



AEDE Agricultural, Environmental,
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Do I need Livestock Gross Margin Insurance?

Livestock gross margin insurance as a management tool for my dairy business.
A guide for dairy producers.ⁱ

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by

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Evaluation Question #1: How do I determine my risk exposure?

What is the ‘risk’ exposure for your dairy operation gross margin?

This is an important question to answer. Insurance can be purchased for many events, some of which are more likely to occur than others. For example, when you purchase auto insurance you must decide on the amount of liability protection you believe necessary. To make this decision you must evaluate two items: the likelihood that you will be involved in a serious event with liability and the potential extent of that liability. You must decide on the likelihood or probability of an auto event with liability attached and then the level of that liability. Margin insurance is not any different in this regard. You must decide on your risk exposure. You must determine what you believe to be the likelihood of a loss, i.e., low margin, and what that loss may be in dollar terms. You may have completed something like this if you purchase crop insurance. With crop insurance you must evaluate what your expected crop loss might be over the growing season and then determine what dollar amount this loss would represent. In the case of margin insurance you must also make similar evaluations, however determining the likelihood of a margin ‘loss’ and the amount of the loss is not as straightforward as it is for crop insurance.

How do I determine my risk exposure for ‘low’ margin?

You determine your risk exposure by a two step process. First, you must decide what the likelihood of a loss will be in the coming months or years. This is separate from the amount of loss. How likely is it that the coming months will exhibit a pattern of low milk prices and high feed cost such that your required or anticipated margin will be reduced below what you might normally expect? Second, you must evaluate the magnitude of the loss. For this you must think about what a *normal* margin for your operation might be over time.

When working with Livestock Gross Margin insurance, the margin is defined as the amount of income which remains after you have subtracted the feed expense. This is typically referred to as income over feed cost or IOFC. In defining this margin, income can be measured using a number of alternative prices for valuing the revenue produced by your dairy operation. The LGM-Dairy insurance product uses the Chicago Mercantile Exchange Group (CME) class 3 futures price for this valuation. However, you know that your mailbox price or milk check price is generally larger than this class 3 price. In this evaluation guide the mailbox price is used to determine the gross value of revenue to your dairy operation.

The following table shows a hypothetical example of the data required. The data in the table reflect numbers for a typical small herd ~ 125 with an average milk per cow per day of 53 pounds. Annual milk production equals 24,181 hundredweight. A much larger herd ~ 880 milk cows with a milk per cow per day of 75 pounds and total annual production of 240,900 cwt.. By examining your past financial records you determine that a normal margin over the operating year for the small herd is \$230,000 and for the large herd \$1,700,000. For the small herd the gross margin per hundredweight is \$7.07 and for the large herd gross margin is \$7.12. Note that these values are constructed from average values for small and large scale Ohio dairy farms and represent expositional values only. Normal can be based on a single year or more reasonably an average of a number of years, excluding exceptionally low or high years from the calculation.

Table 1. Small and Large Dairy Farm Data.

	Cows	Production (cwt)	Margin over Feed (\$)	Margin over Feed (\$/cwt)
Small Herd Farm	125	24,181	230,000	7.07
Large Herd Farm	880	240,900	1,700,000	7.12

The next step is one of thinking about the potential for the average gross margin to fall short of what is required by the dairy operation. If market prices, milk, feed or both, are such that you receive only a portion of this normal gross margin, then your potential loss for each herd size is shown in Table 2. For example using the small herd and an 80% of the normal margin the potential loss is \$34,191, and for the large herd the potential loss is \$343,274. A more severe change in market prices which results in only a 20% margin being realized would have a potential loss of \$1,630,550 for the large herd and \$162,407 for the small herd.

Table 2. Potential Loss due to a reduction in gross margin for small and large herd dairy farms, an example.

	20% reduction	40% reduction	60% reduction	80% reduction
Small Herd Potential Loss (\$)	34,191	68,382	102,573	162,407
Large Herd Potential Loss (\$)	343,274	686,548	1,029,821	1,630,550

In the next section you will determine how to evaluate this potential loss information.

Evaluation Question #2: How inadequate of a margin can you withstand?

Determining how much equity you have and how much you need.

In this section I will take up the question of what is an adequate or perhaps an inadequate margin for your dairy operation. You will start to answer this question by creating and examining your dairy business *balance sheet*. This is the financial document which shows you the balance between what you own outright, as assets, and what you owe others in the form of liabilities. Subtracting your liabilities from your assets gives you your *total equity*. Financial lenders like to see the *ratio of total equity to total assets* at or above some minimum level. This financial ratio is called the *equity ratio*. A benchmark number for the equity ratio might be 65% for a small dairy and 60% for a large dairy. What the actual number will be is determined by your agricultural lender. Whenever the equity ratio falls below the minimum threshold level the financial health of the dairy is of concern. For example two balance sheet worksheets are shown below. These balance sheets are taken from the Dairy Farm Business Summary, New York Small Herd Farms, 80 Cows or Smaller, and Large Herd Farms, 300 Cows or Larger, 2007, published by Department of Applied Economics and Management, Cornell University.

Small Herd Example:

Looking first at the small herd balance sheet, 47 small dairy farms completing the Dairy Farm Business Record program at the end of 2007. The average number of milk cows is 73 head. The total equity on December 31, 2007 is \$525,607. The total equity ratio is 79%. The year 2007 was a very good year as judged by high milk prices and reasonable feed prices.

Now consider what the impact would be on the small dairy from Table 1, assuming the milk and feed prices for 2009 had been realized in 2007. In this case, the realized gross margin would have been \$50,602, a reduction or loss in margin of \$120,352 or 70.4%. This loss of net income would have to be added to the liabilities side of the balance sheet as either a current debt or an intermediate debt obligation. Doing so increases total liabilities and reduces total equity to \$405,255. Total equity ratio falls from 79% to 61%, below the target level of 65%. Clearly a decline in the gross margin of this magnitude is an event that the purchase of gross margin insurance is designed to offset.

Chart 1. Balance sheet for small herd dairy farm, 2007.

2007 FARM BUSINESS & NONFARM BALANCE SHEET			
47 Small Herd Dairy Farms, 2007			
Farm Assets	Dec. 31	Farm Liabilities & Net Worth	Dec. 31
<u>Current</u>		<u>Current</u>	
Farm cash, checking & savings	\$ 6,856	Accounts payable	\$ 6,435
Accounts Receivable	16,880	Operating debt	5,512
Prepaid Expenses	205	Short Term	511
Feed & Supplies	40,199	Advanced govt. receipts	0
		Current Portion:	
		Intermediate	10,051
		Long Term	4,494
Total Current	\$ 64,141	Total Current	\$ 27,003
<u>Intermediate</u>		<u>Intermediate</u>	
Dairy Cows:		Structured debt	
owned	\$ 85,446	1-10 years	\$ 55,647
leased	0	Financial lease	
Heifers	48,795	(cattle/machinery)	112
Bulls/other livestock	2,498	Farm Credit Stock	478
Mach./equipment owned	120,273	Total Intermediate	\$ 56,237
Mach./equipment leased	112		
Farm Credit stock	478		
Other stock/certificate	2,932		
Total Intermediate	\$260,534		
<u>Long Term</u>		<u>Long Term</u>	
Land/buildings:		Structured debt	
owned	\$340,384	>10 years	\$ 56,212
leased	0	Financial lease	
		(structures)	0
Total Long Term	\$340,384	Total Long Term	\$ 56,212
		Total Farm Liab.	\$139,452
Total Farm Assets	\$665,059	FARM EQUITY (FARM)	\$525,607
		TOTAL EQUITY RATIO	79%

Large Herd Example:

Now consider the case of the large dairy herd. The large herd balance sheet shows the average values for 86 large dairy herds completing the Dairy Farm Business Record program at the end of 2007. The average number of milk cows is 880 head. The total equity is \$4,303,610. The total equity ratio is 65.3%. The year 2007 was a very good year as judged by high milk prices and reasonable feed prices.

Chart 2. Balance sheet for large herd dairy farm, 2007

2007 FARM BUSINESS & NONFARM BALANCE SHEET			
86 Large Herd Dairy Farms, 2007			
Farm Assets	Dec. 31	Farm Liabilities & Total Equity	Dec. 31
<u>Current</u>		<u>Current</u>	
Farm cash, checking & savings	\$ 29,358.00	Accounts payable	\$ 69,517
Accounts Receivable	307,747	Operating debt	147,296
Prepaid Expenses	11,202	Short Term	7,205
Feed & Supplies	759,929	Advanced govt. receipts	0
		Current Portion:	
		Intermediate	185,715
		Long Term	57,600
Total Current	\$ 1,108,236	Total Current	\$ 467,333
<u>Intermediate</u>		<u>Intermediate</u>	
Dairy Cows:		Structured debt	
owned	\$ 1,133,343	1-10 years	\$ 945,053
leased	1,808	Financial lease	
Heifers	665,007	(cattle/machinery)	4,047
Bulls/other livestock	9,023	Farm Credit Stock	1,149
Mach./equipment owned	1,070,708	Total Intermediate	\$ 950,249
Mach./equipment leased	2,239		
Farm Credit stock	1,149		
Other stock/certificate	137,594		
Total Intermediate	\$ 3,020,871		
<u>Long Term</u>		<u>Long Term</u>	
Land/buildings:		Structured debt	
owned	\$ 2,465,536	>10 years	\$ 873,451
leased	626	Financial lease	
Total Long Term	\$ 2,466,162	(structures)	626
		Total Long Term	\$ 874,077
Total Farm Assets	\$ 6,595,269	Total Farm Liab.	\$ 2,291,659
		TOTAL EQUITY (FARM)	\$ 4,303,610
		TOTAL EQUITY RATIO	65.3%

Now consider what the impact would be on this large dairy if the milk and feed prices for 2009 had been realized in 2007. In this case, the gross margin would have been \$496,254, a reduction or loss in margin of \$1,220,114 or 71%. This loss of net income would have to be added to the liabilities side of the balance sheet as either a current debt or an intermediate debt obligation. Doing so increases total liabilities and reduces total equity to \$3,083,495. Total equity ratio falls from 65.3% to 46.7%. This equity ratio is below the target ratio of 60%.

Evaluation Question #3: What is your maximum reduction in equity allowable?

Determining how much of an equity reduction you can sustain on your dairy.

The question that each dairy operator must answer is how much of a reduction in gross margin can the dairy withstand without damaging the financial health of the farm.

Maximum equity reduction for small herd

Using the balance sheet data for the small herd, if the minimum target level for the total equity ratio is 65%, then the maximum reduction in gross margin is 14% of total equity. This is $0.14 \times \$665,059 = \$93,318$. This is the maximum reduction in equity allowable for this dairy operation which will keep the equity ratio from falling below 65%. This maximum reduction when divided over average production results in a loss or reduction in gross margin per hundredweight of \$3.86.

This provides a benchmark for the minimum gross margin acceptable for the small herd dairy. In this case the average gross margin over feed of \$7.07 is reduced to $[\$7.07 - 3.86] = \3.21 per hundredweight.

Maximum equity reduction for large herd

Using the balance sheet data for the large herd, if the minimum target level for the total equity ratio is 60%, then the maximum reduction in gross margin is 5.3% of total equity. This is $0.053 \times \$6,595,269 = \$346,448$. This is the maximum reduction in equity allowable for this dairy operation. This maximum reduction when divided over average production results in a loss or reduction in gross margin per hundredweight of \$1.44.

This provides a benchmark for the minimum gross margin acceptable for the large herd dairy. In this case the average gross margin over feed of \$7.12 is reduced to $[\$7.12 - 1.44] = \5.68 per hundredweight.

Determining your annual cash carryover and retained earnings.

Now that you have a better idea of the potential loss and by how much your gross margin may be reduced before you find your dairy operation under financial pressure, you need to consider your dairy farms cash flow and retained earnings picture.

Some dairy operations may be able to withstand the reduction in gross margin through the use of annual cash flow or annual retained earnings. To determine this you need to complete a *cash flow budget* and from this determine your annual cash carryover. This can be determined by completing the dairy's cash flow coverage or *cash flow carryover*. In the cash flow carryover table list all farm income and all cash outflow and planned debt service payments. An example is shown in the Table 3.

Table 3. Cash flow carry-over calculations for small and large herd dairy farms.

Cash Carry Over Calculations		
	Small herd	Large herd
Cash farm receipts	\$231,322	\$3,744,716
Cash farm expenses	177,617	3,088,765
Interest paid	8,359	143,857
Net personal withdrawals from the farm	23,966	178,482
Amount available for debt service	38,098	621,326
Debt service planned for operating year	23,982	384,496
Cash carryover available	\$14,116	\$236,830

Determining your total absorbable losses for your dairy operation.

You determine your farm's maximum absorbable reduction in total equity by adding the maximum decline in equity to the cash carryover amount. This will result in the maximum reduction in gross margin which the dairy operation can absorb. For the small herd example this amount is $\$93,318 + \$14,116 = \$107,434$ or $\$4.44$ per hundredweight. For the large herd dairy used in this example, this amount is $\$346,448 + \$236,830 = \$583,278$ or $\$2.42$ per hundredweight.

The minimum gross margin for the small herd dairy, with cash carryover included is $\$2.63$ [7.07 minus 4.44] per hundredweight. For the large herd dairy, the minimum gross margin target would be $\$4.70$ [7.12 minus 2.42] per hundredweight. These values would be minimum target levels when considering the usefulness of Livestock Gross Margin insurance.

For at least one operating year the small herd dairy could absorb a reduction in gross margin equal to 63% and the large herd dairy a 34% reduction. After that the balance of cash reserves would be depleted and a continuation in a low margin state would prove difficult to either dairy operation.ⁱⁱ

Steps for evaluation

To assess whether or not you should be considering the purchase and use of Livestock Gross Margin Insurance as a tool to protect your balance sheet equity ratio you need to complete these seven steps.

1: Complete a balance sheet for your dairy operation. If you need assistance you can contact the author or Dianne Shoemaker, The Ohio State University Extension to discuss a FINPACK Analysis for your dairy operation.

2: Using your balance sheet, calculate your total equity and total equity ratio. Discuss with your banker or agricultural lender what a target equity ratio should be for your dairy operation.

- 3: Determine the minimum total equity ratio as your target.
- 4: Calculate the maximum absorbable reduction in equity which meets your target equity ratio.
- 5: Complete a cash carry over calculation.
- 6: Determine the total absorbable reduction in equity by adding 4 and 5.
- 7: Review the calculations for LGM-Dairy insurance to determine if you can indemnify your dairy operation against reductions in gross margin greater than the amount determined at item 6. You can get LGM-Dairy insurance information from the author, or you can visit the LGM website at the University of Wisconsin: http://future.aae.wisc.edu/lgm_dairy.html

If you have additional questions on anything discussed in this article please contact the author at thraen.1@osu.edu.



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ⁱ The motivation for the ideas expressed in this paper comes from the publication “Do I need crop insurance? Self-evaluating crop insurance as a risk management tool in New York State”, by Steve Richards. EB-2009-01, Cornell University, 2009. Dairy producers must think strategically about their need for catastrophic financial insurance to protect against economic ruin. Those with crop activities would be well served to access and read the article by Richards.

ⁱⁱ Note that it is the larger scale dairy, with an equity ratio only 5 points above its minimum target level, that has a smaller margin for a reduction in realized gross margin. The smaller scale dairy farm, by virtue of starting with a higher total equity ratio, has a larger cushion. Of course much depends on the individual balance sheet, the cash carryover position of each dairy, and the standards of the lending institution.