

Introduction and Overview

Most farm legislation at the Federal level is contained in “Farm Acts,” which first authorized farm income support in the form of commodity payments in the 1930s (Bowers et al., 1984). Support—in the form of countercyclical payments (CCPs) and marketing loan benefits (MLBs)—makes payments to producers in response to price shortfalls. Commodity support not covered in the Farm Act includes ad hoc disaster assistance and Federal crop insurance. This report focuses on CCPs, MLBs, ad hoc disaster assistance, and a new class of revenue-based support.

While CCPs and MLBs target low prices, ad hoc disaster assistance generally targets low yields. However, farm returns per acre, as measured in terms of revenue, are price times yield. While longstanding support for program crops (corn, for example) addresses revenue, it does not do so in a coordinated fashion. In particular, government payments are typically triggered by price or yield shortfalls and, until the 2008 Farm Act, did not calculate payments based on revenue shortfalls. As a result, traditional support programs can over- or undercompensate producers relative to changes in their gross revenue.

The 2008 Farm Act, the Food, Conservation, and Energy Act of 2008 (Public Law 110-246), allows an eligible producer to receive revenue-based support in the Average Crop Revenue Election (ACRE) program. In return, the producer forgoes payments under one price-based payment program, and accedes to reduced payments under another price-based support program and to a reduction in a fixed payment (USDA/ERS, 2008; Zulauf et al., 2008).

A revenue-based support program could be more efficient than the traditional suite of uncoordinated commodity support programs and disaster assistance programs in that payments are more closely aligned to actual changes in farm revenue. If prices and yields are inversely related, the revenue-based approach may offer less variable payment outlays from year to year than the longstanding forms of support—even if mean total payments are the same between the two forms of support. In such a case, a high level of payments may also be less likely under revenue-based support.

Rather than focus specifically on the new ACRE program, which has a complex mechanism for setting payments and will not provide coverage until the 2009 crop year, this report provides an overview of revenue-based domestic commodity support alternatives in general.

Traditional Forms of Domestic Commodity Support

Direct commodity price and income support to producers under Title I of the Farm Security and Rural Investment Act of 2002 (abbreviated throughout this report as “2002 Farm Act”) was primarily provided in the form of direct payments, countercyclical payments, and marketing assistance loan benefits (i.e., marketing loan gains, loan deficiency payments, and certificate exchange gains). For more detailed discussion of these programs, see USDA

(2006) and USDA/ERS (2007a). These forms of support continue with the 2008 Farm Act, but with some relatively minor changes.

Direct and countercyclical payments cover producers with base acres of feed grains (corn, sorghum, barley, and oats), wheat, oilseeds (e.g., soybeans), upland cotton, rice, peanuts, and pulse crops (only for countercyclical payments). In addition, these commodities and a number of other crops (including extra-long staple (ELS) cotton, honey, wool, and mohair) are eligible for marketing assistance loan benefits.¹ Thus, these “program” crops are those covered by standard commodity programs.² Commodity support in the form of subsidized crop insurance is offered under the Federal Crop Insurance Act of 1980, as amended by the Agricultural Risk Protection Act of 2000. In addition, ad hoc disaster and/or market loss assistance has been authorized by Congress for most years since 1988.

Countercyclical Payments

The Direct and Countercyclical Payment Program (DCP), as authorized under the 2008 Farm Act, provides payments to eligible farmers and landowners on farms enrolled for the 2008–2012 crop years. Direct payments are fixed and do not vary with current crop production or price (USDA/ERS, 2007a; FSA, 2006; OMB, 2008).³ Like direct payments, a producer’s countercyclical (CCP) payments are not tied to current production, but apply whenever the effective price is less than a statutory target price (USDA/ERS, 2007a; FSA, 2006). CCPs are based on farm-level historical base acres and program yields, and so do not depend on current production. As such, they are less distorting than payments tied to actual production (USDA/ERS, 2002; pp. 27 to 28). However, since CCP payments are tied to current prices, they are more distorting than direct payments. Because they are neither price nor yield sensitive, direct payments are not included in the scenario analysis.

Marketing Loan Benefits

The nonrecourse marketing assistance loan program provides income support at a per-unit price, or loan payment rate (USDA/ERS, 2007a; USDA/FSA, 2003). While CCPs use the national loan payment rates, the marketing assistance loan program uses county-level rates. The program is intended to provide financial liquidity to producers after harvest for more orderly marketing, while minimizing price distortions and the buildup of government stocks. Unlike CCPs, marketing assistance benefits require production of the specific program commodity. Farmers may request a marketing assistance loan after harvesting the program commodity, pledging the harvested commodity as collateral.

When market prices are below the loan rate plus accrued interest, farmers are allowed to repay their loan at a loan repayment rate (reflecting market prices) that is lower than the loan rate (except for extra-long staple cotton). A producer realizes a marketing loan gain if the loan is repaid at less than the loan principal. The marketing loan “gain” per unit of crop output is the amount by which the loan rate exceeds the loan repayment rate. Marketing assistance loans have a 9-month maturity and accrue interest, but if the loan repayment rate is less than the principal plus accrued interest, the interest need not be repaid (USDA/FSA, 2007). The loan is nonrecourse in that,

¹For ELS cotton, the producer must repay the loan at the loan rate (plus accrued interest and other charges), and ELS cotton is not eligible for loan deficiency payments.

²Programs for milk and sugar, which support market prices by restricting marketable supplies, are not covered in this report.

³The terminology for direct payments can be confusing. All commodity-related payments made directly to farmers are categorized as “direct payments” or “direct cash payments” in the Federal budget. The decoupled payments made to farmers are known as “Direct Payments.” We capitalize this specific form of payment to distinguish it from the general category of direct cash payments.

for most program crops, the government must accept the collateral as full payment of the loan at loan maturity if a producer so chooses.

A farmer can alternatively choose to receive the marketing loan benefit as a cash payment (loan deficiency payment), or LDP, if the repayment rate is less than the loan rate. The farmer taking the LDP is free to sell the crop on the open market after receiving the LDP. Marketing loan gains and LDPs are both referred to as marketing loan benefits (MLBs).

Economic Rationale for Revenue-Based Commodity Support

The gross revenue of a producer is price times output, and so will change with changes in price or yield. Traditional commodity support, in the form of CCPs and MLBs, pays producers when prices fall below specified levels, but does not compensate them for yield losses. Traditional disaster assistance does, but in ad hoc fashion, and does not necessarily compensate for low prices. Marketing loss assistance payments, most of which occurred over 1999-2001, addressed market losses associated with low prices, but again in ad hoc fashion. Until the 2008 Farm Act, Congress provides disaster assistance only after constituent requests for aid and contingent on budget considerations. In contrast, CCPs and MLBs apply whenever market prices fall enough to trigger payments, as determined by the program parameters.

Providing price and yield compensation separately means that producers may receive support when they do not need it, or not receive support when they need it. For example, a farmer who suffers a complete yield loss will not receive a payment under a price-based program that is tied to current production (i.e., the MLB).

Revenue-Based Support Better Targets the Producer's Bottom Line

An alternative to separate price- and yield-based support programs would be to determine a national or regional payment rate based on shortfalls in market revenue from an expected or target revenue (e.g., Miranda and Glauber, 1991; Babcock and Hart, 2005; Zulauf, 2006; American Farmland Trust, 2007a; National Corn Growers Association, 2006; Cooper, 2009b).

A revenue support program may be more efficient than the longstanding suite of direct commodity support programs and ad hoc disaster assistance as it more directly targets the producer's bottom line. Revenue-based support was included in the 2007 farm bill proposals from the Administration, and in the House of Representatives and Senate-passed farm bills.⁴ Under the 2008 Farm Act, producers can choose the ACRE program in lieu of the traditional suite of support payments. ACRE's revenue-based payment rates are determined by State (USDA/ERS, 2008; Zulauf et al., 2008).

The benefits of targeting revenue rather than price or yield separately hold even when price and yield move independently of each other. However, an additional advantage of revenue-based support occurs when prices are inversely correlated with national average yield (that is, market prices fall as national

⁴The House and Senate bills are titled the "Farm, Nutrition, and Bioenergy Act of 2007" and "The Food and Energy Security Act of 2007," respectively. Among other differences, the revenue program in the House bill would have used a national level payment rate, and the Senate's State level payment rate.

average yield increases).⁵ This negative yield-price relationship means that a farmer's revenue is less variable from year to year than it would be otherwise. The more negative the correlation, the greater the offsetting relationship (or "natural hedge") that works to stabilize revenues.⁶ For instance, a drought in a major growing region can lower aggregate yield, but the resulting price increase will compensate to some extent for the yield decrease.⁷

To the extent that this "natural hedge" exists, commodity support programs that target only price variability can systematically over- or undercompensate farmers who already have a natural hedge. For example, large yield increases nationally can reduce prices below target prices, triggering countercyclical payments. However, the higher yields offset to some extent the effect of lower prices on revenue. Countercyclical payments ignore this positive revenue factor, and can overcompensate for the revenue decline. Conversely, prices tend to rise with large yield decreases, thereby reducing countercyclical payments, which then undercompensate producers for this decline in revenue.

The offsetting price-yield relationship can make revenue-based support programs appealing from a Federal budgetary standpoint. Since revenue will tend to be less variable than price, revenue-based support programs have the potential to lower year-to-year variability in payments. However, revenue-based support is sensitive to factors like expected price and yield levels, program parameters, and general program design.

As revenue-based crop insurance has become a major part of the Federal crop insurance program (Dismukes and Coble, 2006), the rationale at play there would seem to apply to direct support as well. However, Title I support is provided free of cost to the producer, while the farmer must pay an insurance premium (albeit a subsidized one) for Federal crop insurance. Also, eligibility for crop insurance payments requires that the farmer plant or intended to plant a crop, whereas some forms of Title I support (direct payments and CCPs) do not require planting of a crop. Federal crop revenue insurance protects the farmer against decreases in revenue relative to expected revenue—as the name suggests, it is insurance. Title I support can offer price protection (in the form of CCPs and marketing loan benefits) relative to a statutory guarantee that may be above market expectations. Hence, Title I payments can raise average revenue, and not just address revenue variability.⁸

Implementation of revenue-based support might reduce or eliminate calls for ad hoc disaster assistance due to its inclusion of yield in payment calculations. However, this reduction is not a given, especially if the correlation between the revenue support payments and yield-related losses is low, or if producers believe that the program's revenue guarantee is set too low. While these last two points are not drawbacks specific to revenue-based support (they apply as well to price-based support), lowering the need for ad hoc assistance is a possible motivation for moving to revenue-based support.

Graphical Depiction of Yield and Price-Yield Correlations

The motivation for revenue-based payments based on the natural hedge (inverse price-yield relationship) can be illustrated with maps correlating county yields with national average yield and correlating county yield

⁵This situation occurs in major production regions when regional changes in production affect aggregate supply and thus commodity prices.

⁶This can be shown mathematically using the formula for the variance of the product of two non-independent variables (for example, Goodman, 1960).

⁷Note that the "natural hedge" helps to insure producers against yield drops, given that the price increase caused by the yield drop will be proportionately higher than if the price-yield correlation was zero. On the other hand, with the natural hedge, a yield increase will produce a proportionally greater decrease in price than if the price-yield correlation was zero. This dichotomy of the impact of the "natural hedge" on crop revenues was summarized by Neil Harl as "... the only thing worse for a farmer than bad weather is good weather" (quoted in Goodwin, 2000, p. 76).

⁸What is likely to be more specifically of interest to the farmer than how a support program lowers the variability of total revenue is how the program lowers downside risk in total revenue. However, variability is a convenient proxy for a measure of downside risk.

and national price.⁹ Figures 1 and 2 show the correlation between county average yields and national average yield based on 1975-2005 data for corn and cotton. In both figures, the larger the (positive) correlation (shown as progressively darker shades of green), the more suggestive that the county yield moves with the national average yield. Changes in corn yield tend to be quite uniform across the Heartland (the major corn growing region, spanning Iowa and Illinois). Yields in the Heartland dominate national average yield, and most other regions are peripheral players in determining national average yield (fig. 1). For upland cotton, several regions with high correlations of county yield and national yield – for example, the Lower Mississippi region, and regions of California, Texas, and the Carolinas – are dispersed widely across the southern United States, from one coast to another (fig. 2).¹⁰

Figures 3 and 4 show correlation between county yield and national price for corn and upland cotton, again based on 1975-2005 data.¹¹ The more negative (inverse) the relationship between price and yield, the greater the natural hedge inherent in revenue. For corn (fig. 3), the negative correlation between corn price and yield in the Heartland area suggests an inherent natural hedge between price and yield in that region, with lower prices being somewhat offset by higher yields, and vice versa. Hence, for the government, the direct targeting of revenue changes with a revenue-based program may mean less variable program costs due to the lower likelihood of systemic underpayments or overpayments than with a price-based system.

⁹The Pearson correlation can take on values from -1 to 1, and is a measure of the relationship between two random variables. A correlation of -1 means that the two variables move in opposite directions in a perfectly linear fashion (i.e., the movements track along a straight line). A correlation of 1 means that the two variables move in the same direction in a perfectly linear fashion. A correlation of 0 means that there is no relationship between the variables. The relationship gets stronger as the correlation moves from a value of 0 towards -1 or 1. See Appendix C for a discussion of the relationship between the correlation and the mean and variability of revenue.

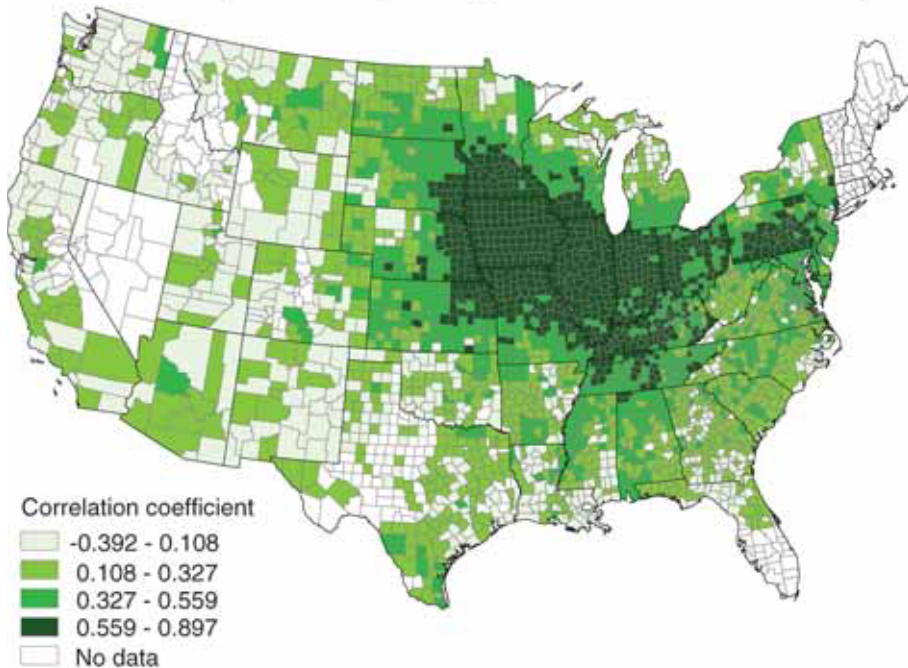
¹⁰In figure 2, the broad geographic area of high correlation in California should not be taken as an indication that the counties in the San Joaquin Valley are dominating U.S. cotton production, but simply that the large size of these counties can exaggerate their apparent influence.

¹¹The price-yield correlations shown in figures 3 and 4 are specifically the correlation of within-season county yield change to within-season national price change. Within-season price change is defined as the percent difference between the harvest time price and the pre-planting time price (an expected price measure). Within-season yield change is defined as the percent difference between harvested yield and expected yield. Converting price and yield to deviation form avoids the need to make arbitrary decisions of how to deflate historic prices to correspond to the detrended yield values (Cooper, 2009b).

Figure 1

Correlation of county corn yield with national yield

The darker the county, the more its yield changes in the same direction as national yield.



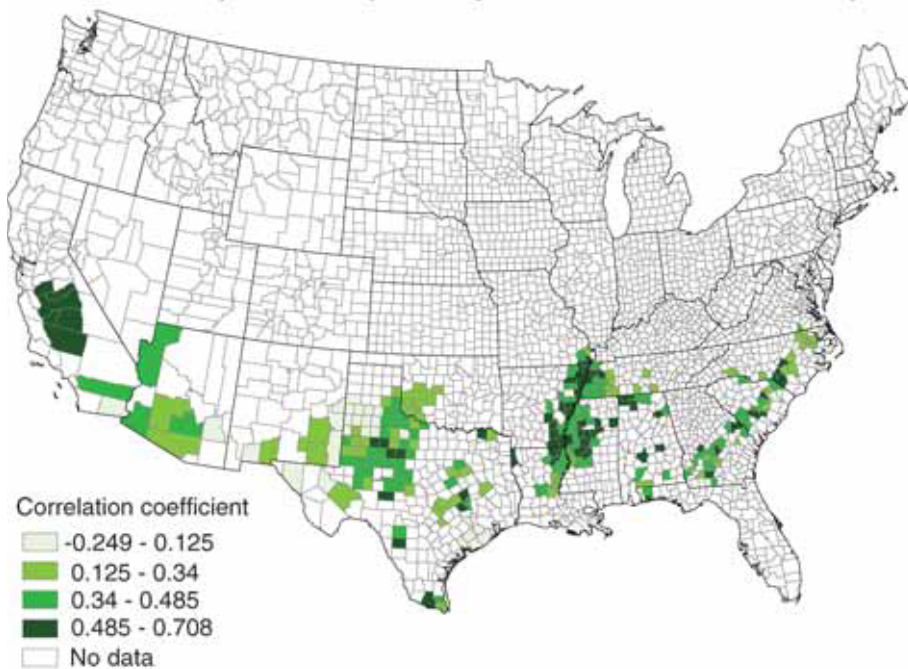
Note: Analysis by ERS based on detrended yields per planted acre for grain and silage over 1975 to 2005 for all counties for which NASS reports continuous production over the period.

Source USDA, Economic Research Service.

Figure 2

Correlation of county upland cotton yield with national yield

The darker the county, the more its yield changes in the same direction as national yield.



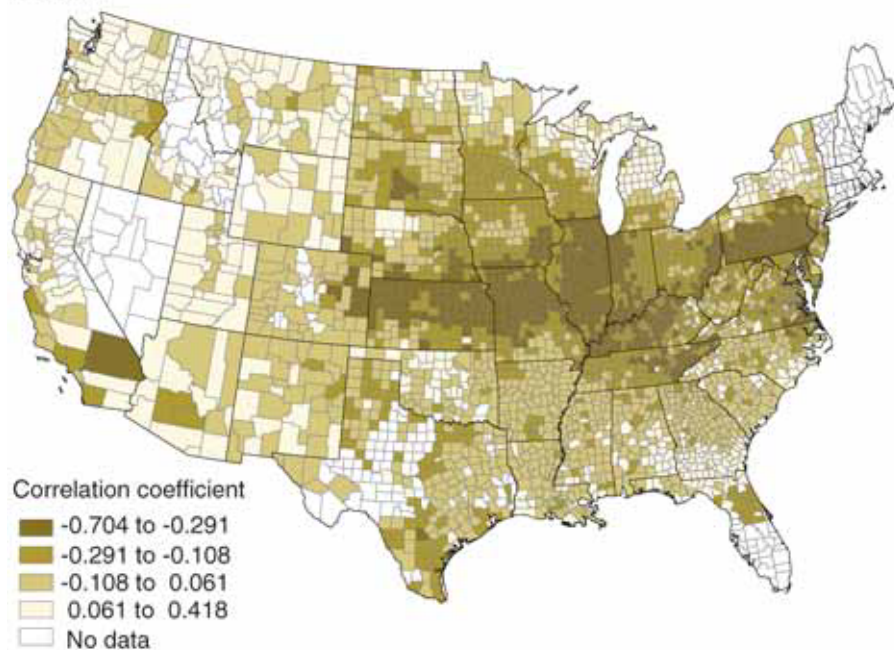
Note: Analysis by ERS based on detrended yields per planted acre for upland cotton over 1975 to 2005 for all counties for which NASS reports continuous production over the period.

Source USDA, Economic Research Service.

Figure 3

Correlation of county yield to national price for corn

The darker the county, the more pronounced the inverse relationship between price and yield.



Note: Analysis by ERS based on Chicago Boards of Trade futures prices for corn and on detrended yields per planted acre for corn for grain and silage over 1975 to 2005 for all counties for which NASS reports continuous production over the period.

Source USDA, Economic Research Service.

As upland cotton does not have any particularly large areas where the correlation between county yield and national price is highly negative (fig. 4), the likelihood of systemic underpayments or overpayments is relatively low and the benefit to the government of a revenue-based payments system in addressing payment variability is likely to be more modest. Nonetheless, even in the case of a low natural hedge, a revenue-based payment more directly targets the economic situation of the farm (assuming revenue as a proxy for this measure) than does a price-based payment, all else being equal.

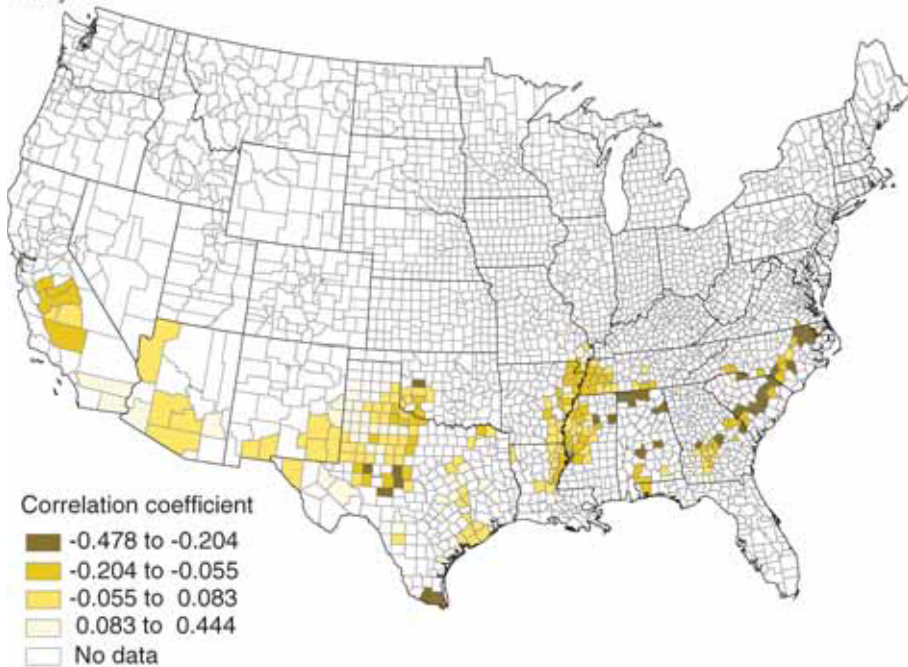
As with price-based payments, revenue-based payments will vary with program details. Still, the guiding principle for a (national or regional) revenue-based payment is that the producer is compensated for the difference between a reference level of revenue per acre and realized revenue per acre. Appendix A demonstrates how payments might actually be made under such programs, with payment schemes that are variations on current marketing loan benefits (MLBs) and countercyclical payments (CCPs).

However, a statistical analysis is necessary to predict at the beginning of the crop season how payments under a revenue-based commodity support system might differ from those under a traditional commodity support structure. The next section presents the results of such an analysis for a county-based payment approach, demonstrating how the mean, variability, and other characteristics of the statistical distribution of payments can be estimated, and how different types of payment program compare to each other on this basis.

Figure 4

Correlation of county yield to national price for upland cotton

The darker the county, the more pronounced the inverse relationship between price and yield.



Analysis by ERS based on cash prices and detrended yields for upland cotton over 1975 to 2005 for all counties for which NASS reports continuous production over the period.

Source USDA, Economic Research Service.