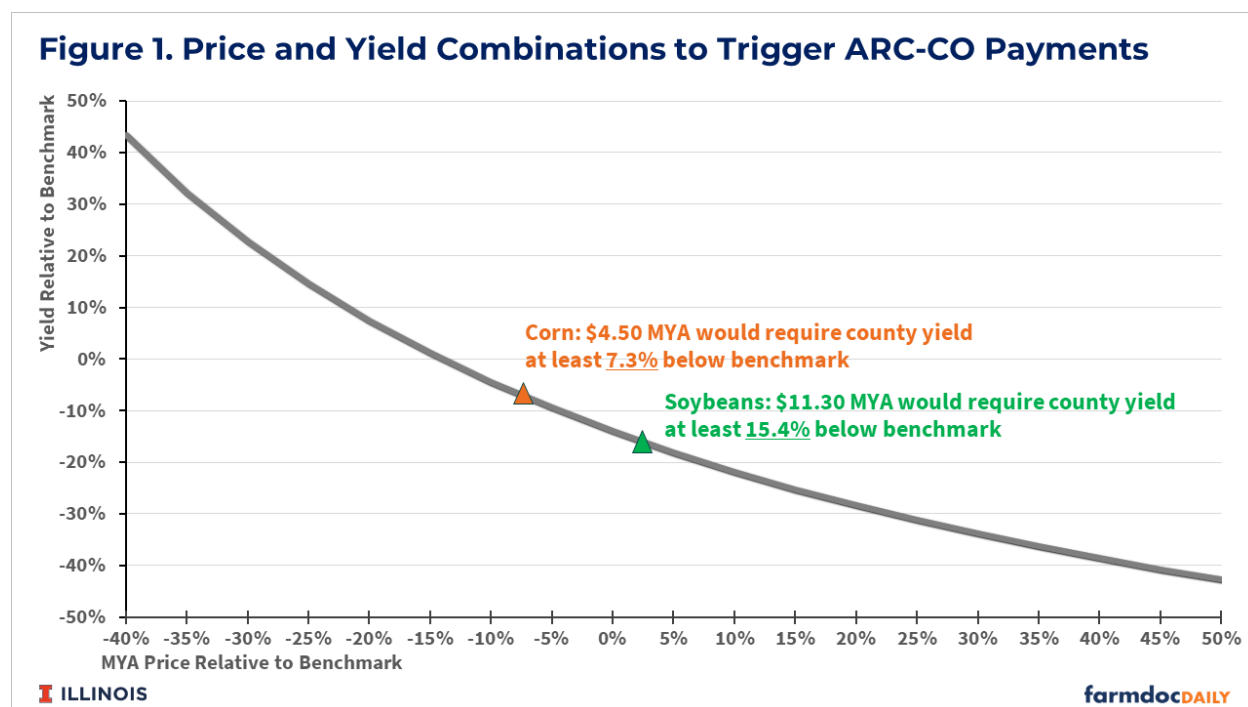
County Yields and ARC-CO Payments

We've previously compared the price protection offered by PLC and ARC by comparing the PLC effective reference price to an ARC trigger price that was defined as 86% of the ARC benchmark price (see *farmdoc daily* from [January 23, 2024](#) and [January 30, 2024](#)). This ARC trigger price is where ARC-CO payments would begin to be triggered assuming county yields are equal to benchmark levels in that year.

An ARC-CO yield loss trigger could be defined in a similar way at 86% of the county's benchmark yield. Actual county yields at or below this level would trigger ARC-CO payments assuming the MYA price is equal to the benchmark price. Alternatively, this can be viewed as a yield loss requirement of at least 14%, relative to a county's benchmark yield.

However, current price expectations for the 2024 marketing year differ from ARC benchmark levels for both corn and soybeans. USDA's current forecasts for 2024/25 are \$4.50 for corn and \$11.30 for soybeans, compared with ARC benchmark prices of \$4.85 for corn and \$11.12 for soybeans.

Figure 1 illustrates various MYA price and county yield combinations, relative to their respective benchmarks, that would result in ARC-CO payments being triggered (i.e. county revenue at or below 86% of benchmark revenue). A corn price of \$4.50 (7.2% below benchmark) would require yield losses exceeding 7.3% relative to the county benchmark yield to trigger ARC-CO payments. A soybean price of \$11.30 (1.6% above benchmark) would require yield losses of at least 15.4% to trigger payments. All other points along the curve in Figure 1 map out the different price and yield combinations, relative to their respective benchmarks, where ARC-CO payments would begin to be triggered.



In practice, the negative correlation between prices and yields should also be considered as producers consider potential price-yield combinations that could lead to ARC-CO payments. Yield losses across

wider areas (i.e. multiple counties and/or states) would be more likely to result in prices above expectations and vice versa. This means yield losses would tend to be partially offset by higher prices, reducing the likelihood and potential size of revenue-based payments from a program like ARC-CO. Still, there always remains a possibility of more localized yield losses coupled with relatively low prices which result in payments in certain areas.

Historical County Yield Variability

Notably, the Farm Service Agency (FSA), which administers the ARC and PLC programs, now prioritizes the use of the county yields used by the Risk Management Agency (RMA) for area crop insurance programs. Below we use historical RMA county yield data for corn and soybeans in Illinois from 1991 through 2022 to illustrate how yield variability might contribute to ARC-CO payments. The yield data is used to construct historical estimates of ARC-CO benchmark yields under current program design. ARC-CO benchmark yields are equal to the Olympic average of trend-adjusted yields over the first 5 of the 6 preceding crop years (i.e. the 1997 benchmark is based on the Olympic average of trend-adjusted yields from 1991 to 1995 and so on). For 2019 to 2022 we apply the actual county trend adjustments used by FSA. For the years prior to 2019 we use the 2019 published trend adjustments with the actual historical RMA yields in computing historical benchmark yields.

Figures 2 and 3 compare actual RMA county yields to the benchmark yields from 1997 through 2022 for Champaign and Franklin Counties, respectively. Champaign is an example of a relatively low yield risk county located in east-central Illinois. Franklin is a relatively high yield risk county located in southern Illinois.

For Champaign County, yield losses relative to benchmark yield were experienced in 9 of the 26 years. The yield losses range from 2% below benchmark for 1997 to 40% below benchmark for the major drought year of 2012. Champaign county yield losses exceeded 7.3% in 6 of the 8 yield loss years. In 17 of the 26 years, Champaign County yields were above the benchmark meaning that the MYA price would have needed to be more than 14% below the ARC benchmark price to trigger ARC-CO payments.

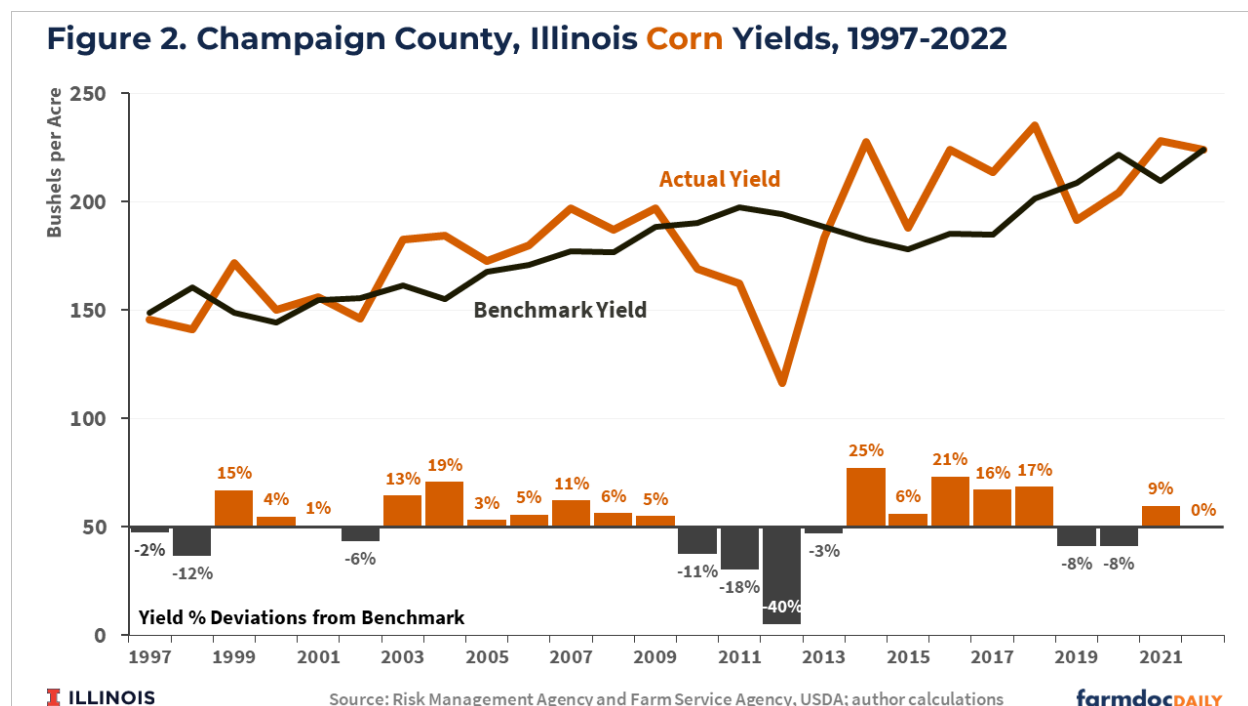
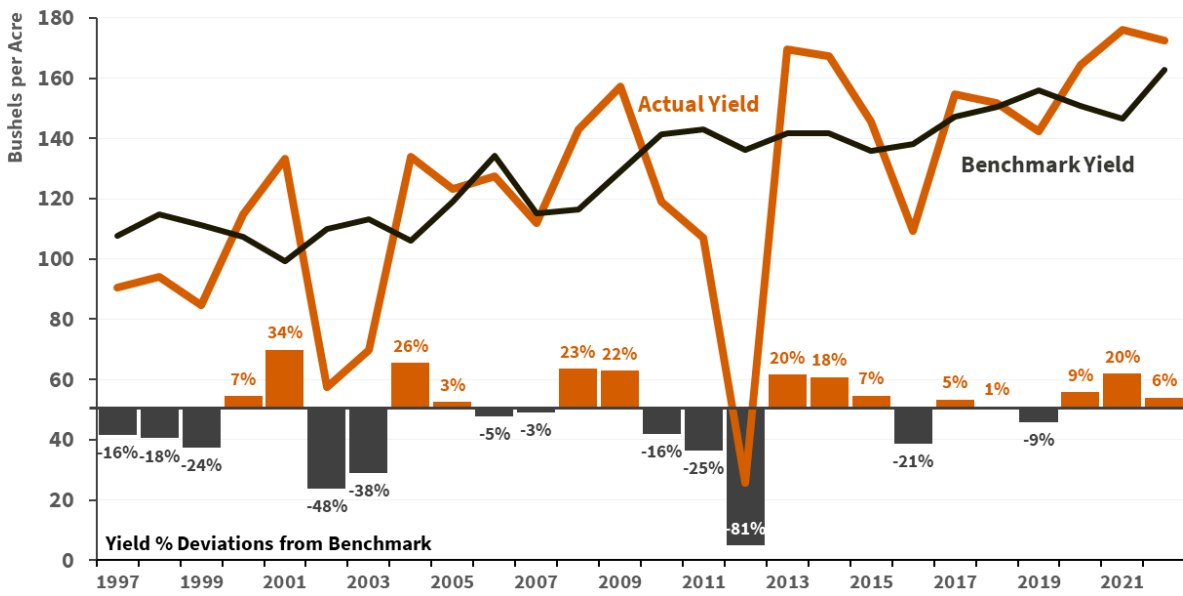


Figure 3. Franklin County, Illinois Corn Yields, 1997-2022

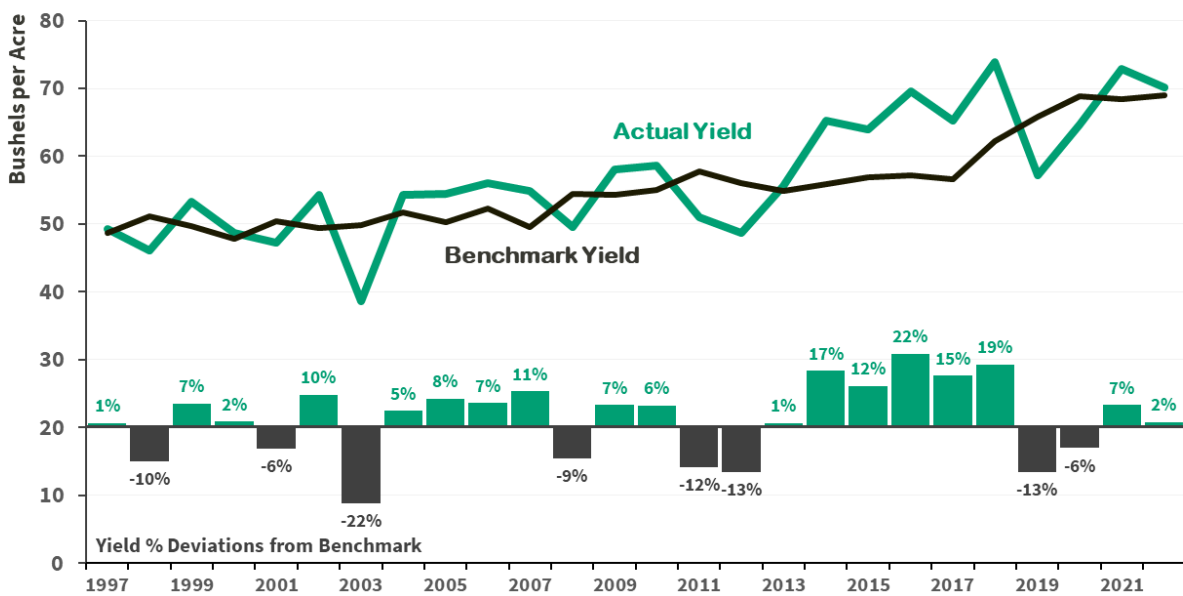


ILLINOIS Source: Risk Management Agency and Farm Service Agency, USDA; author calculations farmdocDAILY

In Franklin County, yields below benchmark occurred in 12 of the 26 years. Franklin County yield losses ranged from 3% in 2007 to 81% below trend for the 2012 drought. Franklin County yield losses were also significant in 2002 (48%) and 2004 (38%). In 14 of the 26 years, Franklin County yields were above the benchmark yield, implying the MYA corn price would have had to be more than 14% below the benchmark price to trigger ARC-CO payments.

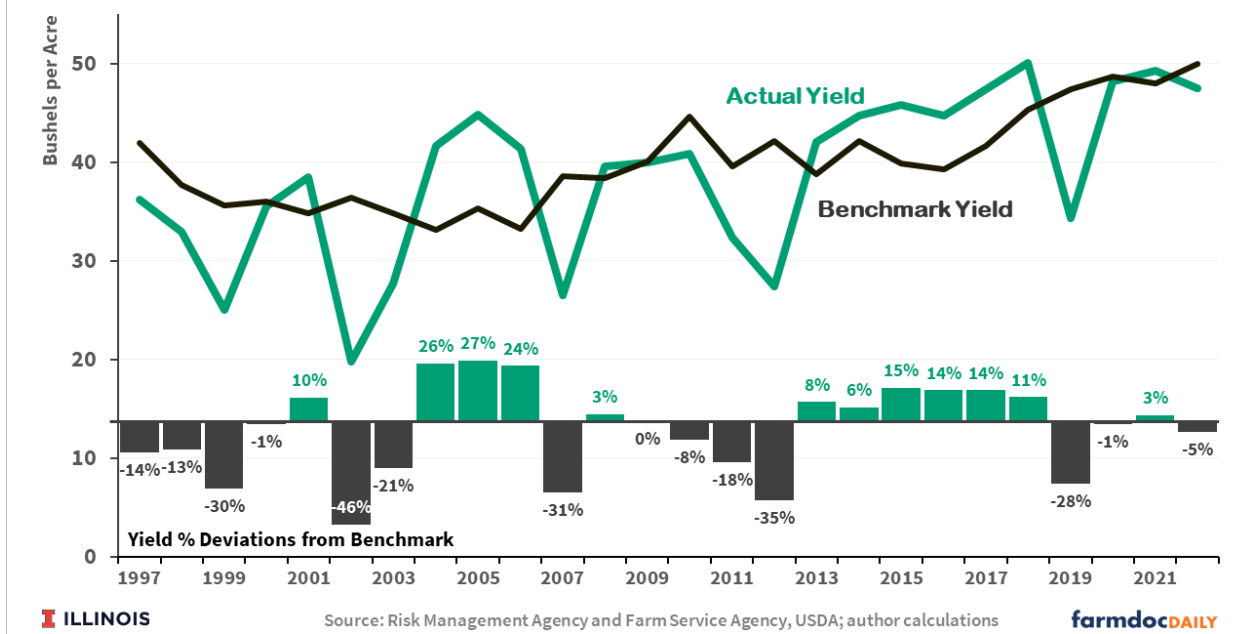
Figures 4 and 5 illustrate county soybean yield experience for both Champaign and Franklin Counties in Illinois. Soybean yields in Champaign County were below the benchmark in 8 of the 26 years, ranging from a 6% loss in 2020 to a 22% loss in 2003. In Franklin County, soybean yield losses occurred in 14 of the 26 years, ranging from a less than 1% yield loss in 2009 to 46% below benchmark in 2002.

Figure 4. Champaign County, Illinois Soybean Yields, 1997-2022



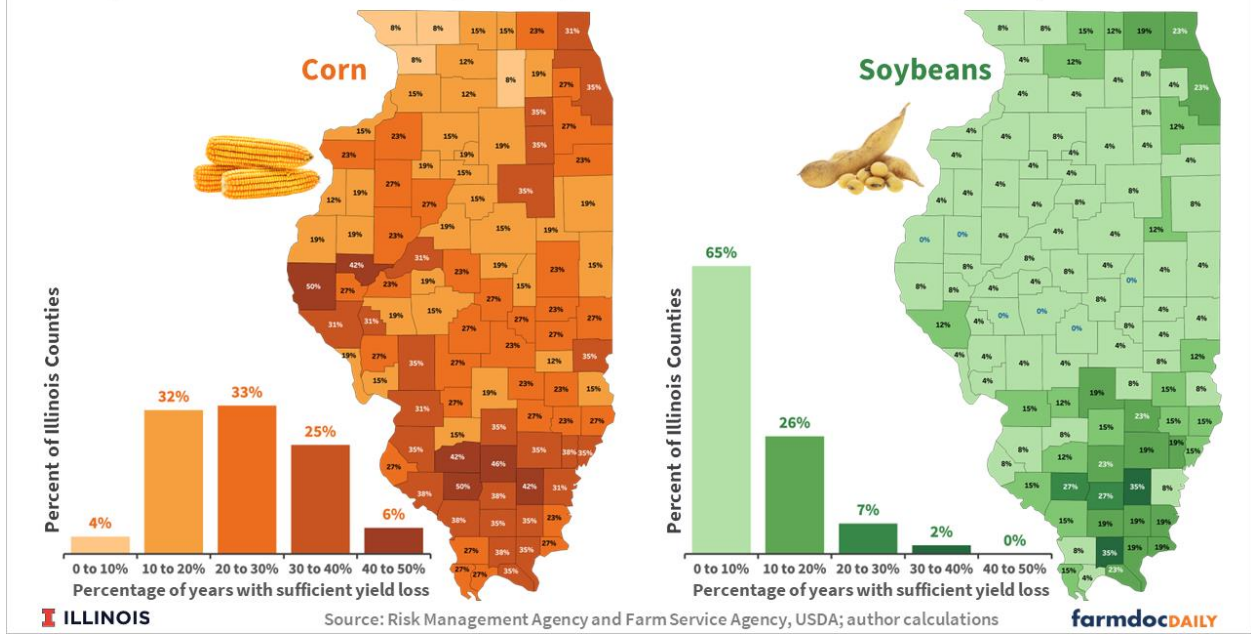
ILLINOIS Source: Risk Management Agency and Farm Service Agency, USDA; author calculations farmdocDAILY

Figure 5. Franklin County, Illinois Soybean Yields, 1997-2022



The Champaign and Franklin County examples illustrate the range in both frequency and size of deviations in county yield from the ARC-CO benchmark that can exist across counties. In general, counties with lower yield risk (i.e. Champaign) will not trigger ARC-CO payments as often, or payments that are as large, as in counties with higher yield risk (i.e. Franklin). Figure 6 illustrates the variation in yield risk that exists across Illinois counties by mapping the county-level percentages when historic yield losses occurred that would have been sufficient to trigger ARC-CO payments on corn (left panel) and soybean (right panel) base acres at current 2024 price projections (\$4.50 for corn, \$11.30 for soybeans).

Figure 6. Percentage of Years (Out of 26) Where County Yield Losses Would Have Triggered ARC-CO Payments at Current Price Projections (\$4.50 for Corn and \$11.30 for Soybeans)



Yield risk and variability tends to be lower in the central and northern regions of Illinois, while southern Illinois counties typically experience more variability in yields. Other areas of greater yield variability in Illinois include some western Illinois counties with farmland at greater risk of flooding along the Mississippi

river, and in the “collar” counties around Chicago in northeastern Illinois. The maps in Figure 6 illustrate this pattern, with sufficient yield losses to trigger payments by ARC-CO occurring more frequently in these areas.

Summary

If 2024 MYA prices for corn and soybeans are at their current forecast levels (\$4.50 for corn, \$11.30 for soybeans), county level yield losses would need to occur to trigger ARC-CO payments. Yield losses for corn would have to exceed 7% relative to the county benchmark yield, while soybean losses would have to exceed 15%. Higher MYA prices for 2024 would require even larger yield losses to trigger ARC-CO payment while lower prices would require smaller yield losses or even the potential for ARC-CO support with yields above the county benchmark.

Historic yield data shows that corn and soybean yield losses are more likely to occur, and more likely to be more severe losses, in southern, western, and northeastern Illinois counties compared with other regions of the state where county level crop yields have been less variable through time. Producers who have farms in counties with greater historical yield variability may be more likely to consider ARC-CO over PLC in 2024.

As we’ve stated in our earlier articles focused on the 2024 ARC/PLC decision, there are multiple aspects that factor into the decision. Producers are encouraged to use available tools and resources, such as our [Farm Bill What-if Tool](#), to analyze scenarios specific to their farm.

References

Paulson, N., G. Schnitkey, R. Batts and C. Zulauf. "[First Look at PLC and ARC-CO for 2024.](#)" *farmdoc daily* (14):11, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, January 16, 2024.

Paulson, N., C. Zulauf, J. Coppess and G. Schnitkey. "[Comparing 2024 Effective Reference and ARC Benchmark Prices.](#)" *farmdoc daily* (14):15, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, January 23, 2024.

Paulson, N., G. Schnitkey, C. Zulauf, J. Coppess and J. Baltz. "[Considering Low Prices, Yields, and Maximum ARC-CO Payments for 2024.](#)" *farmdoc daily* (14):20, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, January 30, 2024.

USDA, Risk Management Agency. [Area Plan Reports](#).

USDA, Farm Service Agency. [ARC/PLC Program Data](#).