



Weekly Farm Economics: Using *farmdoc* Tools to Make the ARC-CO and PLC Decisions

Gary Schnitkey, Nick Paulson and Krista Swanson

Department of Agricultural and Consumer Economics
University of Illinois

Carl Zulauf

Department of Agricultural, Environmental and Development Economics
Ohio State University

February 16, 2021

farmdoc daily (11): 23

Recommended citation format: Schnitkey, G., N. Paulson, C. Zulauf, and K. Swanson. "Using *farmdoc* Tools to Make the ARC-CO and PLC Decisions." *farmdoc daily* (11): 23, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 16, 2021.

Permalink: <https://farmdocdaily.illinois.edu/2021/02/using-farmdoc-tools-to-make-the-arc-co-and-plc-decisions.html>

Two tools are available on the *farmdoc* website for evaluating Commodity title choices faced by farmers. The first is the [2018 Farm Bill What-If Tool](#), a Microsoft Excel spreadsheet that calculates payments under differing price and yield scenarios. The second is the [Gardner ARC/PLC Calculator](#), which provides probabilities and estimates of likely payments. The tools are demonstrated for corn in Macon County. Results suggest that PLC will have a higher chance of payments than ARC-CO, likely causing it to be the preferred alternative by many farmers.

Background

By March 15th, farmers can change their Commodity title choices for the 2021 marketing year. The choices will be made between:

1. Price Loss Coverage (PLC) — a program that makes payments when the market year average (MYA) price is below the effective reference price.
2. Agriculture Risk Coverage at the County Level (ARC-CO) — a program that makes payments when county revenue is below a county guarantee.
3. Agriculture Risk Coverage at the Individual Level (ARC-IC) — a program under which an Farm Service Agency (FSA) farm is enrolled in a farm-level program (all FSA farms are aggregated together in a state if more than one FSA farm is enrolled).

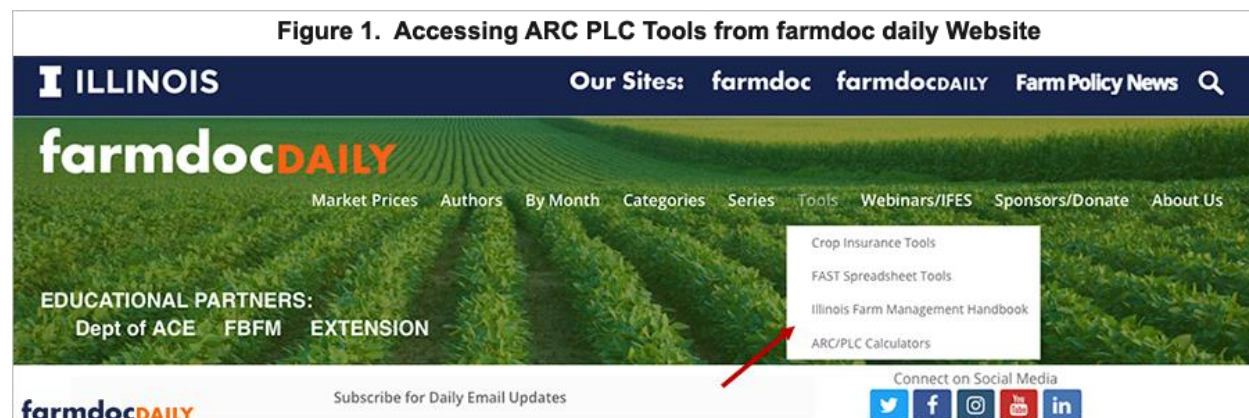
This article focuses on the PLC and ARC-CO decisions. Aside from special situations, most farmers are not likely to choose ARC-IC because it pays on fewer base acres than the other two programs (see

*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](#).*

farmdoc daily, [January 7, 2020](#), [October 29, 2019](#) for more information on ARC-IC). The farm program selection can vary across program crops on an FSA farm. For example, PLC could be chosen for corn, and ARC-CO can be chosen for soybeans on the same FSA farm. Moreover, decisions can vary across FSA farms. For example, corn can be enrolled in PLC on one FSA farm and in ARC-CO on another FSA farm.

Tools are illustrated for corn in Macon County, Illinois, with a PLC yield of 185 bushels per acre. The PLC yield is FSA farm-specific and has been set based on previous yield updating decisions. Farmers can consult FSA offices for a farm's PLC yield.

Both tools are available from the Tools menu on both the *farmdoc daily* and *farmdoc* websites (see Figure 1).



2018 Farm Bill What-If Tools

The *2018 Farm Bill What-If Tool* can evaluate ARC-CO, PLC, and ARC-IC (see *farmdoc daily*, [January 14, 2021](#)). The specific utility illustrated below is the "ARC-CO PLC Comparison," which compares ARC-CO and PLC payments under different price and yield scenarios.

Figure 2 shows the input for the Macon County case farm. Corn is selected, and the practice is "all" because Macon County does not have an irrigation practice option. Some counties in Illinois have both irrigated and non-irrigated practices. The PLC yield is 185 bushels per acre, and the year is "2021". The tool has the ability to evaluate payments for:

1. 2019 (actual payments made in 2019),
2. 2020 (payments that may occur in the fall of 2021), and
3. 2021 (the upcoming year for which decisions will be made, payments that may occur in the fall of 2022).

For 2021, a default county yield of 227 bushels per acre is used. This projected county yield is the same yield as the ARC-CO benchmark yield. The MYA price for 2021 is projected at \$4.00 per bushel, a projection made based on current levels of futures prices. The 2021 projected yield and price does not result in a PLC or ARC-CO payment.

Figure 2. Input Screen from the 2018 Farm Bill What If Tool

ARC-CO PLC WHAT-IF COMPARISON

Input


State	Illinois
County	Macon
Crop	Corn
Practice	All
PLC Yield	185
Year	2021

Default PLC Yield 185

Use Defaults Menu

Help


Print




Calculation of PLC and ARC-CO Payments

Year	County Yield ¹ Bu	MYA Price ² \$/Bu	Payment ^{3,4}		ARC-CO Calculations			
			PLC \$/base acre	ARC-CO \$/base acre	Benchmark		Guarantee ⁷ \$ per base acre	County Revenue ⁸
					Yield ⁵ Bu	Price ⁶ \$/Bu		
2021	227	4.00	\$0	\$0	226.9	3.70	721.87	907.44
Default	226.86	4.00						

¹ County yields impact ARC-CO payments. 2018 yields enter into 2020 ARC-CO benchmark calculations. The 2018 yield is an estimate.
² Market year average (MYA) prices impact both PLC and ARC-CO payments.
³ PLC payments equal PLC yield x (effective reference price - higher of MYA price or loan rate) x .85. PLC payment calculations are shown in Table 1 below.
⁴ Equals .85 x minimum of (ARC guarantee - county revenue) or (10% of benchmark yield x benchmark price), when county revenue is less than ARC guarantee, zero otherwise. Guarantee and revenue calculations are shown in the green ARC-CO Calculations box.
⁵ Benchmark yield calculations are shown in Table 2 and 3 below.
⁶ Benchmark price calculations are shown in Table 3 below.
⁷ Guarantee equals .86 x benchmark yield x benchmark price.
⁸ County revenue equals county yield x MYA price.



For estimates of expected values of ARC-CO and PLC payments see the Gardner Program Payment Calculator at:
<https://fd-tools.ncsa.illinois.edu>



The spreadsheet will show a table of different PLC and ARC-CO payments at different yields and prices. Figure 3 shows PLC payments. Note that the program selection entry in blue letters and yellow background can be changed from "PLC" to "ARC-CO" or "PLC minus ARC-CO." For PLC, payments occur at prices below the effective reference price of \$3.70 per bushel. At a \$3.50 price, the PLC payment is \$31 per corn per acre. The \$31 equals .85 x (\$3.70 reference price - \$3.50 MYA price) x 185 PLC yield. The PLC payment is dependent on the farm PLC yield but will be the same at a \$3.50 price regardless of county yield. The PLC payment increases as price decreases further from the \$3.70 trigger point: \$71 per base acre at a \$3.25 MYA Price, \$110 at a \$3.00 MYA price, and \$149 at a \$2.75 MYA price.

Figure 3. 2021 PLC Payments for Corn in Macon County

Program Selection	PLC	State = Illinois, County = Macon, Crop = Corn, Year = 2021 ARC-CO Benchmark Yield = 226.86, Benchmark Price = \$3.70, Guarantee \$721.87 PLC Yield = 185, Effective Reference Price = \$3.70										
Price Change	\$ 0.25											
Yield Change	20											
-2021 County Yield		2021 Market Year Average Price										
		\$2.75	\$3.00	\$3.25	\$3.50	\$3.75	\$4.00	\$4.25	\$4.50	\$4.75	\$5.00	\$5.25
327	149	110	71	31	0	0	0	0	0	0	0	0
307	149	110	71	31	0	0	0	0	0	0	0	0
287	149	110	71	31	0	0	0	0	0	0	0	0
267	149	110	71	31	0	0	0	0	0	0	0	0
247	149	110	71	31	0	0	0	0	0	0	0	0
227	149	110	71	31	0	0	0	0	0	0	0	0
207	149	110	71	31	0	0	0	0	0	0	0	0
187	149	110	71	31	0	0	0	0	0	0	0	0
167	149	110	71	31	0	0	0	0	0	0	0	0
147	149	110	71	31	0	0	0	0	0	0	0	0
127	149	110	71	31	0	0	0	0	0	0	0	0

Figure 4 shows ARC-CO payments (note that the program selection is "ARC-CO"). For Macon County, the benchmark yield is 226.86 bushels per acre, the Olympic average of county yield from 2015 to 2019. The ARC-CO benchmark price is \$3.70, the Olympic average of MYA prices from 2015 to 2019, with a minimum of the \$3.70 reference price used in each year. This benchmark yield and benchmark price

results in a guarantee of \$721.87 per acre (.86 coverage level x 226.86 benchmark yield x \$3.70 benchmark price). ARC-CO will make payments when county revenue is below the \$721.87 guarantee. An \$18 per base acre payment will occur at a \$3.75 price and a 187 bushel per acre county yield (\$18 per acre = .85 x (\$721.87 - 187 bushel per acre yield x \$3.85 price). The payment is capped at 10% of the benchmark revenue (benchmark yield x benchmark price). After accounting for the fact that Commodity title payments are .85% of base acres, the maximum ARC-CO payment is \$71 per base acre. At a \$4.00 price, the maximum ARC-CO payment of \$71 per base acre would occur at a county yield of 127 bushels per acre or less. ARC-CO payments will not increase with lower yields at this price level because the ARC-CO payment has reached its maximum.

Figure 4. 2021 ARC-CO Payments for Corn in Macon County, Illinois

Program Selection		ARC-CO		State = Illinois, County = Macon, Crop = Corn, Year = 2021								
Price Change		\$ 0.25		ARC-CO Benchmark Yield = 226.86, Benchmark Price = \$3.70, Guarantee \$721.87								
Yield Change		20		PLC Yield = 185, Effective Reference Price = \$3.70								
-2021												
County												
Yield	2021 Market Year Average Price											
	\$2.75	\$3.00	\$3.25	\$3.50	\$3.75	\$4.00	\$4.25	\$4.50	\$4.75	\$5.00	\$5.25	
327	0	0	0	0	0	0	0	0	0	0	0	
307	0	0	0	0	0	0	0	0	0	0	0	
287	0	0	0	0	0	0	0	0	0	0	0	
267	0	0	0	0	0	0	0	0	0	0	0	
247	37	0	0	0	0	0	0	0	0	0	0	
227	71	35	0	0	0	0	0	0	0	0	0	
207	71	71	42	0	0	0	0	0	0	0	0	
187	71	71	71	58	18	0	0	0	0	0	0	
167	71	71	71	71	71	46	11	0	0	0	0	
147	71	71	71	71	71	71	71	52	21	0	0	
127	71	71	71	71	71	71	71	71	71	71	47	

farmdocDAILY

ARC-CO will make payments under a low yield, a low price, or a combination of low yield and low price. At a \$4.00 price, ARC-CO would begin to make payments at yields below 181 bushels per acre. While possible, yields below 181 bushels per acre have a low likelihood of occurring.

The *What-If* Tool also will show "PLC minus ARC-CO" (see Figure 5). In Figure 5, there is a -\$46 per base acre entry for a \$4.00 MYA price and a 167 bushel per acre yield. The -\$46 equals \$0 in PLC payments minus \$46 in ARC-CO payments. A positive number indicates that PLC makes higher payments than ARC-CO. Negative values indicate that ARC-CO is making higher payments than PLC. Values of \$0 usually mean that neither program is making a payment.

Figure 5. 2021 PLC minus 202 ARC-CO Payments, Corn, Macon County

Program Selection		PLC minus ARC-CO		State = Illinois, County = Macon, Crop = Corn, Year = 2021								
Price Change		\$ 0.25		ARC-CO Benchmark Yield = 226.86, Benchmark Price = \$3.70, Guarantee \$721.87								
Yield Change		20		PLC Yield = 185, Effective Reference Price = \$3.70								
-2021												
County												
Yield	2021 Market Year Average Price											
	\$2.75	\$3.00	\$3.25	\$3.50	\$3.75	\$4.00	\$4.25	\$4.50	\$4.75	\$5.00	\$5.25	
327	149	110	71	31	0	0	0	0	0	0	0	
307	149	110	71	31	0	0	0	0	0	0	0	
287	149	110	71	31	0	0	0	0	0	0	0	
267	149	110	71	31	0	0	0	0	0	0	0	
247	113	110	71	31	0	0	0	0	0	0	0	
227	78	75	71	31	0	0	0	0	0	0	0	
207	78	39	29	31	0	0	0	0	0	0	0	
187	78	39	-1	-26	-18	0	0	0	0	0	0	
167	78	39	-1	-40	-71	-46	-11	0	0	0	0	
147	78	39	-1	-40	-71	-71	-71	-52	-21	0	0	
127	78	39	-1	-40	-71	-71	-71	-71	-71	-71	-47	

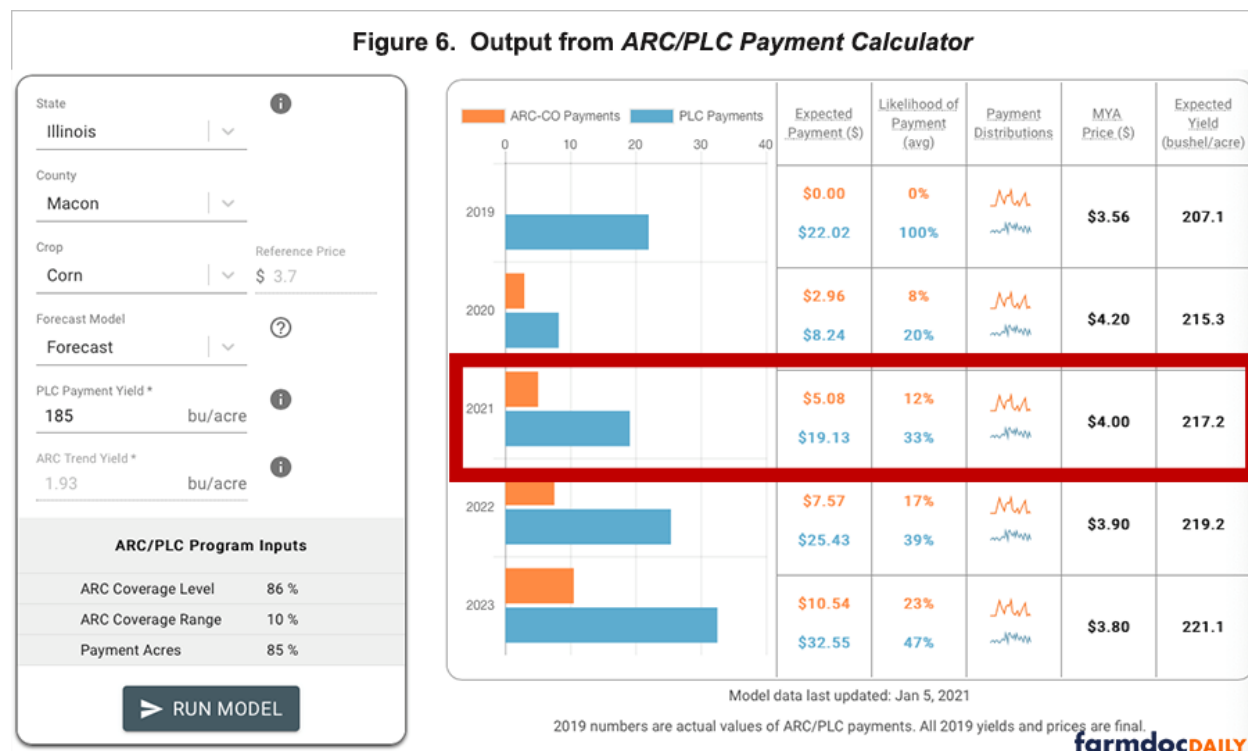
* A positive value indicates that PLC will pay more, a negative value indicates that ARC-CO will pay more.

farmdocDAILY

At prices between \$3.25 and \$3.70 and moderate to high yields, PLC will make higher payments than ARC-CO (see Figure 5). At prices below \$3.25, PLC will make higher payments than ARC-CO. At low yields and prices above \$3.25, ARC-CO will make higher payments than PLC.

Gardner ARC/PLC Calculator

The online *ARC/PLC Calculator* is shown in Figure 6. Inputs are corn for Macon County, Illinois, with a PLC yield of 185 bushels per acre. The tool gives expected payments for 2019 through 2023. The year 2019 has passed, and Commodity Title payments have been made. In 2019, Macon County did not receive an ARC-CO payment for corn. There was a PLC payment of \$21.90 for a PLC yield of 185 bushels per acre.



For the 2021 decision, the focus should be given to the 2021 results (in the red box). This tool reports results from a simulation of possible 2021 yields and prices calibrated based on historical results. The expected MYA price for 2021 is \$4.00, an average of many different price scenarios that result in an average of \$4.00 over all scenarios. The 2021 expected yield is 217.2 bushels per acre, the average over many scenarios. The 217.2 yield is based on a history of yields and assumes a trend increase in yields.

For 2021, the likelihood of a PLC payment is 33%. This means that 33% of the time, the model estimates that the 2021 MYA price will be below the \$3.70 effective reference price. This 33% probability is based on historical changes in prices.

The expected payment for PLC in 2021 is \$19.13 per base acre. This includes the 77% of the time that PLC does not make a payment.

For 2021, the likelihood of an ARC-CO payment is 12%. This means that the ARC-CO combination that makes payments in the 2018 What If Tool (see Figure 6) are estimated to occur only 12% of the time. Much of the reason for this low likelihood is because of the low yields needed to trigger ARC-CO payments. History would suggest that those low yields happen rarely.

The expected payment from ARC-CO is \$5.08 per base acre. This \$5.08 includes the 12% of times that ARC-CO makes payments and the 88% of the time it does not make payments.

Making the Decision

The ARC/PLC calculator indicates the following for Macon County, Illinois in 2021;

- Both PLC and ARC-CO are unlikely to make payments.
- PLC has a higher likelihood of payments for corn than ARC-CO: 33% for PLC versus 12% for ARC-CO.
- PLC has a higher expected payment for corn than ARC-CO: \$19.02 per base acre for PLC versus \$5.08 for ARC-CO.

The *2018 Farm Bill What-If Tool* indicates that PLC will pay more than ARC-CO at prices below \$3.70 and moderate to high yields. ARC-CO will pay more than PLC at prices above \$3.25 and low yields. Those low yields would generally be in drought situations, often resulting in higher prices.

Based on the above results, we would suggest that farmers lean towards taking PLC. This choice also allows for the Supplemental Coverage Option (SCO) to be chosen as a crop insurance policy. The most likely case in which PLC will not result in a higher payment than ARC-CO is in a drought year. In a drought year, yields could be 100 bushels lower than the 217.2 trend or in the 127 bushels per acre range. However, if yields are that low, prices would likely rise and reduce the likelihood and size of payments from ARC-CO. For example, at a 127 bushel yield in Macon County, prices at \$5.68 or above would not generate an ARC-CO payment.

References

2018 Farm Bill What-If Tool. *farmdoc FAST tools*, updated January 14, 2021. Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, <https://farmdoc.illinois.edu/fast-tools/arc-co-plc-model>

Batts, R., G. Schnitkey, K. Swanson, C. Zulauf and N. Paulson. "[Release of the 2018 Farm Bill What-If Tool for 2021 Decisions](#)." *farmdoc daily* (11):6, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, January 14, 2021.

Coppess, J., N. Paulson, K. Swanson, G. Schnitkey and C. Zulauf. "[Farm Program Update: ARC/PLC Enrollment](#)." *farmdoc daily* (10):80, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, April 30, 2020.

Schnitkey, G., K. Swanson, C. Zulauf, R. Batts, J. Coppess and N. Paulson. "[ARC-IC in 2019: Release of a 2019 ARC-IC Payment Calculator](#)." *farmdoc daily* (10):2, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, January 7, 2020.

Zulauf, C., B. Brown, G. Schnitkey, K. Swanson, J. Coppess and N. Paulson. "[The Case for Looking at the ARC-IC \(ARC-Individual\) Program Option](#)." *farmdoc daily* (9):203, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, October 29, 2019.