MPP Decision Guide 15-07

Case Studies with MPP-Dairy Financial Stress-test Calculator: Insights from *Northeast Dairy Farm Summary*

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A financial stress-test tool has been created to help dairy farm managers in determining how MPP-Dairy might assist in farm financial risk management. This case study utilizes data from Farm Credit East's dairy farm financial database to help Northeast producers more easily use the MPP-Dairy stress-test tool.

The National Program on Dairy Markets and Policy released Advanced MPP-Dairy Calculator in July 2015 to support risk management decision making by U.S. dairy producers. The advanced tool enables dairy producers to create their own stress-test scenario with low milk prices, high feed costs or a combination of both. The tool evaluates the impact of low IOFC margins on a dairy farm profitability, liquidity and solvency. In this case study, produced in collaboration with Farm Credit East, we illustrate the use of the tool by four categories of Northeast dairy farms.

Northeast Dairy Farm Summary

Each year since 1979, Farm Credit East publishes *Northeast Dairy Farm Summary (DFS)*, a renowned publication that assesses the financial health and progress of dairy farm businesses within Farm Credit East loan service area. The DFS includes data from over 350 dairy producers from Connecticut, Maine, Massachusetts, New Hampshire, New Jersey and New York. For this case study we have chosen to group farms using herd sizes based on their requirements for Confined Animal Feeding Operation (CAFO) plans. While these average farms probably do not represent any single business, these groupings provide for valuable indications about the differences between herd sizes in the Northeast region. For herds with less than 300 cows, no CAFO plan is required. However we have chosen to create two size categories to recognize the differences between smaller operations that are largely operated by the owners with only some part-time labor employed in general and those of a larger size with payrolls that indicate three or four employees. This categorization differentiates between herds with 1-99 cows and those with 100-299 cows. Our next size category are those herds from 300 to 699 cows which are categorized as medium CAFO's and herds greater than 700 cows which are considered to be large CAFO's. The MPP-Dairy stress-test tool requires producers to input data in four categories:

1) Production & Prices
2) Risk Management
3) Financials
4) Margin Stress Test.

To build a complete dairy farm profile, 13 input parameters are needed. The purpose of the DMaP MPP-Dairy case studies is to suggest meaningful starting points for parameter values that can be used by dairy educators and producers as they explore the stress-test tool.

In this case study, we utilize *Northeast Dairy Farm Summary* data to propose specific parameters in each of these categories for four "average" Northeast dairy farms.

Table 1. 2016 MPP-Dairy Advanced Tool Profiles for Four "Average" Northeast Dairy Farm Profiles				
	99 Cows or Fewer	100-299 Cows	300-699 Cows	700 Cows or More
Production and Prices				
Cows	68	172	483	1085
Milk Per Cow (lbs/yr)	20,976	22,575	24,571	26,086
Expenses, Other than Feed ($/cwt)	$16.48	$17.24	$15.64	$15.33
Worst-Case IOFC Basis over MPP ($/cwt)	$3.84	$3.68	$3.63	$3.63
Other Revenue (beef, crops, etc.) ($/cwt)	$4.19	$3.67	$3.12	$2.76
Risk Management				
MPP-Dairy: Production History	1,420,057	3,871,001	11,721,682	28,075,109
MPP-Dairy: Coverage Percentage	90%	90%	90%	90%
CME & Other: % of 2016 Milk and Feed Hedged	0%	0%	0%	0%
CME & Other: Average Hedged IOFC	$0.00	$0.00	$0.00	$0.00
Financials				
Working Capital Per Cow	$1,844	$1,747	$1,826	$1,647
Assets Per Cow	$18,912	$16,597	$12,988	$12,039
Debt-to-Asset Ratio (At Market Value)	16.4%	20.7%	22.3%	31.7%
Effect of Crisis on Assets Value	-15%	-18%	-12%	-10%
Diagnostics				
Expected 2016 Milk Production	1,426,368	3,882,900	11,867,793	28,303,310
Cash-Flow Breakeven MPP-Dairy Margin	$8.45	$9.89	$8.89	$8.94

Expenses, other than purchased feed are comprised of variable expenses excluding feed, and overhead expenses. Included in the variable costs are milk marketing expenses, hired labor costs (including benefits and mandated payroll expenses), livestock supplies, veterinary, medicine and breeding, crop expenses including chemicals and sprays, custom hires, fertilizer and lime, gasoline, fuel & oil, seeds and cow replacement expenses. In other words, all of the expenses which would be expected to increase as herd size increases. As herd sizes get larger, we note that variable costs per hundredweight increase with size while overhead costs per hundredweight tend to decrease with size. There is a strong correlation between purchased feed costs per cow and herd size. Going hand-in-hand with this increased production level on larger farms is an increase in veterinary, medicine and breeding costs per cow basis. All other variable costs show very little variation across herd sizes. Included in the overhead costs are insurance, interest, rent and leases, repairs, property taxes, utilities and other miscellaneous expenses. In addition, we also include an average principal payment and family living plus income tax expense reduced by the net off-farm income. In a case where the off-farm income is very large, the family living requirement from the farm business would become a negative number and greatly decrease the break-even cash flow. This gives a very clear picture of net earnings and allows us to calculate cash flow break-even very accurately. We projected expenses other than purchased feed for 2016 based on the 2014 Northeast DFS publication, as detailed in the Table 2. First, we deducted Purchased Feed from Total Farm Production Costs. We use Gasoline, Fuel & Oil costs from 2010 in place of 2014 costs in that category, as retail prices of petroleum derivatives have declined substantially in 2015. Cow Replacement costs are projected at the average 2011-2013 level instead of record high 2014 replacement costs. Note that cow replacement costs refer only to costs of cattle purchased as herd replacements. Repairs are another expense category that is strongly pro-cyclical, as producers use high earnings in a year like 2014 to catch up on

deferred equipment and facility maintenance. Therefore, we substituted average 2009-2013 repair expenses for 2014 repair expenses. Family living & Income Taxes as well as Net Nonfarm Income were projected at the average 2012-2014 levels. To make this cash-flow basis expense rather than accrual cost of production, we replace depreciation with scheduled principal payments, which were calculated as the sum of Farm Credit Short-Term Loans and Other Current Liabilities (2014 DFS, Table B-2, Page 32). Projected 2016 *Expenses Other Than Feed* Per Cow were converted to per hundredweight basis by dividing with projected yield per cow, estimated to be 3.5% higher than yield recorded in 2014.

Other revenue per hundredweight includes calf sales, cull cow sales, crop sales, government program payments, refunds and cooperative patronage, custom work, timber sales and miscellaneous other income. Note that as farm size increases, and the operation becomes more specialized in milk production, the other revenue declines on a per hundredweight basis. We projected other revenue in 2016 based on observed 2014 non-milk revenue. While beef prices have started to decline in Midwest and Western United States, prices are still holding high in Northeast, and we assume strong local demand will keep them high in 2016. *Worst-case scenario IOFC Basis over MPP* is based on historical and projected differences in local milk prices and feed costs on dairies in the Farm Credit East dairy database, and milk and feed prices used in MPP-Dairy margin formula. We used basis observed in 2009, as that was the year with the lowest basis in the last eight years for three out of four dairy farm size categories. Table 3 details the calculation of worst-case scenario IOFC basis for each farm size. *MPP-Dairy: Production History* is the 2016 Production History. For producers that have enrolled in the fall of 2014, this number will be equal to the production history declared on the form CCC-781, multiplied by two adjustment factors announced by the USDA: 1.0087 (for 2015) and by 1.0261 (for 2016). For producers who are signing up in 2015 for the first time, only the 2016 multiplier of 1.0261 should be used. To keep the case study simple, we assume all four farm profiles choose 90% coverage percentage and do not hedge in private markets. *Working Capital Per Cow* is calculated from the balance sheet as the difference between current assets and current liabilities, divided by the number of cows. Similarly, *Assets per cow* are calculated as total assets divided by the number of cows. *Debt-to-asset ratio* is a standard solvency measure obtained by dividing total liabilities (excluding owner's equity) by total assets. Values in the *Diagnostics* section are automatically populated by the MPP-Dairy stress-test tool. *Expected 2016 Milk Production* is a simple product of *Cows* and *Milk Per Cow*. *Cash-Flow Breakeven MPP-Dairy Margin* is calculated as *Expenses, Other Than Feed* minus *Other Revenue* minus *Worst-Case IOFC Basis over MPP.*

The Small Dairy (99 Cows or Fewer)

The 68-cow herd is a typical Northeastern family dairy operation. Most of these farms would be considered to be in their final generation of operation as these farms chose to pursue a lower debt load situation rather than growth which would have required additional capital investments. This farm profile has hired labor costs of $1.54/cwt (vs. $3.26/cwt for medium, $3.55/cwt for large and $3.59/cwt for very large farms) and crop sales of $274 per cow. Purchased feed expenses averaged $6.78/cwt in 2014. Variable expenses other than feed were $8.80/cwt with overhead expenses at $9.35/cwt which includes $1.65/cwt for net family living expense. At $3,100/cow, the average debt per cow on these farms may not seem to be much different than farms of other sizes ($3,435/cow for medium, $2,899/cow for large and $3,612/cow for very large farms), but note that they have concentrated considerably more assets per cow and have developed net worth in excess of $1 million.

Table 2. Calculating Projected Cash-Flow Break-Even MPP-Dairy Margin for 2016 for Northeast Dairy Farms				
	99 Cows or Fewer	100-299 Cows	300-699 Cows	700 Cows or More
Variable Expenses				
Chemicals & Sprays	69	86	58	80
Custom Hire	109	153	180	144
Fertilizer & Lime	193	178	217	147
Freight & Trucking (Marketing)	212	229	209	235
Gasoline, Fuel & Oil	184	189	177	177
Hired Labor	313	711	843	906
Seed & Plants	159	154	146	151
Supplies	291	301	290	301
Veterinary, Medicine & Breeding	157	187	218	253
Cow Replacements	15	21	11	8
Total Variable Expenses	**$1,702**	**$2,209**	**$2,349**	**$2,402**
Overhead Expenses				
Insurance	85	84	65	60
Interest	126	117	105	118
Rent	55	110	110	111
Repairs	283	282	283	290
Property & Misc. Taxes	129	94	77	65
Utilities	144	127	119	118
Other	98	93	80	90
Scheduled Principal Payments	493	565	544	672
Total Overhead Expenses	**$1,413**	**$1,472**	**$1,383**	**$1,524**

Table 2 (Continued). Calculating Projected Cash-Flow Break-Even MPP-Dairy Margin for 2016 for Northeast Dairy Farms

	99 Cows or Fewer	100-299 Cows	300-699 Cows	700 Cows or More
Family Living expenses				
- Net Nonfarm Income	192	95	36	16
+ Family Living & Income Taxes	533	305	148	90
Net Family Living Expenses	**$341**	**$210**	**$112**	**$74**
Projected Expenses Other Than Feed in 2016	**$3,456**	**$3,891**	**$3,844**	**$4,000**
Other Revenue				
Cattle Sales	409	389	426	401
Crop Sales	274	212	181	148
Government Payments	29	59	36	31
Other	166	169	123	141
Projected Other Revenue in 2016	**$878**	**$829**	**$766**	**$721**
Projected Yield Per Cow in 2016	20,976	22,575	24,571	26,086
Projected Expenses Other Than Feed in 2016, Per Cwt	**$16.48**	**$17.24**	**$15.64**	**$15.33**
Projected Worst-Case Scenario Basis in 2016, Per Cwt	**$3.84**	**$3.68**	**$3.63**	**$3.63**
Projected Other Revenue in 2016, Per Cwt	**$4.19**	**$3.67**	**$3.12**	**$2.76**
Cash-Flow Break-Even MPP Margin, Per Cwt	**$8.45**	**$9.89**	**$8.89**	**$8.94**

Table 3a. Milk Income over Purchased Feed Margin Basis, 99 Cows or Fewer

Year	MPP-Dairy Milk Price	MPP-Dairy Feed Costs	DFS Milk Price	DFS Purchased Feed Costs	Milk Price Basis	Feed Costs Basis	IOFC Margin Basis
2007	19.13	7.12	20.20	4.90	1.08	-2.22	3.30
2008	18.33	9.77	19.37	5.65	1.05	-4.12	5.17
2009	12.83	8.25	13.30	4.88	0.47	-3.37	3.84
2010	16.26	8.01	17.55	5.05	1.29	-2.96	4.25
2011	20.14	11.32	20.93	6.22	0.79	-5.10	5.89
2012	18.52	13.21	19.42	6.83	0.90	-6.38	7.28
2013	20.05	12.86	21.00	6.85	0.95	-6.01	6.96
2014	23.97	10.67	25.33	6.78	1.36	-3.89	5.25

Table 3b. Milk Income over Purchased Feed Margin Basis, 100-299 Cows

Year	MPP-Dairy Milk Price	MPP-Dairy Feed Costs	DFS Milk Price	DFS Purchased Feed Costs	Milk Price Basis	Feed Costs Basis	IOFC Margin Basis
2007	19.13	7.12	20.67	5.29	1.55	-1.83	3.38
2008	18.33	9.77	19.59	6.02	1.27	-3.75	5.02
2009	12.83	8.25	13.65	5.39	0.82	-2.86	3.68
2010	16.26	8.01	17.71	5.44	1.45	-2.57	4.02
2011	20.14	11.32	21.37	6.53	1.23	-4.79	6.02
2012	18.52	13.21	19.67	7.27	1.15	-5.94	7.09
2013	20.05	12.86	21.22	7.52	1.17	-5.34	6.51
2014	23.97	10.67	25.67	7.52	1.70	-3.15	4.85

Table 3c. Milk Income over Purchased Feed Margin Basis, 300-699 Cows

Year	MPP-Dairy Milk Price	MPP-Dairy Feed Costs	DFS Milk Price	DFS Purchased Feed Costs	Milk Price Basis	Feed Costs Basis	IOFC Margin Basis
2007	19.13	7.12	20.48	5.32	1.36	-1.80	3.16
2008	18.33	9.77	19.64	6.29	1.32	-3.48	4.80
2009	12.83	8.25	13.87	5.66	1.04	-2.59	3.63
2010	16.26	8.01	17.70	5.75	1.44	-2.26	3.70
2011	20.14	11.32	21.53	6.86	1.39	-4.46	5.85
2012	18.52	13.21	19.90	7.39	1.38	-5.82	7.20
2013	20.05	12.86	21.42	7.75	1.37	-5.11	6.48
2014	23.97	10.67	25.65	8.04	1.68	-2.63	4.31

Table 3d. Milk Income over Purchased Feed Margin Basis, 700 Cows Or More							
Year	MPP-Dairy Milk Price	MPP-Dairy Feed Costs	DFS Milk Price	DFS Purchased Feed Costs	Milk Price Basis	Feed Costs Basis	IOFC Margin Basis
2007	19.13	7.12	20.48	5.32	1.36	-1.80	3.16
2008	18.33	9.77	19.60	6.29	1.28	-3.48	4.76
2009	12.83	8.25	13.87	5.66	1.04	-2.59	3.63
2010	16.26	8.01	17.70	5.75	1.44	-2.26	3.70
2011	20.14	11.32	21.53	6.86	1.39	-4.46	5.85
2012	18.52	13.21	19.69	7.72	1.17	-5.49	6.66
2013	20.05	12.86	21.29	7.97	1.24	-4.89	6.13
2014	23.97	10.67	25.41	7.97	1.44	-2.70	4.14

These farms with 99 cows or fewer are extremely financially secure at 83.6% equity and able to withstand downturns in the dairy economy quite well even though they do not benefit from the same economies of scale as the larger herds. It is common for these operations to borrow back a significant amount of loan principal paid and maintain a fairly level amount of debt per cow over time. This creates a cash flow breakeven margin that may overstate what occurs in reality because the breakeven margin includes an expectation that debt principal will be reduced each year.

This strategy allows the farm to continue providing for family living expenses with the expectation that over time the value of assets will continue to appreciate and provide net worth growth without repayment of debt principal. Given that many of these farms will be sold to neighboring operations as the current owners retire, preservation of net worth is important to the retirement plans of these farm families.

When utilizing MPP-Dairy stress-test tool, last-generation dairies may consider removing principal payments from expenses other than feed to arrive at "adjusted" cash-flow break-even MPP-Dairy margin that keeps their debt per cow at a stable level, consistent with their business and retirement strategy. On average, this adjustment would reduce overhead expenses by $2.43 per hundredweight.

The Medium Dairy (100-299 Cows)

The 172-cow herd is a farm that has expanded to gain some economies of scale while avoiding the significant capital expenditures required for a medium CAFO permit. Until recently, farms in New York State (where a majority of Northeastern dairy is concentrated) were limited to 199 cows before needing a medium CAFO permit. Only recently did the state modify its rules to encourage these operations to continue expansion of the New York milk market by granting a reprieve from CAFO capital expenditures for herds below 300 cows.

This allowed the dairy industry to expand to meet the perceived demands of a burgeoning yogurt industry at a more accelerated rate. We note that in more recent times Class II usage has dropped by about 5% below the comparable periods in 2013 as some yogurt production has shifted out of the region. The combination of growth in milk production and a regional shift in yogurt processing has challenged Class IV plants to be able to handle this newly created excess

production and may also provide marketing challenges for these products.
Recently, this size category had the lowest net earnings per cow of all four size categories, and the highest cash-flow break-even MPP-Dairy margin. Thus this is not a stable farm size. These mid-size dairies continue to grow aggressively and we would anticipate over the next 7 to 10 years that many of them will hit the 299-cow ceiling and have to make further decisions about the future of their operations.

The Large and Very Large Dairies (300-699 and 700+ Cows Category)

These farms represent more progressive and aggressively growing businesses. With average herd sizes of 483 cows (medium CAFO's) and 1085 cows (Large CAFO's) these operations have significantly more non-family employees, are less diversified and more focused on milk production, and they dilute their capital assets with larger herd sizes and more milk sold per cow. They are more leveraged than smaller operations.

Risk Management Objectives

DMaP MPP-Dairy Decision Guides 15-01 to 15-06 illustrate the use of MPP-Dairy Stress-Test Tool in different farm scenarios.

A question can be asked – what should be solvency and liquidity targets that a dairy operation should consider when choosing MPP-Dairy coverage level?

Working capital at $3,000 per cow or higher would seem as an ideal situation. This would provide dairies with adequate liquidity to withstand milk price drops of over $4.00 per hundredweight out of cash reserves. The reality is, that on average, only a percentage of farms in the upper half of profitability distribution accumulate adequate cash reserves to achieve this goal. Agricultural lenders and dairy consultants would like to see working capital above $800 per cow in the worst of times and debt-to-asset ratios below 40% unless there are mitigating circumstances such as a large planned expansion. However, dairies with aggressive growth goals will require capital expenditures that make it difficult to achieve the strong liquidity that is necessary to withstand milk price volatility and income over feed cost volatility without having to occasionally increase debt load to cover operations through challenging times.

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