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One Safety Net, Two USDA Measures of Dairy Feed Costs

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Background

With the introduction of the 2014 Farm Bill's Margin Protection Program for Dairy Producers (MPP-Dairy), USDA now reports two different national average estimates of dairy feed costs each month. These monthly feed price calculations include Farm Service Agency's (FSA) MPP-Dairy national average dairy feed cost, and the Economic Research Service's U.S. estimate of total feed costs. MPP-Dairy is a farm safety net program administered by USDA FSA, and program payments are triggered using FSA-estimated dairy feed costs. However, the presence of an alternative, and higher-valued ERS estimate of dairy feed cost may represent a source of confusion with respect to MPP-Dairy performance given that both feed cost estimates are announced near the end of the month and both draw upon data from the National Agricultural Statistics Service (NASS) Agricultural Prices report.

Historically, ERS-estimated dairy feed costs have been $2.09 per hundredweight greater than MPP-Dairy feed cost estimates. The price difference follows a seasonal pattern, and recently was as high as $3.24 per hundredweight during March 2015. The large observed differences between the USDA estimates of dairy feed costs support farmer concerns that MPP-Dairy may not cover 100 percent of the risk to farm income posed by feed costs. Today's article seeks to provide insight on the sources of difference and risk management implications with respect to these two estimates of dairy feed costs.

MPP-Dairy National Average Dairy Feed Cost

As discussed in several *farmdoc daily* articles (April 15, 2015, February 11, 2015, September 26, 2014) MPP-Dairy is a voluntary dairy farm safety net program which makes payments when the national average income-over-feed-cost margin falls below a farmer-selected coverage level. The margin is defined as the difference between the USDA NASS U.S. all-milk price and the estimate of national average feed costs (MPP-Dairy ration). The MPP-Dairy margin was not designed to reflect farm-level milk or feed costs, instead it was designed to be a national policy trigger mechanism.

MPP-Dairy employs a generic formula-based measure of U.S. average dairy feed costs to trigger farm program payments. The MPP-Dairy ration is derived using monthly prices for corn, soybean meal, and alfalfa hay reported in USDA's NASS Agricultural Prices and Agricultural Marketing Service (AMS) Feedstuff Reports. The MPP-Dairy ration was designed to reflect the costs associated with producing 100 pounds of milk and is based on a 1,000 cow milking operation producing 56.39 pounds of milk per day (National Milk Producers Federation, 2010; Bozic, Thraen, and Newton, 2013; Penn State Extension, 2014). The MPP-Dairy ration was reviewed by USDA, animal scientists, and veterinary experts.

MPP-Dairy uses fixed ration coefficients on the corn, soybean meal, and alfalfa hay prices to estimate average feed costs. Using USDA reported prices, the MPP-Dairy average feed cost is straightforward to calculate and is given by the following formula: 1.0728*(NASS corn $/bushel) + 0.00735*(AMS soybean meal $/ton) + 0.0137*(NASS alfalfa hay $/ton). Importantly, these MPP-Dairy feed ration coefficients include a 10 percent reduction by Congress from the original computations by National Milk Producers Federation (National Milk Producers Federation, 2010). Based on these coefficients, approximately 50 percent of the MPP-Dairy feed ration is represented by the corn price, followed by soybean meal price at 27 percent, and the alfalfa hay price at 24 percent.

This method of calculating a dairy feed value using fixed ration coefficients and USDA reported commodity prices is not without precedence. The previous dairy farm safety net program, USDA's Milk Income Loss Contract (MILC), employed a formula-based estimate of a 16 percent dairy feed ration to adjust the level of income support provided under MILC (FSA MILC Program Fact Sheet).[3] The same feed ration used in the MILC program has been used since 1995 as part of the milk-feed price ratio reported in USDA's NASS Agricultural Prices. Thus, the method used for MPP-Dairy continues a two decade practice of using prices for corn, soybean (soybean meal), and alfalfa hay feed ingredients in a price formula to estimate a dairy feed value.

ERS Estimates of Total Feed Costs

USDA's ERS releases annual and monthly milk cost-of-production (COP) estimates. The monthly ERS estimates of dairy feed cost are not as reliable as the annual estimates and are for reference purposes only. As ERS puts it:

> *"Users of the monthly milk COP estimates need to be aware that these estimates are not as reliable as the annual estimates published by ERS. […] The monthly estimates are simply an attempt to reflect how price and production variations in each month cause costs to vary. Also, the monthly cost estimates become less reliable the longer the time interval between the update month and the year in which the last ARMS was conducted."*

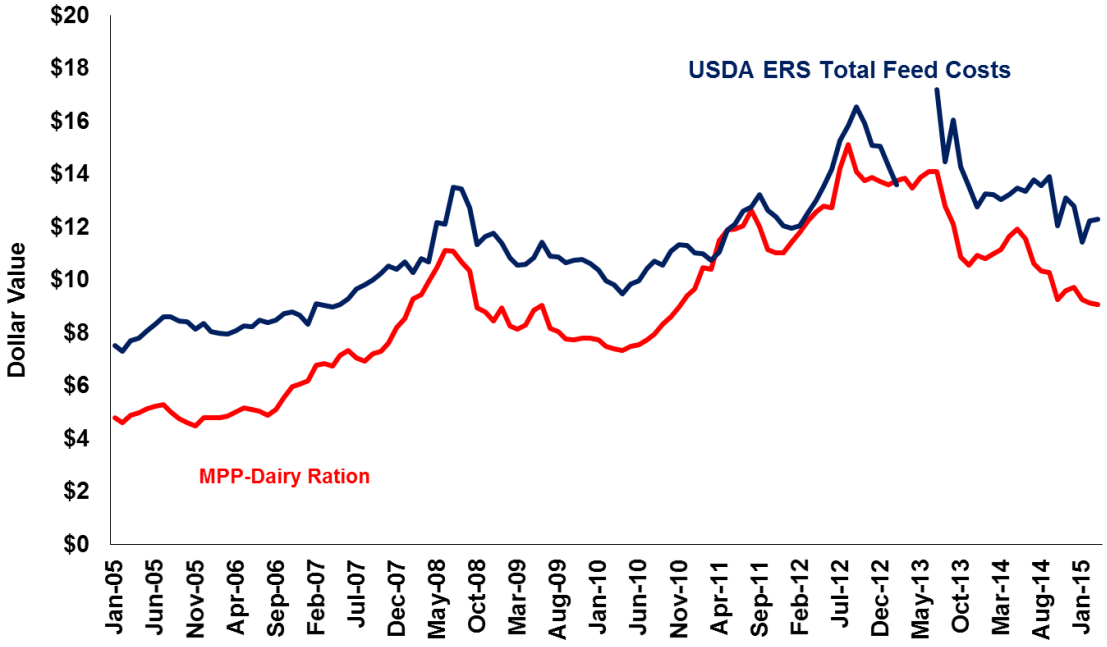
As part of the COP report, ERS includes estimates for purchased feed, homegrown feed, grazed feed, and total dairy feed costs. The ERS estimate of total feed costs does not employ fixed ration coefficients or directly utilize USDA reported prices for corn, soybeans, soybean meal, or alfalfa hay. Instead, the method for determining ERS total feed costs is based on Agricultural Resource Management Survey (ARMS) data of milk producers, NASS Agricultural Prices indexes for feed concentrates and hay and forage, and an ERS-derived measurement of cow productivity. First, weighted-average costs of feed from the most recent 2010 ARMS survey are used to establish baseline values for purchased, homegrown, and grazed feed costs. The ARMS feed costs reflect actual purchased, homegrown, and grazing feed costs for the dairy farms represented in the survey. Then, to account for monthly price variations in the feed costs, the ARMS feed cost estimates are multiplied by the appropriate concentrates or hay and forages indexes. Finally, to account for the monthly variation in milk production per cow the feed costs are divided by an index measuring dairy cow productivity. The relevant formulas for ERS milk feed costs can be found online.

Two components of the ERS feed costs formulas are worth noting. First, by including a daily average milk per cow index, improvements in animal productivity and seasonal changes in milk output per cow are reflected in the cost of production estimate. As demonstrated here, milk per cow is captured in the denominator of the ERS feed cost formulas. Thus, as the daily average milk per cow increases, ERS feed costs per hundredweight decrease, holding all else constant. This is best demonstrated by taking the

derivative of ERS feed costs with respect to the milk production index: $f(x) = \frac{1}{x}$, and $f'(x) = -x^{-2} < 0$. Doing so reveals a negative relationship between milk production and ERS feed costs. As a result, this productivity adjustment may lead to significant month-to-month changes in ERS-estimated total feed costs even if feed prices remain unchanged.

Second, the components included in the NASS concentrates and hay and forages indexes do not capture corn price variations. The NASS hay and forage index is based on the monthly prices for alfalfa hay and other hay. The NASS concentrates index is based on annual prices for cottonseed meal and soybean meal.[2] Noticeably missing from the ERS estimate of feed cost is an index-based adjustment using the NASS corn price. NASS does report a complete feeds index which includes, among other items, a 16 percent dairy feed ration and a 32-38 percent dairy feed ration. The complete feeds index also includes feed cost measurements for cattle, hogs, and poultry and is not used to update the ERS estimate of dairy feed costs. By using only the concentrates index (cottonseed and soybean meal) to update dairy purchased feed costs ERS does not capture the impact of corn price spikes to the same degree as MPP-Dairy (or the NASS 16 percent ration). Figure 1 plots the ERS and MPP-Dairy estimates of dairy feed costs.

Figure 1. USDA ERS Total Feed Costs and MPP-Dairy Ration Value



Source: USDA NASS, ERS, FSA, AMS, and Author's Calculations

Note: ERS milk cost-of-production estimates were unavailable March 2013 to June 2013 as NASS monthly milk production per cow data were not available for these months.

Comparing USDA-Estimated Dairy Feed Costs

Comparing the MPP-Dairy dairy ration with the ERS estimate of total feed costs in Figure 1 reveals that the two price series are highly correlated (coefficient equals 0.94). While the prices tend to move in the same direction, the average difference between the two series is $2.09 per hundredweight, favoring the ERS feed

costs. The MPP-Dairy margin exhibits greater variability with a variance of $8.21 per hundredweight and a coefficient of variation that is 58 percent greater than the ERS estimate of feed costs.

The differences in the feed cost estimates can be traced to four sources. First, the MPP-Dairy ration developed by National Milk Producers Federation proposed a feed ration consisting of 1.1921 bushels of corn, 0.0082 tons of soybean meal, and 0.0152 tons of alfalfa hay. Congress subsequently reduced each of the MPP-Dairy feed ration coefficients by 10 percent. This reduction resulted in an average decline of $1.01 in MPP-Dairy estimated feed costs. Thus, had the original ration coefficients been used the difference between ERS total feed costs and the MPP-Dairy ration would have averaged only $1.08 per hundredweight, Table 1.

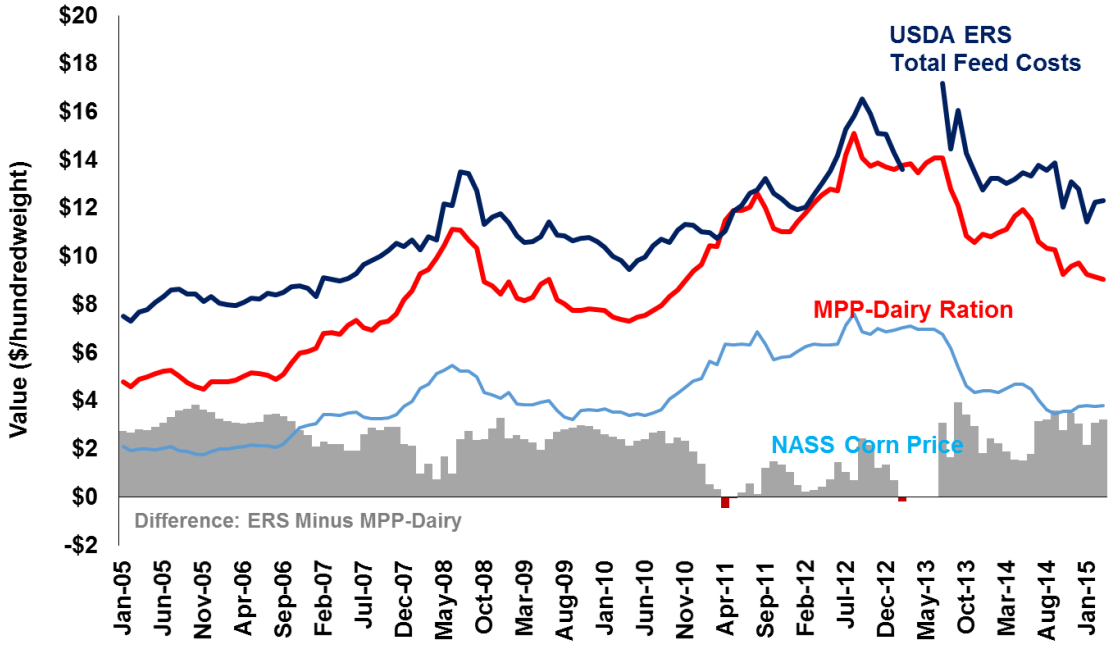
Table 1. Descriptive Statistics for ERS and MPP-Dairy Monthly Dairy Feed Costs, Jan 2005 to Feb 2015

	MPP-Dairy Feed Costs (FSA)	ERS Total Feed Costs	MPP-Dairy Feed Costs (Pre 10% Congressional Reduction)
		$/hundredweight	
Average	$9.13	$11.22	$10.14
Variance	$8.21	$5.05	$10.13
Coefficient of Variation	$0.31	$0.20	$0.31
Maximum	$15.11	$17.20	$16.79
Minimum	$4.49	$7.31	$4.98

Second, the absence of a monthly corn price index in the ERS calculation leads to ERS underestimating, or MPP-Dairy overestimating, the impact of corn price spikes on dairy feed costs. The corn price represents approximately 50 percent of the MPP-Dairy ration and is in line with the NASS 16 percent dairy ration which is 51 percent corn. However, regression results of ERS total feed costs revealed that the NASS corn price explained only 33 percent of the variation in monthly ERS dairy feed costs. Appropriately then, there is a strong negative correlation between corn price spikes and the difference between the ERS and MPP-Dairy feed rations (coefficient equals -0.78). The impact of corn price spikes on the two feed costs estimates is demonstrated in Figure 2. As the corn price increases the difference between the two series decreases, e.g. 2011 to 2012. This effect is directly attributable to different contributions of the corn price in each of the USDA-estimated dairy feed rations.

Third, by keeping milk production fixed at 56.39 pounds per cow per day the MPP-Dairy ration assumes a fixed level of productivity relative to the U.S. average. During 2009, when MPP-Dairy was in development stages, on average U.S. dairy cows produced 56 pounds per cow per day. The MPP-Dairy formula does not take into account how seasonal changes or future productivity improvements may change the costs of producing 100 pounds of milk. For example, in 2014 the average U.S. milk production per cow per day ranged from a low of 59 pounds to a high of 63 pounds and averaged 61 pounds. Using a lower (higher) value for milk pounds per cow per day in the MPP-Dairy ration formula would increase (decrease) ration weights and, holding all else constant, total feed costs. Figure 3 demonstrates the milk productivity patterns for U.S. dairy cows and the productivity implied under MPP-Dairy.

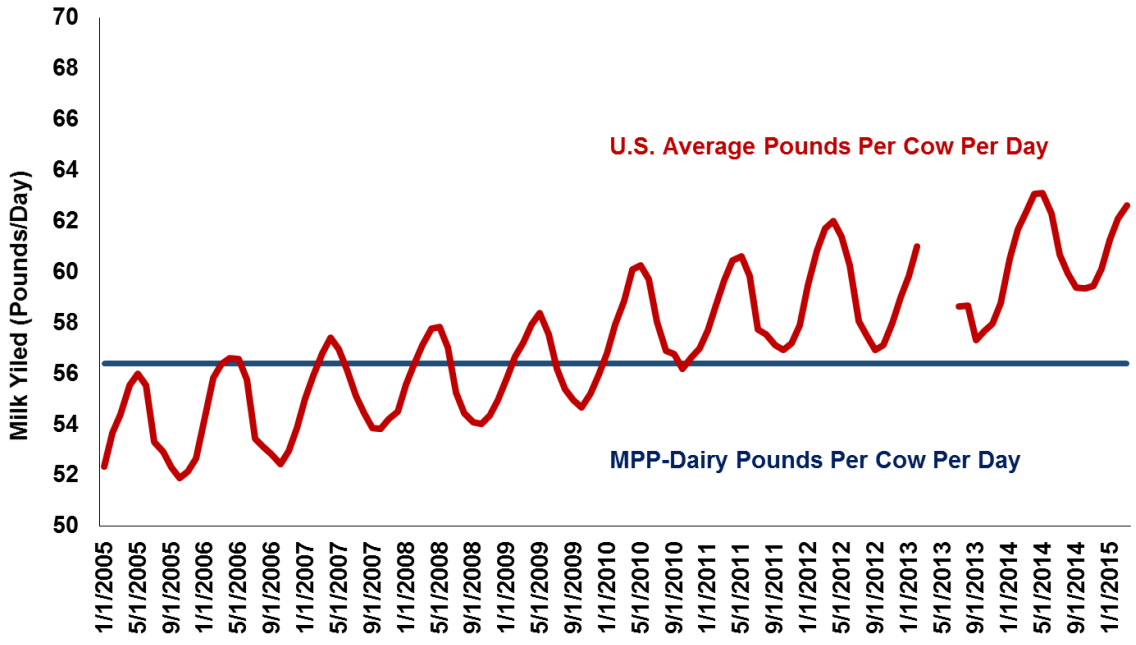
Figure 2. Comparision of USDA ERS Total Feed Costs and MPP-Dairy Ration Value



Source: USDA NASS, ERS, FSA, AMS, and Author's Calculations

Note: ERS milk cost-of-production estimates were unavailable March 2013 to June 2013 as NASS monthly milk production per cow data were not available for these months.

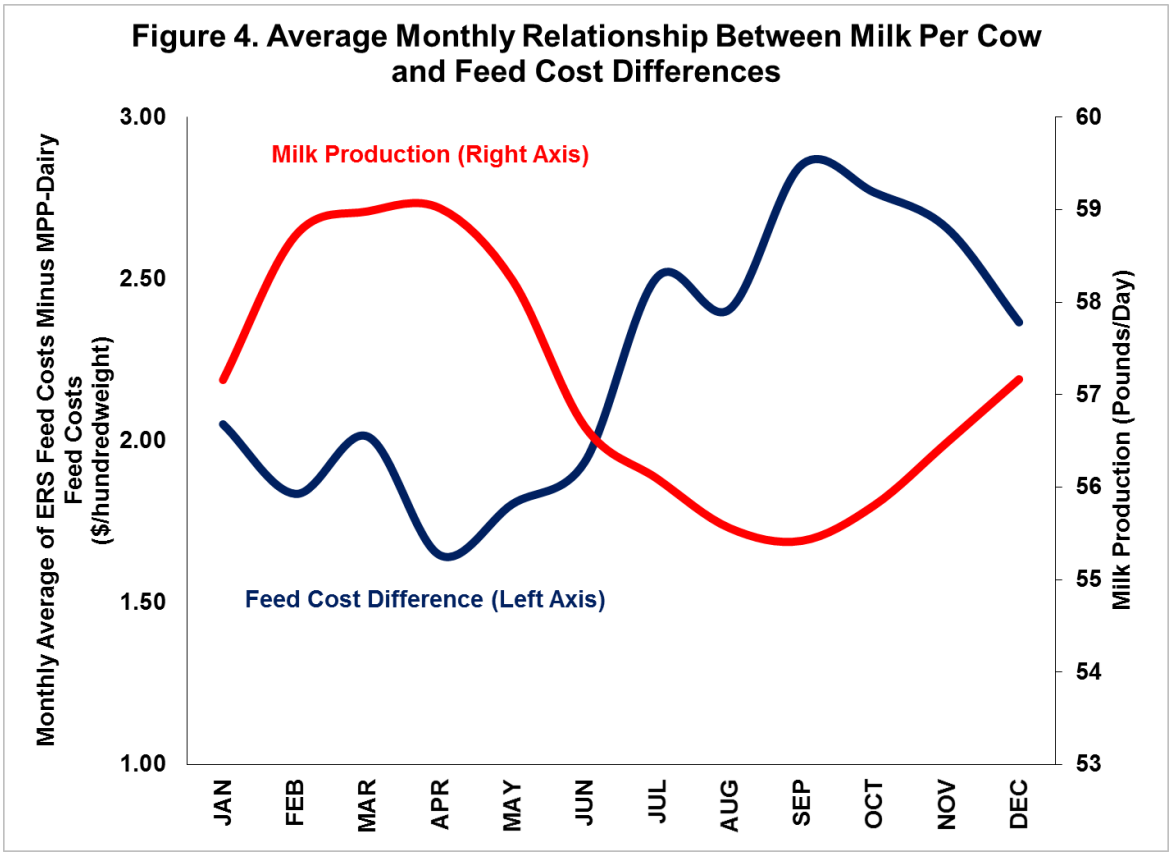
Figure 3. MPP-Dairy and U.S. Average Milk Yield Per Cow Per Day



Source: USDA NASS and Author's Calculations

Note: ERS milk cost-of-production estimates were unavailable March 2013 to June 2013 as NASS monthly milk production per cow data were not available for these months.

ERS takes into consideration animal productivity and seasonal changes in milk production to adjust the total feed costs. However, by capturing seasonal changes in the estimate of total feed costs, month-to-month differences between the two series can often be significant. For example, as demonstrated in Figure 4, when milk production per cow increases the difference between the two price series decreases. Then, when milk per cow is seasonally low the difference between ERS and MPP-Dairy feed rations increases substantially.



Finally, during the 2010 ARMS survey period any difference between the ERS weighted-average dairy feed costs and the MPP-Dairy feed costs will form the basis for future differences. During the 2010 survey period ARMS total feed costs averaged $10.42 per hundredweight and average milk per cow in the U.S. was 57.9 pounds per day. During this same time period the formula-based MPP-Dairy feed costs averaged $8.01 per hundredweight given 56.39 pounds per cow per day, a difference of $2.41 favoring the ERS estimate. Through the index-based adjustments in the ERS feed costs the $2.41 difference could grow larger or smaller depending on changes in cow productivity and the magnitude of feed price changes. The baseline difference will increase as milk productivity decreases or if the ERS feed indexes increase at a greater rate than MPP-Dairy feed prices. The difference will decrease when milk productivity increases or when MPP-Dairy feed costs increase at a greater rate than the ERS feed indexes.

Implications

With the introduction of MPP-Dairy USDA now reports multiple estimates of national average dairy feed costs. Historically the financial differences between the ERS dairy feed costs and MPP-Dairy feed cost estimates averaged $2.09 per hundredweight. However, during the active MPP-Dairy coverage period beginning September 2014, differences approaching $4.00 per hundredweight have been observed. The

gap in feed cost estimates is attributable to: a 10 percent congressional reduction in MPP-Dairy ration coefficients, fixed milk production per cow in the MPP-Dairy ration, the lack of an index representing corn price changes in the ERS feed cost calculation, and differences related to the 2010 ARMS survey of dairy feed costs. For farmers participating in USDA's MPP-Dairy program the differences between these USDA-estimated dairy feed costs may lead to inaccurate expectations of MPP-Dairy program payments.

Additionally, the magnitude of the differences between ERS and MPP-Dairy feed costs has led to concerns that MPP-Dairy does not fully cover dairy feed costs. Depending on farm management style, animal productivity, and regional basis in feed costs this may in fact be true. MPP-Dairy was not designed to reflect farm-level costs of production. Instead, MPP-Dairy is a financial loss management program which provides assistance to dairy farmers when the national measure of farm income falls below a farmer-selected threshold. For dairies with high purchased feed costs or lower animal productivity MPP-Dairy may not fully cover the costs of producing 100 pounds of milk. On the other hand, for dairies with low purchased feed costs or higher animal productivity, MPP-Dairy may cover more than 100 percent of the feed costs for milk covered in the program (*farmdoc daily,* September 26, 2014). In any case, no matter what the farm-level costs of production may be, MPP-Dairy can be used to limit downside income risk.

For those farms with feed costs greater than those protected under MPP-Dairy it is important to consider that similar to other Title I commodity programs MPP-Dairy offers partial safety net protection. MPP-Dairy offers margin protection up to $8 per hundredweight. The average MPP-Dairy margin from 2000 to 2015 was $8.58 per hundredweight. Thus, MPP-Dairy offers safety net protection on as much as 93 percent of the historical U.S. average margin and can cover up to 90 percent of a farm's milk production history. This level of protection exceeds those found under other safety net programs. For example, field crop farmers enrolled in Agricultural Risk Coverage may only receive safety net protection on up to 10 percent of the benchmark revenue guarantee (*farmdoc daily,* March 18, 2015). Then, unlike MPP-Dairy, farmers in other Title I commodity programs are subject to eligibility constraints such as payment limitations or means testing on income. For farms seeking additional risk protection, futures and options contracts or forward positions may be incorporated with USDA tools to better protect against unforeseen catastrophic declines in farm income.

Notes

1. The authors would like to thank USDA NASS and USDA ERS for helpful contributions to the research.

2. The 16 percent dairy feed ration is not the costs associated with producing 100 pounds of milk. Instead it is the costs for 100 pounds of a 16 percent dairy feed ration. The feed allocation is based on 51 percent corn, 8 percent soybeans, and 41 percent alfalfa hay and is given by the following formula: Given these ration coefficients the NASS 16 percent dairy ration is given by the following formula: 51%*(corn $/bushel)/(56 lbs./bushel) + 8%*(soybean $/bushel)/(60 lbs./bushel) + 41%*(alfalfa $/ton)/(2000 lbs./ton).

3. The annual prices used in the concentrates index are then updated using Bureau of Labor Statistics component indexes to obtain monthly index estimates (Price Program, History, Concepts, Methodology, Analysis, Estimates, and Dissemination 2011).

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