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[Field Research]

Market Oriented Revenue Assistance for Farmers: A Case Study of the United State's ACRE Program

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Abstract

Purpose - Intense debate is occurring over support for farmers in Korea, specifically on the justification, policy design, and equality issues of the farm support programs. Given this debate, a new type of farm program in the US, a market flexible revenue program (the Average Crop Revenue Election, ACRE), is examined. ACRE stands in contrast to traditional programs that tie payments to price and have parameters that are fixed or change only infrequently.

Research design, data, and methodology – Based on the ACRE program formulas, the potential payments are estimated by crop year, program crop and geographical area using the FSA acreage and payment rate data.

Results - If all US farm program acres were in ACRE over the 2009-2013 crop years, payments would have totaled \$7.95 billion or 1.2 percent of average market receipts for US crops. Enacting ACRE as a revenue program instead of a similarly-structured price-only program increased payments by \$1.75 billion or 28 percent.

Conclusions - Potential payments by ACRE largely reflected the distribution of the value of production across the program crops eligible for ACRE as well as across state geographical areas. If program parameters can be made acceptable and if data availability issues can be addressed, market flexible revenue programs offer a farm policy option that can address many of the concerns that have arisen over farm policy in Korea.

Keywords: ACRE, Crop Revenue Program, Payments.

JEL Classifications: Q18.

1. Introduction

Intense debate is occurring over support for farmers in Korea, specifically on the justification, policy design, and equality issues of the farm support programs. A key issue is the Variable Direct Payment (hereafter VDP). VDP, one of the largest direct aid programs for Korean farms, is available only for producers of rice. Eligibility conditions for VDP

include the production of rice. A VDP payment is triggered when average market price during the harvest season is less than a pre-announced target price. The target price is fixed for a time period that historically has lasted around five years. It is argued that this design is, at least partially, responsible for the large increase in government spending for VDP and the cost of storing the "mountain of rice" that has resulted. It is also argued that current policies, including VDP, have failed to address the long term decline in the income of rice farms and are not fair to producers of other commodities.

In its two most recent farm bills enacted in 2008 and 2014, the United States (hereafter US) enacted a market flexible revenue farm program option in addition to a traditional program option based on fixed price targets. A revenue program is more encompassing than a price program since revenue reflects both price and yield. A market flexible program allows policy targets to change with market conditions. Fixed targets often result in either

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payments that are too high, causing overproduction, or too low, leading to insufficient assistance, because market prices and revenue turn out to be lower or higher than expected at the time the policy target was fixed. Such an overproduction situation has occurred in Korea.

Given the debate over farm policy in Korea and given that the US is an important producer of agricultural commodities and a key player in international farm policy discussions, this study provides estimates of potential payments that the market flexible program enacted in the 2008 farm bill, specifically Average Crop Revenue Election (ACRE) Program. The 2008 farm bill program, not the 2014 farm bill program, is chosen for analysis because this analysis focuses on a broad perspective of how such a program operates. In addition, the analysis can use actual payment rates and program parameters announced by the US Farm Service Agency (FSA) in implementing the program for the 2009-2013 crops instead of relying on assumptions about what policy parameters, such as revenue targets, and market conditions might be.

In Korea, besides a crop insurance in effect since 2000, an additional crop revenue insurance program was introduced as a pilot program on soybeans, onion, and grape in 2015. Distinctively from the revenue-based ACRE program, Korea's crop insurance program is a yield-based farm support program, thus its stabilizing impact on farm income is known to be relatively limited in that it does not properly work in case of "high yield-low price" situation. Therefore, examining the US revenue-based farm support program is expected to provide insights on designing the farm income support program in Korea.

To the authors' knowledge, there is no study of calculating the potential ACRE payment and compare it by crop and geographical location. This article is organized as follows. The traditional US crop programs are discussed to provide a comparison for a discussion of the market flexible program in the 2008 farm bill that follows. Next, the methodology used to estimate potential payments by the market flexible program in the 2008 farm bill is discussed. Payments are discussed for the program as a whole, by crop and by state. The article ends with a summary and implication section.

2. Description of Traditional US Crop Support Programs

A central feature of US farm policy since its beginning in 1933 has been a loan program that established a floor on per unit receipt for all of the amounts of a program crop produced in a year. The floor is known as the loan rate. Prior to the 1985 or 1991 farm bill depending on the crop, a nonrecourse loan program created a floor for the price of the program crop. Farmers received the loan rate price floor

by taking out a loan from the US government and then defaulting the grain to the government instead of repaying the loan. The nonrecourse loan program has been replaced by a marketing loan program. Under a marketing loan program, farmers receive the difference between the loan rate and the market price that is lower than the loan rate on a day of their choosing.

With the exception of the 1996 farm bill, counter-cyclical price programs have been a cornerstone of US farm policy since the 1973 farm bill. Counter-cyclical price programs make payments whenever market price is less than a price target established in the farm bill. These price targets are higher than loan rate. Payments are countercyclical to market prices, occurring when market price is below the price target but disappearing when market price exceeds the price target. A per unit payment rate based on the difference between the target and market prices is multiplied by a historical program yield and a share of historical program base acres.

The 1996 farm bill not only eliminated the counter-cyclical price program but also annual acreage set asides and most public stocks programs. The counter-cyclical program was replaced with a Production Flexibility Contract (hereafter PFC) program. PFC paid farmers a fixed amount per unit of a program crop. The per unit payment rate was multiplied by a historical program yield and a share of historical program base acres. However, when prices declined in 1997 and 1998, Congress stepped in with ad hoc payments. Continued low prices and farm income resulted in the 2002 farm bill retaining PFC, which was renamed the direct payment program, and reinstating a counter-cyclical price program. The direct payment program was eliminated in the 2014 farm bill.

Parameters of the counter-cyclical and direct payment programs were fixed for the life of a farm bill, but varied from farm bill to farm bill. Payments by these programs to an individual payment entity were subject to limits. The limits varied from farm bill to farm bill.

The discussion in this chapter highlights the main features of US traditional programs. For a more extensive discussion of these programs as well as the history of US farm policy, see USDA (1984), Robinson (1989), Tweeten (1989), and Orden, Paarlberg, and Roe (1999).

3. Description of US ACRE Programs

The US authorized its first market flexible, revenue program in the Food, Conservation, and Energy Act of 2008. Known as the Average Crop Revenue Program (ACRE), it made payments for a program crop when a state's actual revenue per planted acre was less than the state's revenue target per planted acre for a crop year. State revenue per planted acre equaled (average state yield times US crop

year price). The revenue target equaled 90 percent of a state's benchmark revenue. Benchmark revenue was calculated using US price for the two most recent crop years and Olympic average state yield for the five most recent crop years. An Olympic average eliminates the low and high values before calculating the average. Per acre payment was capped at 22.5 percent of the revenue target. Payment was made on 83.3 percent (85 percent for 2012 and 2013) of acres planted to a program crop, but payments from ACRE could not be received on more than a farm's total base acres. Last, a farm eligibility condition existed. Specifically, a farm could receive a payment only if its actual revenue for a program crop was less than its benchmark revenue plus the per acre insurance premium paid for the crop.

Other provisions included separate ACRE state revenue targets for irrigated and non-irrigated land if at least 25% but no more than 75% of a state's planted acres were irrigated. In addition, payments were adjusted by the ratio of a farm's 5-year Olympic average yield to the 5-year Olympic average yield for its state. For example, if a farm's 5-year Olympic average yield was 110 percent of the state's 5-year Olympic average yield, the farm's payment rate was increased 10 percent.

Use of a historical moving averages on prices and yields means that ACRE's revenue target adjusts more slowly than market revenue, especially when changes in market revenue are large. Adjustment of the revenue target was also slowed by a provision that limited the increase and decrease in benchmark revenue to no more than 10 percent of the prior year's benchmark revenue. While changes in the revenue target from year to year were limited, no floor existed on the target.

Under the 2008 farm bill, farmers were enrolled in the traditional direct payment, counter-cyclical program unless they elected ACRE. The election decision was made on the basis of a farm unit registered at FSA, hereafter referred to as an FSA farm. Election of ACRE applied to all eligible program crops plus peanuts grown on the FSA farm; however, payments were made on a crop-by-crop basis. ACRE could be elected in any crop year, but, once elected, the FSA farm was in ACRE through the 2012 crop year. When ACRE was extended through the 2013 crop year, previously enrolled farms were allowed to opt out for the 2013 crop year. If ACRE was elected, the FSA farm's direct payment was reduced by 20 percent and loan rates for crops raised on the farm were reduced by 30 percent. Payments by ACRE to a given payment entity in a crop year could not exceed \$65,000 plus the payment entity's 20 percent reduction in direct payments.

Relatively few farms elected ACRE. Even by the 2012 crop year, the last year of its original authorization period, only 8.3 percent of FSA farms accounting for 13.9 percent of FSA base acres had elected ACRE (USDA, 2015, 2016; FSA, 2015, 2016). When the US Congress extended ACRE

through the 2013 crop year, participation dropped to 4.8 percent of FSA farms and 7.9 percent of FSA base acres (USDA, 2015, 2016; FSA, 2015, 2016). Reasons cited for the low participation in ACRE include a new program with a complex set of provisions including its calculation of payments, the 20 percent reduction in direct payments, the 30 percent reduction in loan rates, and producer risk preferences for direct payments, which were certain and known, vs. the uncertainty of payments by ACRE (Edwards, 2011; Woolverton & Young, 2009). In addition, for many farmers the high prices and revenues over the 2009-2013 crop years reduced the need to understand farm programs, especially one that was new and complex. While not the focus of this article, the Agricultural Act of 2014 made a number of changes in the ACRE program, including renaming it the Agriculture Risk Coverage (ARC) program (Congressional Research Service, 2014).

To address the desire for a simple program, the 2014 farm bill did not retain ACRE's farm eligibility condition nor its payment adjustment based on the ratio of the farm to state 5-year Olympic average yield. The 30 percent reduction in the loan rate was eliminated while the 20 percent reduction in direct payments no longer applied because direct payments were eliminated by the 2014 farm bill. Several important changes were made to the payment formula. ARC uses a 5-year Olympic average for both price and yield. ARC's payment starts when revenue is below 86 percent instead of 90 percent of the revenue target, and the payment coverage cap is reduced to 10 percent from 22.5 percent. These two changes saved money that funded two other changes.

First, while the 10 percent limit on the increase or decrease in benchmark revenue in a crop year was eliminated, ARC, unlike ACRE, has a potential floor on its revenue target. ARC's Olympic average price cannot decline below the target price, now called reference price, of the traditional counter-cyclical price program, now referred to as the Price Loss Coverage (PLC) program. Assuming yield trends up, a floor thus exists on ARC's revenue target. Second, whereas ACRE used state yields, ARC uses county yields in a county version of the program or farm yields in a whole farm version of the program. This change was made to accommodate a widespread desire to move the program closer to the individual farm level. Overall, US farmers chose ARC-CO for majority of program base acres (FSA). Across all program crops, 76 percent of US base acres were enrolled in ARC-CO, 1 percent in ARC-IC, and 23 percent in PLC. However, pronounced differences in program enrollment existed across crops. For example, almost all rice and peanut base acres were enrolled in PLC while corn and soybean base acres were overwhelming enrolled in ARC-CO.

The discussion in this chapter highlights the main features of the US ACRE program. For a more extensive discussion, see Zulauf, Schnitkey, and Langemeier (2010).

4. Framework for Calculating ACRE Potential Payments

Potential payments by ACRE for a crop-state-year combination were estimated using acres planted to the crops (USDA, 2015; NASS, 2015), FSA's announced payment rates (USDA, 2014, 2015; FSA, 2014, 2015), and the 83.5/85 percent base acre payment factor. ACRE's individual farm loss provision was included by using Zulauf, Schnitkey and Langemeier's (2011) estimate that this provision leads to a 10 percent reduction in payments.

We could not estimate potential ACRE payments for approximately 3 percent of total U.S. planted acres. Barley, corn, upland cotton, and wheat each accounted for approximately one fifth of the acres for which ACRE potential payments could not be estimated. FSA payment rates were not available for some crop-state-year combinations, usually because no farm had elected ACRE. In addition, for some combinations either planted acres or planted acres by irrigation / non-irrigation were not available.

The missing data imply potential ACRE payments are underestimated. On the other hand, ACRE potential payments are overestimated because neither the payment limit per payment entity nor a FSA farm's base acre cap on the farm's ACRE payment acres could be implemented due to a lack of information at the FSA farm and payment entity level. Lack of FSA farm data also means payments cannot be adjusted by the ratio of the 5-year Olympic average yields for the FSA farm relative to the state. However, since all farms are assumed to be in ACRE, higher payments to FSA farms with higher yields than the state yield should be largely offset by lower payments to FSA farms with yields lower than the state yield. Thus, it is not clear that the inability to include this program provision affects the estimates of potential ACRE payments. The net impact of these estimation issues is not clear, but they should be kept in mind when assessing the results.

5. Total Potential ACRE Payments

Estimated potential payments by ACRE for the 2009-2013 crop years totaled \$7.95 billion, or 1.2 percent of average market receipts for US crops over this period (due to its low participation rate, ACRE made only \$1 billion in actual payments to US farms over the 2009-2013 crop years; See <Figure 1>). Potential payments were highest in 2013, followed by 2009 and 2012. These three years accounted for 85 percent of potential ACRE payments. A major U.S. drought occurred in 2012. In contrast, for most program crops and states, 2009 and 2013 were high yield, low price years. High yield was defined relative to ACRE's Olympic average state yield for the five prior crop years while low price was defined relative to ACRE's average US price for

the two prior crop years.

As discussed earlier, prior to ACRE, US farm bill commodity programs were based on price, not revenue, targets. To gain insights into ACRE as a revenue instead of price-only program, potential payments were calculated as (5-year Olympic average state yield times the difference, if positive, between average U.S. price for the two preceding crop years minus U.S. crop year price), with all other program provisions remaining the same. In short, payments would result only from variation in price.

Over the 2009-2013 crop years, estimated potential price-only payments equaled \$6.20 billion. Enacting ACRE as a revenue program instead of a price-only program increased payments by \$1.75 billion or 28 percent. In other words, as expected, a revenue program was more expensive than a similarly structured price program since revenue includes both yield and price.

Potential payments were also calculated assuming ACRE had been implemented as a yield only program. Payments were estimated as (5-year Olympic average state price times the difference, if positive, between the Olympic average state yield for the 5 prior crop years minus state crop year yield). Potential yield-only payments were calculated to be \$7.7 billion, or higher than the calculated price-only payments. Unsurprisingly given the magnitude of the 2012 drought, yield-only payments were highest for 2012, equaling \$4.1 billion. However, yield-only payments averaged \$0.9 billion over the other 4 years. Size of the yield-only payments again underscores the importance of yield relative to the importance of price in determining payments by a revenue program.

6. Potential ACRE Payments by Program Crop

Due to missing data on payment rates or planted acres, potential ACRE payments could not be estimated for the program crops of canola, crambe, mustard, rapeseed, and sesame. Of the remaining 16 program crops for which ACRE was an option, 6 accounted for 97 percent of all potential ACRE revenue payments: corn, wheat, upland cotton, sorghum, soybeans, and rice (<Table 1>). Corn (44 percent) and wheat (27 percent) together accounted for over 70 percent of all potential ACRE payments.

Because a market oriented policy updates its policy parameters based upon recent market conditions, the distribution of payments by a market oriented program and the distribution of market receipts should be similar across the program crops. However, given the importance of low probability events, such as extreme weather, in determining the value of crop production in any given year, variation from this expectation could occur during short time periods, such as the five crop years during which ACRE existed. Nevertheless, the distributions of ACRE payments and crop

receipts by program crop were similar in general over the 2009-2013 crop years (<Table 1>). Their Pearson correlation was +0.83. The largest percentage point difference between the two distributions occurred for wheat and soybeans. Wheat's share of potential ACRE payments was 16.9

percentage points greater than its share of the value of program crop production. In contrast, soybeans' share of potential ACRE payments was 23.1 percentage points smaller than its share of the value of program crop production.

<Table 1> Potential ACRE Payments by Crop, United States, 2009-2013 Crop Years

Crop	Potential ACRE Payments	Share of ACRE Payments	Share of Value of Production
Corn ¹⁾	\$3,497,155,668	43.974%	50.827%
Wheat	\$2,153,304,740	27.076%	10.186%
Upland Cotton	\$820,755,520	10.320%	4.014%
Sorghum ¹⁾	\$448,744,106	5.643%	1.148%
Soybeans	\$443,923,105	5.582%	28.687%
Rice	\$346,222,818	4.353%	2.256%
Barley	\$70,390,546	0.885%	0.749%
Sunflowers	\$68,572,950	0.862%	0.414%
Oats	\$56,009,333	0.704%	0.158%
Lentils	\$16,626,964	0.209%	0.104%
Dry Peas	\$16,380,143	0.206%	0.114%
Peanuts	\$4,683,503	0.059%	0.877%
Safflower	\$4,627,259	0.058%	0.033%
Flaxseed	\$3,256,053	0.041%	0.049%
Large Chickpeas	\$2,029,190	0.026%	0.047%
Small Chickpeas	\$169,997	0.002%	0.011%
Canola	insufficient data	insufficient data	0.317%
Crambe	insufficient data	insufficient data	no data
Mustard	insufficient data	insufficient data	0.008%
Rapeseed	insufficient data	insufficient data	0.001%
Sesame	insufficient data	insufficient data	no data
TOTAL	\$7,952,851,896	100%	100%

Note: 1) Corn and sorghum include an estimate of the value of silage production. The estimate equals (acres harvested for silage times average U.S. yield of grain per planted acre times U.S. season average price).

Source: Own (calculated using data from U.S. Department of Agriculture (USDA), Farm Service Agency and USDA, National Agricultural Statistics Service)

7. Potential ACRE Payments by State Geographical Area

Of the 15 states whose share of potential ACRE payments exceeds 2 percent, 11 lie between the Mississippi River and Rocky Mountains (see Figure 2). These 11 states have sizable acres of program crops, particularly the large

potential ACRE payment crops of corn and wheat. Only two states had share of ACRE payments that were in double digits: Texas (21 percent) and Kansas (11 percent). These two states had the highest standard deviation of state average yield for corn and wheat among the 15 states with the most corn and wheat acres over the 2009-2013 crop years.

A revenue program can be made to cost the same as a price program by appropriately setting its program parameters.

Market flexible programs will slow the adjustment to major changes in market situations, but will not indefinitely postpone such adjustment. The speed at which adjustment occurs can be influenced by the parameters set for the program, including the length of the moving average. Thus, a market flexible program can avoid the cost that has arisen from the overproduction of rice in Korea but also provide transition assistance to rice growers.

Market flexible revenue programs can be developed for any commodity provided data on price and yield are available. The geographic area can vary from the country to smaller units, again provided data are available. In short, if

program parameters can be made acceptable and if data availability issues can be addressed, market flexible revenue programs offer a farm policy option that can address many of the concerns that have arisen over farm policy in Korea.

There exist several limitations of this study. First, this study is calculation-based, not (econometrically) estimation-based, thus the determinants of ACRE potential payments were not identifiable. Therefore, further studies will hopefully explore the contribution of price and yield variations to the potential payments by ACRE to obtain more insight into farm policy design. Second, the potential payments by ACRE are slightly over-estimated as this analysis assumes all US farms had elected to enroll in ACRE program. Hence, a discount scheme should be applied when the results are interpreted.

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Appendix: ACRE Program Formulas

(1) Actual state revenue per planted acre for program crop c , state s and crop year t ($ASR_{c,s,t}$) = $ASY_{c,s,t} \times \text{MAX}(USP_{c,t}, 70\% \times \text{MLR}_{c,t})$

(2) ACRE benchmark state revenue for program crop c , state s and crop year t ($BSR_{c,s,t}$) = $OA5SY_{c,s,t} \times AP2US_{c,t}$

(3) ACRE's state revenue target per planted acre for crop c , state s , and crop year t ($SRT_{c,s,t}$) = $\text{MIN}[\text{MAX}(90\% \times BSR_{c,s,t}, 90\% \times BSR_{c,s,t-1}), 110\% \times BSR_{c,s,t-1}]$

where $ASY_{c,s,t}$ = actual state yield per planted acre for program crop c , state s and crop year t ; $USP_{c,t}$ = US cash price for program crop c and crop year t ; $\text{MLR}_{c,t}$ = US marketing loan rate for program crop c and crop year t ; $OA5SY_{c,s,t}$ = Olympic average state yield per planted acre for the 5 crop years immediately preceding crop year t for program crop c , state s and crop year t ; and $AP2US_{c,t}$ = average US cash price for 2 crop years immediately preceding crop year t for program crop c and crop year t . The 10 percent limit on the increase in the ACRE state revenue target from the prior year's level was called a cap while the 10 percent limit on the decrease in the ACRE state revenue target from the prior year's level was called a cup. Separate ACRE state revenue targets were established for irrigated and non-irrigated land if at least 25% but no more than 75% of a state's planted acres were irrigated.

A farm eligibility condition also had to be met for an FSA farm to receive a payment from ACRE. Specifically,

$$(4) AFR_{c,f,t} < BFR_{c,f,t}$$

$$(5) AFR_{c,f,t} = AFY_{c,f,t} \times USP_{c,t}$$

$$(6) BFR_{c,f,t} = ((OA5FY_{c,f,t} \times AP2US_{c,t}) + \text{per acre farmer-paid insurance premium}_{c,f,t})$$

where $AFR_{c,f,t}$ = actual revenue for program crop c , FSA farm f , and crop year t ; $BFR_{c,f,t}$ = benchmark revenue for program crop c , FSA farm f , and crop year t ; $OA5FY_{c,s,t}$ = Olympic average farm yield per planted acre for the 5 crop years immediately preceding crop year t for program crop c , FSA farm f , and crop year t ; and $AFY_{c,s,t}$ = actual farm yield per planted acre for program crop c , FSA farm f , and crop year t .

An ACRE revenue payment was made to an FSA farm for an eligible crop when both the state payment condition and FSA farm eligibility condition were met. Specifically,

$$(7) \text{ACRERP}_{c,f,t} = ((83.3\% \text{ (or } 85\% \text{ for 2012 and 2013 crops)} \times \text{FSA farm planted acres}_{i,s,t}) \times \text{MIN}[(SRT_{c,s,t} - ASR_{c,s,t}), 22.5\% \times SRT_{c,s,t}]) \times (OA5FY_{c,f,t} / OA5SY_{c,s,t})$$

where $\text{ACRERP}_{c,f,t}$ = ACRE revenue payment per planted acre for program crop c , FSA farm f , and crop year t .

While ACRE revenue payment depended on the acres planted to the eligible crop, an FSA farm could not receive ACRE payments on more acres of all eligible crops than the FSA farm's total historical base acres. The ACRE state revenue payment per acre was capped at 22.5 percent of the state revenue target. An FSA farm's payment was adjusted by the ratio of the farm's 5-year Olympic average yield to the state's 5-year Olympic average yield.