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Department of Agricultural and Consumer Economics, University of Illinois Urbana-Champaign

Analysis: ARC-IC vs. ARC-CO Payments Using Illinois and Kansas Farm Management Association Data

Carl Zulauf and Andrea Hershey

Department of Agricultural, Environmental and Development Economics
Ohio State University

Gary Schnitkey

Department of Agricultural and Consumer Economics
University of Illinois

Gregg Ibendahl

Department of Agricultural Economics
Kansas State University

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Farm Service Agency (FSA) farm operators can elect 1 of 3 crop programs for the 2014-2018 crop years by the end of March 2015. ARC-CO (Agriculture Risk Coverage – county) and PLC (Price Loss Coverage) have drawn the most attention. The third option is ARC-IC (ARC – individual). Since ARC-CO and ARC-IC are variations of the same policy concept, a question of interest is, "How do potential payments from the ARC programs compare?" This article provides one perspective on this question using farm level yield data from the Illinois and Kansas farm management associations.

Program Description

Both ARC-CO and ARC-IC are multiple year shallow loss programs that use a market-oriented benchmark. Comparing their operation, ARC-CO (ARC-IC) makes a payment whenever county revenue (ARC-IC farm unit revenue) is below 86% of the county's (ARC-IC farm unit's) benchmark revenue. For both programs, payment is capped at 10% of their benchmark revenue. Specifics of the ARC-CO and ARC-IC calculations are presented in Appendix A.

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ARC-CO is elected on a program crop basis while ARC-IC is elected for the entire FSA farm. Thus, payments by ARC-CO are crop specific while payments by ARC-IC are specific to the ARC-IC farm unit. The ARC-IC farm unit is all FSA farms a given operator elects into ARC-IC within a state. Thus, ARC-IC is an individual FSA farm only if 1 FSA farm is elected into ARC-IC.

A key difference is that ARC-CO pays on 85% of a crop's base acres while ARC-IC pays on 65% of an ARC-IC farm unit's total base acres. Thus, ARC-IC starts with a payment hole. However, other considerations can offset this hole. Three potential offsets are:

(1) Yield is higher for the FSA farm on average than for the county.
(2) Yield is more variable for the farm than for the county. This is usually true since the county covers a wider geographic area, but it can be especially true in some situations, such as river bottom land prone to flooding and soils prone to drought damage.
(3) Fruits and vegetables (other than mung beans and pulse crops) or wild rice are planted on the FSA farm. Payments are reduced if these non-program crops are planted on more than the non-payment acres. Non-payment acres total 15% for ARC-CO but 35% for ARC-IC. ARC-IC thus provides more opportunity to plant fruits and vegetables without giving up program payments.

For a more detailed discussion of ARC-CO and ARC-IC see the material in the "Farm Box Toolkit" available here.

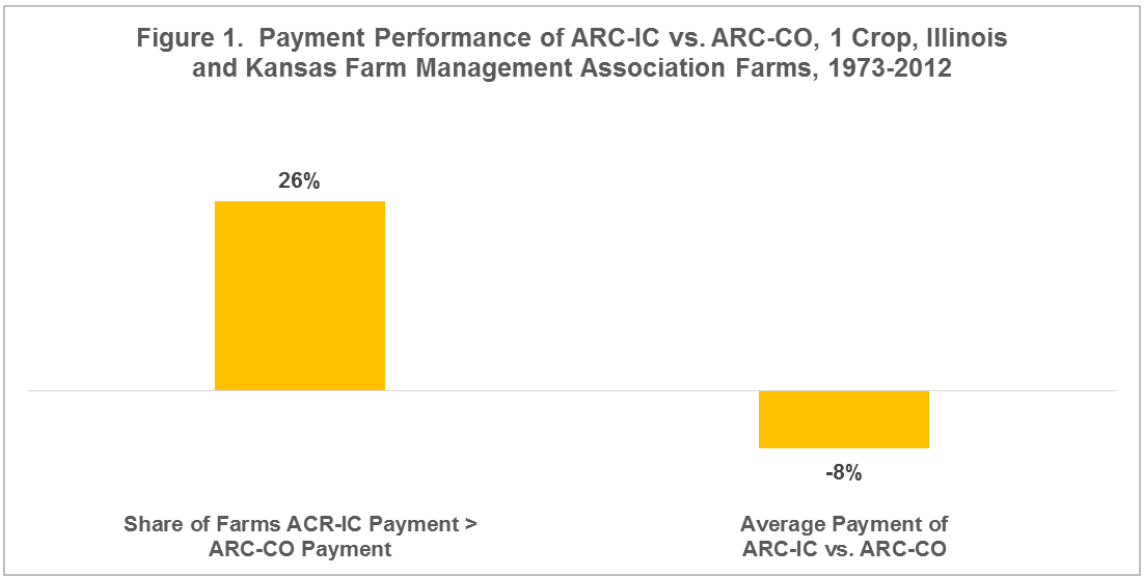
Appendix B lists assumptions made in conducting the analysis. The assumptions address considerations that could be important to individual FSA farms and thus should be assessed.

Data

The analysis uses farm level yield data from the Illinois Farm Business Farm Management (FBFM) program and Kansas Farm Management Association (KFMA) over the 1973 through 2012 crop years. For a farm to be included in the analysis, yields had to be available for all years for both the farm and the county in which the farm is located. County yield data were from the USDA, NASS (National Agricultural Statistics Service) Quick Stats website. Availability of county yields is more problematic later in the analysis period, especially for Kansas. A number of farms are eliminated because of missing data for the county, not the farm. A total of 57 crop-farm combinations had complete data for the farm and the county. Number of farms by crop-state combination is 13 for Illinois corn, 11 for Illinois soybeans, 14 for Kansas soybeans, and 19 for Kansas wheat. To further analyze the relationship between ARC-CO and ARC-IC payments, a data set involving farms with complete data for two crops was compiled. A total of 11 farms remained, with 9 being Illinois corn and soybeans. Both data sets are small samples, especially the two crop data set. Thus, the analysis is an illustrative probe that may reveal some insights. Appendix C contains a more detailed discussion of the FBFM and KFMA data. Note that FBFM and KFMA farms are farm operation units and thus can be composed of more than one FSA farm.

ARC-CO vs. ARC-IC Payments

If all 57 crop-farm combinations planted the same crop every year, average payment per planted acre by ARC-IC averaged -8%, not -20%, less than the average ARC-CO payment per planted acre (see Figure 1). ARC-IC payments averaged higher than ARC-CO payments for 26% of the 57 farms. Average income on the 57 farms was approximately 10% higher than the average county income. Higher income for the farm than for the county implies higher payments from ARC-IC than from ARC-CO, everything else the same. Standard deviation of annual revenue was also approximately 10% higher for the farms than for the county. Higher variation in income for the farm than for the county implies higher payments from ARC-IC than from ARC-CO, everything else the same. However, it is important to note that the value of these two variables across the 57 farms was not associated with the variation of the ratio of ARC-IC to ARC-CO payment across the farms. This non-trivial finding calls into question the ability to predict which FSA farms will have higher payments from ARC-IC based on higher revenue or variation in revenue.



Results for the 11 farms for which information on 2 crops is available reveals that the ratio of ARC-IC to ARC-CO payment per acre is 14 percentage points lower when 2 crops are raised on the farm. After examining the data, the most likely explanation is a lower positive correlation between corn and soybean revenue per acre for the farm than for the county. A lower positive correlation between the revenue of the 2 crops means that, when revenue declines notably for a crop, revenue for the other crop is less likely to drop the same amount. Revenue per planted acre thus declines less if 2 rather than 1 crop is raised on the farm, in turn leading to less of a payment for 2 than for 1 crop.

Summary Observations

- ARC-IC starts in a 20% payment hole due to paying on 20% fewer acres than ARC-CO or PLC.
- However, factors exist that can offset this hole in part or in whole over the 5 crop years of the decision. One is that revenue per acre for the individual farm is higher than for the county. A second is that revenue is more variable for the farm than the county. Results from this analysis support this offset but also suggests that it is difficult to forecast for which farms these relationships hold.
- Results of this study supports the idea that the attractiveness of ARC-IC declines if multiple crops are raised on the ARC-IC farm unit.
- If ARC-IC is a program you wish to consider, please spend time learning the intricacies of its calculations. They are important to understand in order to evaluate the program.

This publication is also available at http://ohioagmanager.osu.edu.

The authors thank the Illinois Farm Business Farm Management (FBFM) program and the Kansas Farm Management Association (KFMA) for the use of their data.

Appendix A: Program Calculation Formulas

ARC-CO Calculation Formulas

- ARC-CO revenue benchmark / plant acre = (Olympic average of county yield / plant acre for 5 prior crop years times Olympic average of Maximum (MAX) (U.S. crop year price, reference price) for 5 prior crop years)
- Olympic average discards high and low values.
- ARC-CO actual revenue / plant acre = county yield / plant acre times MAX (U.S. crop year price, U.S. loan rate)
- ARC-CO payment / plant acre = MAX (0, Minimum (MIN) [(86% times ARC-CO revenue benchmark / plant acre) – ARC-CO actual revenue / plant acre, 10% times ARC-CO revenue benchmark / plant acre]
- ARC-CO payment per acre is capped at 10% of ARC-CO revenue benchmark
- Maximum (MAX) operation means the higher/highest of options separated by a comma is chosen. Thus for example, 0 is selected if calculated payment per acre is negative. A minimum (MIN) operation means the smaller/smallest of options separated by a comma is chosen.

ARC-IC Calculation Formulas

- ARC-IC actual revenue / plant acre for a crop for a crop year = [farm yield / plant acre times MAX (U.S. crop year price, U.S. loan rate).
- ARC-IC revenue/ plant acre for FSA farm unit for a crop year = sum across program crops of [[farm yield / plant acre times MAX (U.S. crop year price, reference price) times share of program acres planted to specific program crop in current year].
- ARC-IC farm unit revenue benchmark / plant acre = Olympic average for the 5 prior crop years of ARC-IC revenue / plant acre for ARC-IC farm unit
- ARC-IC payment / plant acre = MAX (0, MIN [(86% times ARC-IC farm unit revenue benchmark / plant acre) – ARC-IC farm unit actual revenue / plant acre, 10% times ARC-IC farm unit revenue benchmark / plant acre]
- Share of program crop acres used to weight revenue calculations for ARC-IC is the share of program crop acres in the year for which payment is being calculated. For example, the share of program acres for the 2014 crop year is used in calculating ARC-IC program payments, including the calculations involving the 5 prior, or 2009 through 2013, crop years.

Appendix B: Assumptions made in conducting analysis

- Base acres equal acres planted to the crop.
- Situation of 100% prevent plant acres is not considered, which could affect ARC-IC payments.
- Calculations do not include the reference price as a minimum price for a crop year when computing the revenue benchmark for the year. The reference price is the minimum price for both ARC-CO and ARC-IC; thus, it is not clear this assumption favors one program over another. The reference price minimum is not included because it is not clear what Congress would have set the reference price at for years before the 2014 farm bill if the ARC programs had existed.
- Calculations do not include the substitute yield for ARC-CO and ARC-IC and the assigned yield for ARC-IC. The assigned yield applies for ARC-IC when a program crop is planted on the ARC-IC farm unit but was not planted in previous years. The assigned yield is used when calculating the benchmark revenue for the ARC-IC farm unit. The assigned yield is 100% of the county yield. The county yield is determined by FSA using data which include but are not limited to data from NASS and the Risk Management Agency.
- Calculations do not include the loan rate as a minimum price in the calculation of actual revenue.

Appendix C: Description of Data

FBFM is a farmer-owned cooperative that has a working relationship with the University of Illinois at Urbana-Champaign. Members maintain production and financial records for their farms. At the end of a calendar year, financial statements and production records are prepared and aggregate databases of crop and livestock production, receipts, expenses, inventories, and capital accounts are produced to develop benchmarks against which farmers can compare their farms. To be included in the database, FBFM personnel must certify that a farm's data are reliable and usable. KFMA data are developed in a similar fashion. Consistent preparation of farm level data, including yields, begins with 1972 for FBFM and 1973 for KFMA.