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# Stress and Resilience in the US Dairy Farm Industry

May 2017

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## Objectives

- Understand resiliency
- Consider dairy farm financial stress testing
- Dairy farm structural change and supply response
- Market and policy implications

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## Resilience

- Definition: how an entity or system responds to shocks and disturbances
- Encompasses both elasticity and adaptability
- Farm ability to anticipate, prepare for, respond to, and recover from a shock
- Shocks include milk price, feed cost, interest rates, etc.

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## How is farm financial resiliency measured?

- How much equity or liquidity can a farm afford to lose?
- How much equity and liquidity is lost in bad years?
- How long does it take to recover those losses?

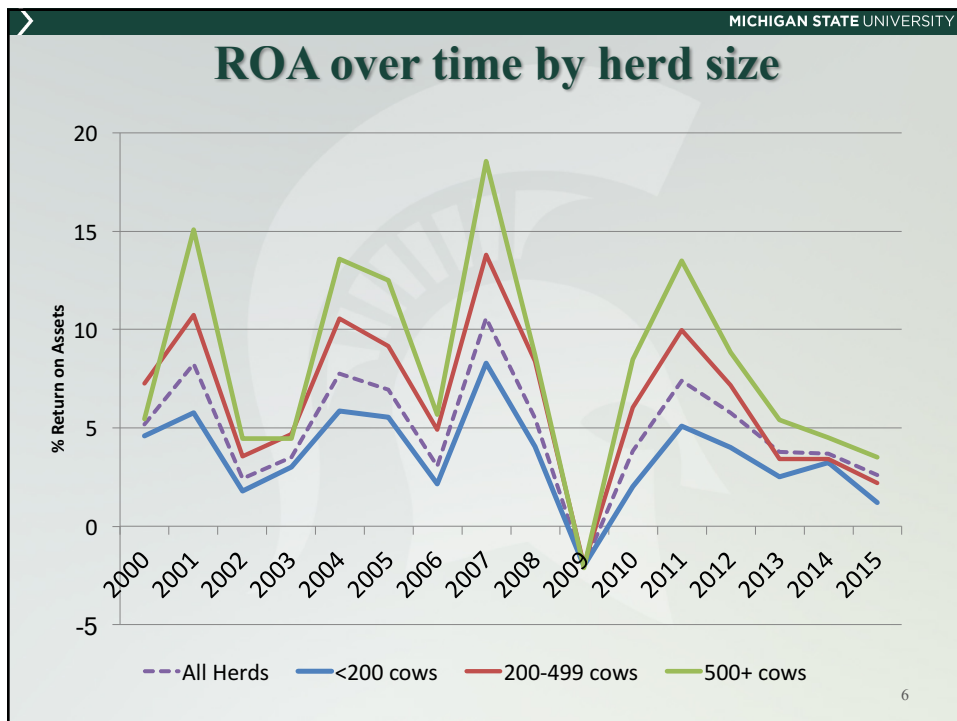
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## What contributes to dairy farm resiliency?

- 1. Profitability:** positive returns measured by ROA
- 2. Solvency:** positive equity measured by E/A
  - Asset value – land and cows
  - Expansion requires long-term debt
- 3. Liquidity:** available funds measured by CR
  - Hold more current assets
  - Access to operating loans
  - Opportunity cost of non-productive assets
- 4. Risk Management**
  - Private Tools
  - Diversification

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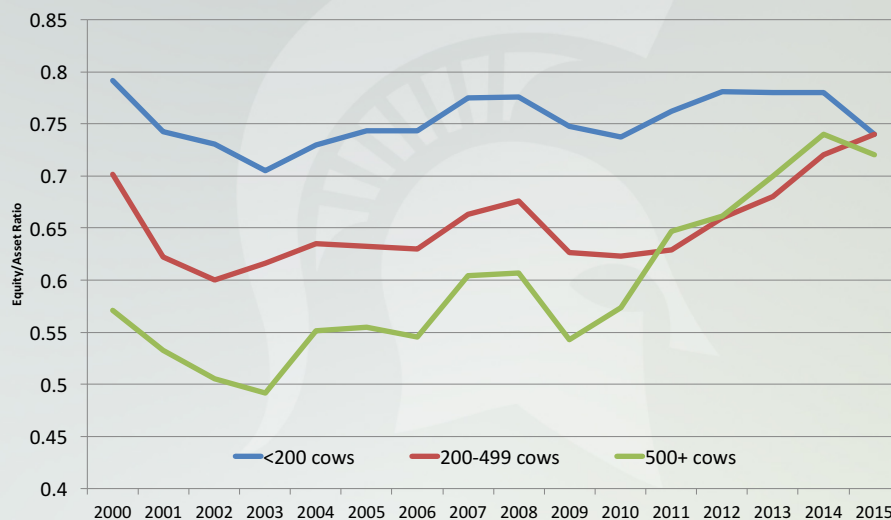


## How much can a farm afford to lose?

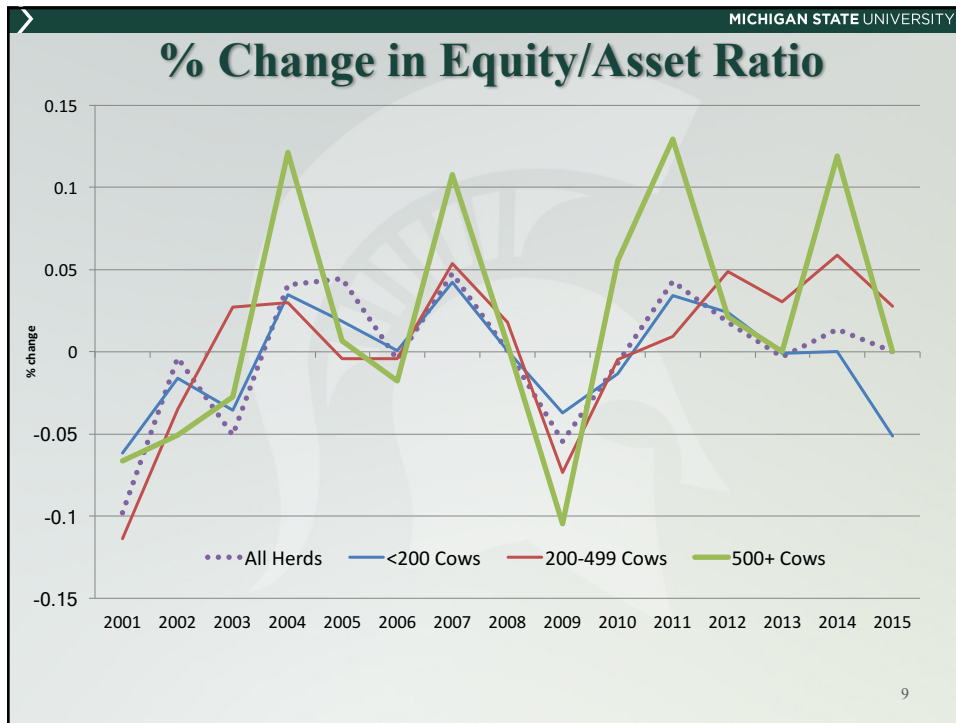
- % equity and stay above threshold
  - Lenders want no less than 40% equity/asset in most cases
  - Note wealth and life-cycle effects

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## Equity/Asset Ratio Over Time



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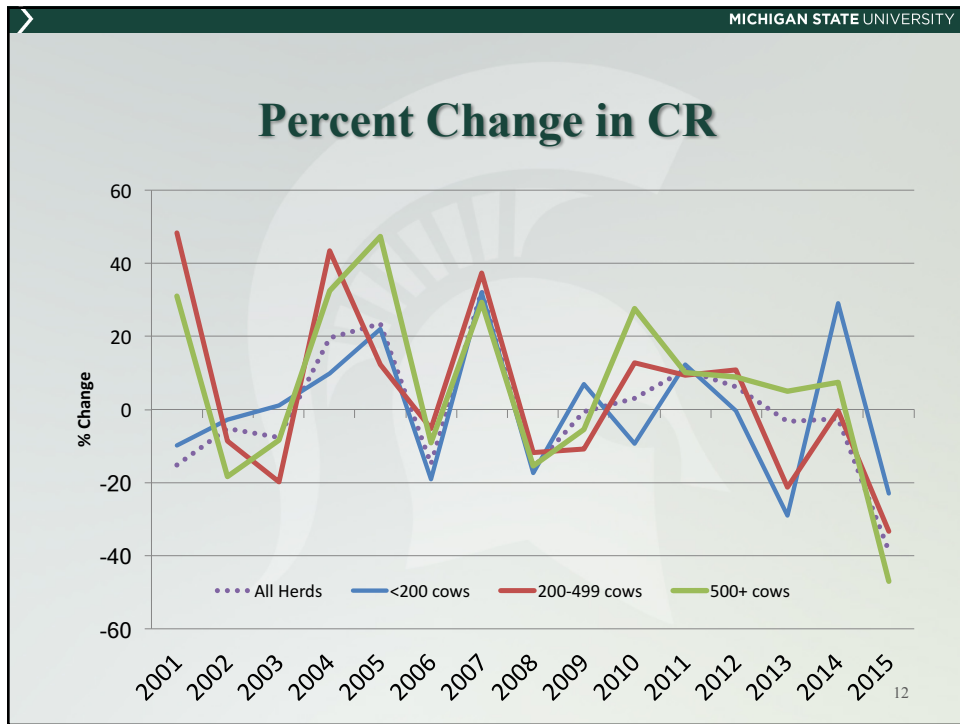
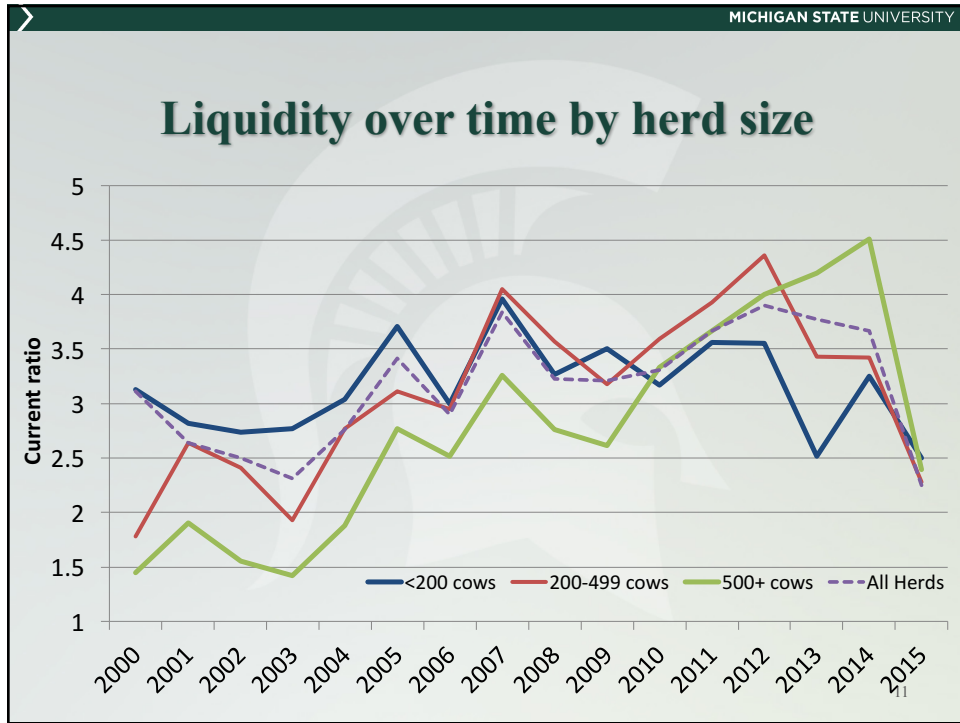


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### E/A Change Summary

	All Herds	< 200 COWS	200-499 COWS	500+ COWS
	<b>% change</b>			
<b>Average Loss in Bad Years</b>	<b>-3.2</b>	<b>-2.7</b>	<b>-3.0</b>	<b>-3.3</b>
<b>Average Gain in Good Years</b>	<b>+3.0</b>	<b>+2.2</b>	<b>+3.4</b>	<b>+6.8</b>
<b>Max Loss</b>	<b>-9.8</b>	<b>-6.2</b>	<b>-11.4</b>	<b>-10.5</b>
<b>Max Gain</b>	<b>+4.7</b>	<b>+4.2</b>	<b>+5.9</b>	<b>+12.2</b>

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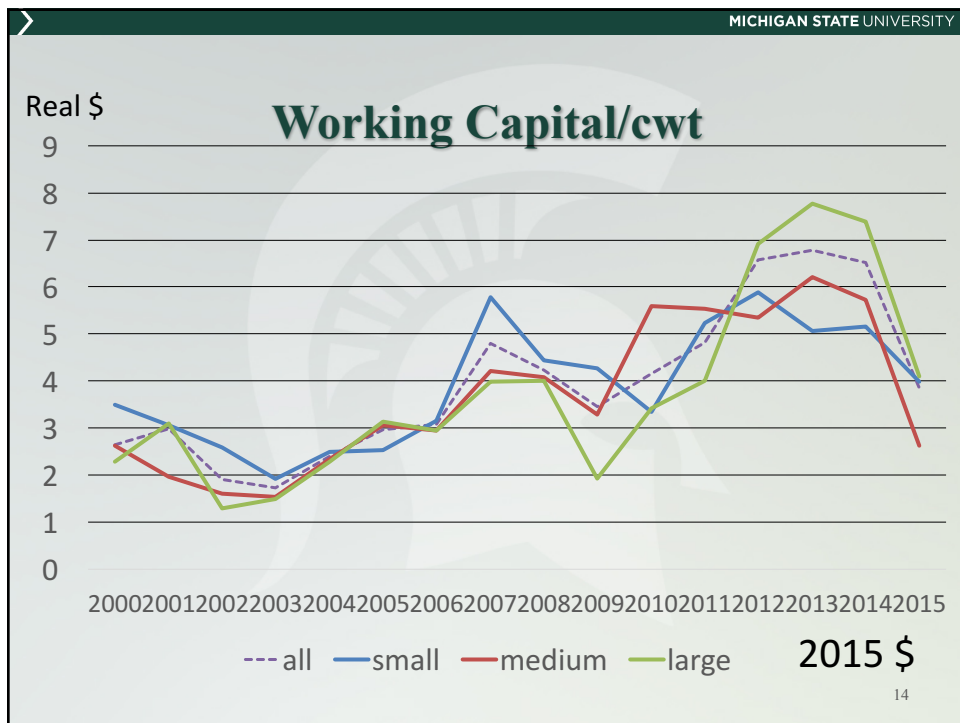


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### Current Ratio Change Summary

	All Herds	< 200 COWS	200-499 COWS	500+ COWS
	<b>% change</b>			
Average Loss in Bad Years	-11.6	-13.9	-13.9	-17.2
Average Gain in Good Years	+16.0	+16.2	+25.0	+27.8
Maximum loss	-38.7	-23.1	-33.3	-47.0
Maximum Gain	+23.6	+32.0	+43.5	+47.3

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### Variance Components by Herd Size

	Effect	<200 cows	200-499 cows	500+ cows
(percent)				
ROA	firm	37.5	22.7	14.6
	industry	16.1	31.0	54.4
	error	46.4	46.3	31.0
DA	firm	82.3	84.1	91.3
	industry	4.0	2.8	0.7
	error	13.7	13.1	8.0
CR	firm	52.7	21.2	45.2
	industry	0.7	1.1	1.7
	error	46.5	77.7	53.1

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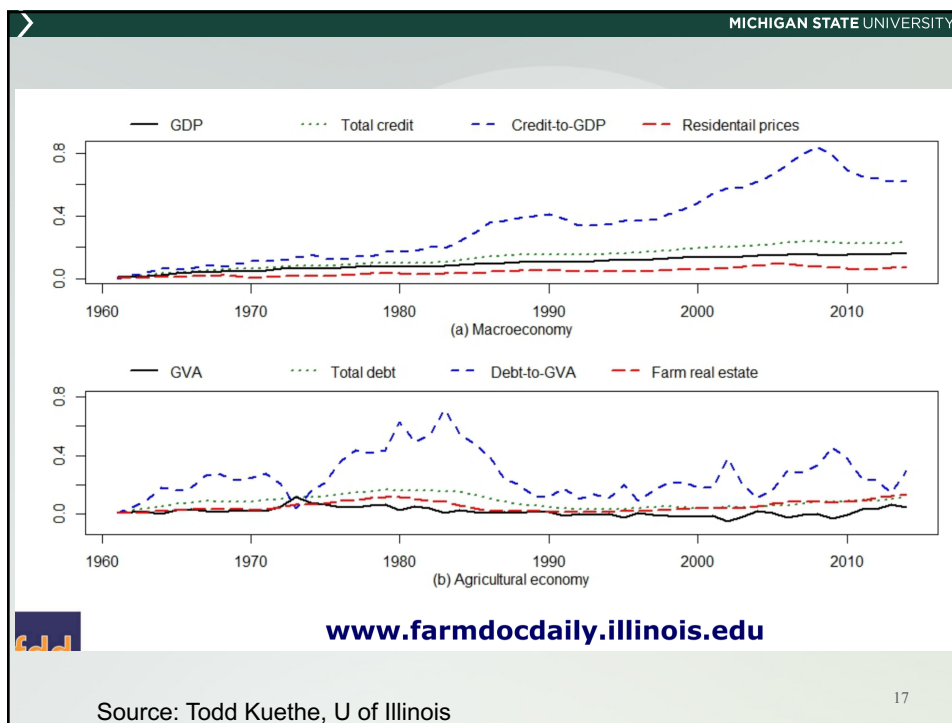
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### Credit and Finance

- Up to 1980's lending focused on balance sheet of farms (solvency)
  - Massive loss of asset market value
  
- Today lenders focus on debt repayment capacity (liquidity)
  - Volatile markets add risk to loan repayment
  - Debt Repayment Capacity

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## Debt Repayment Capacity Measures

- Measurement of borrower's ability to repay capital (intermediate and long-term) debt
- Capital Debt Repayment Capacity
- Term Debt Coverage

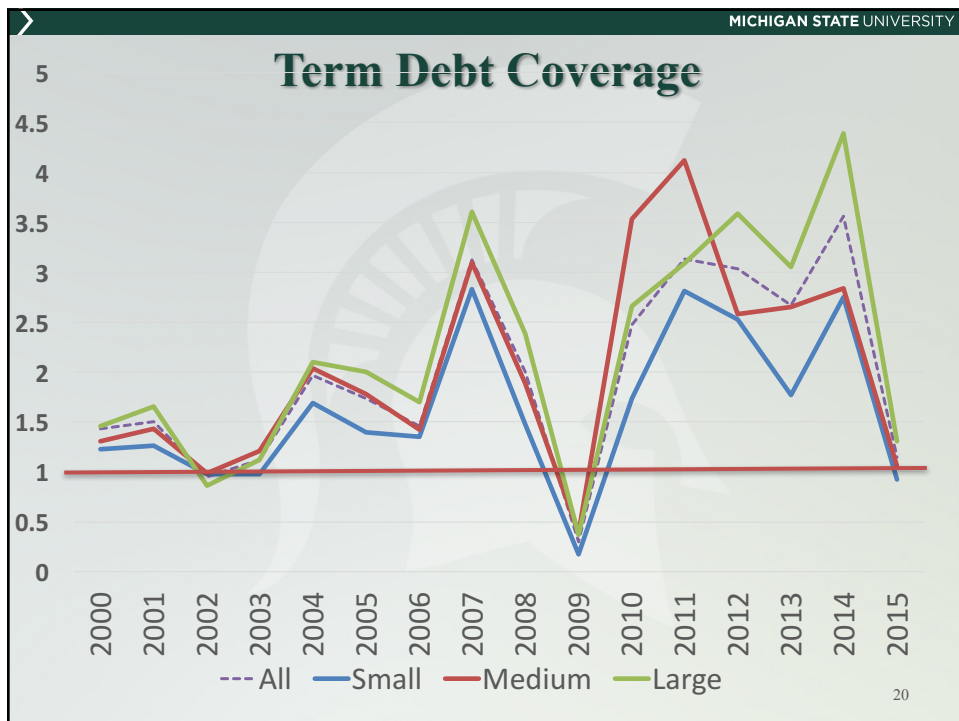
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## Debt Repayment Capacity Measures

- Capital Debt Repayment Capacity = CDRC =  
 (Net income + Depreciation + Non-farm Income + Interest on Capital Debt) –  
 (Family Living + Income Taxes)
- Term Debt Coverage Ratio =  
 (Capital Debt Repayment Capacity) /  
 (Scheduled Principal and Interest Payments on Term Loans and Leases)
- Criteria: greater than or equal to 1.15

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## Correlations with TDC by herd size

- Debt repayments lower correlation with profitability as herd size increases
  - Profits more likely to leverage new borrowing
- Debt repayment higher correlation with liquidity as herd size increases
- Debt repayment higher correlation with solvency as herd size increases

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## Dairy Farmer Use of Contracting for Risk Management

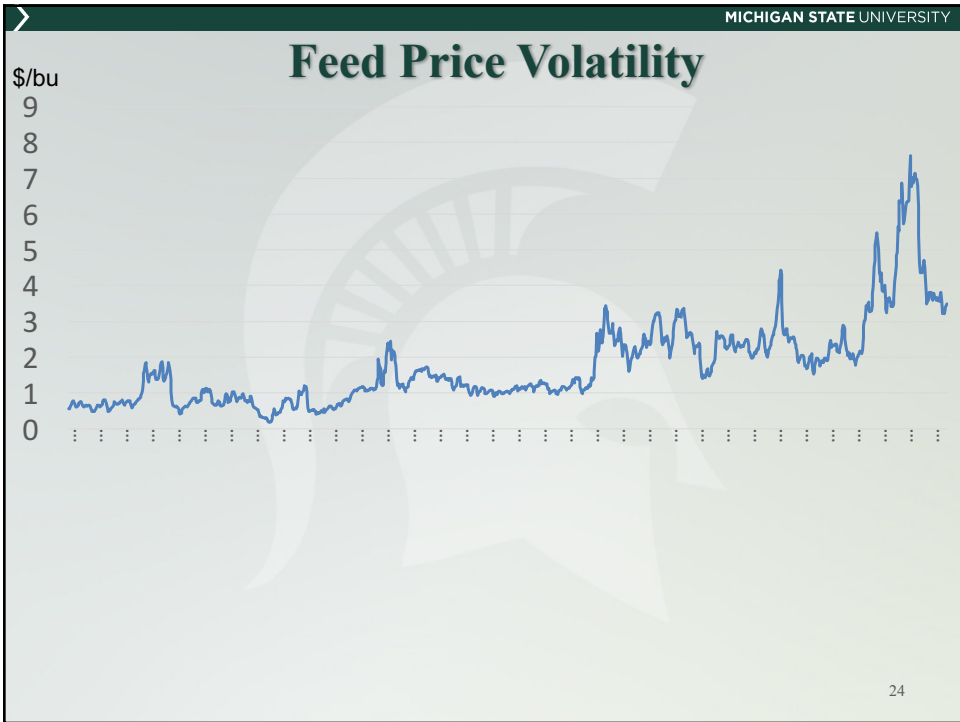
		Cash Forward Contracts	Futures Contracts	Options Contracts
		% Respondents		
Milk Price	Last 5 years	11.2	8.3	7.3
	Ever	14.7	10.3	8.9
Feed Price	Last 5 years	20.5	8.0	4.5
	Ever	23.6	8.8	5.0

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## Reasons Dairy Farmers Don't Use Risk Mgmt Tools

	Milk	Feed
Lack of Knowledge	25.9	24.8
Basis Risk	10.3	12.9
Cost	11.6	10.9
Lack of Management Time	10.1	13.9
Contracts Too Large	7.8	8.4
Inconvenient	7.2	7.9
Difficult to Use	5.5	5.9
Coop Markets Milk	12.7	---
Grow Own Feed	---	6.6
Other	9.0	8.6



## Why are large herds more resilient?

- Lower cost of production means higher profitability
  - Economies of size in capital and labor
- Technology set
- Relatively more equity and liquidity
- Much more likely to be incorporated
  - Separates and protects personal assets
  - Tax and state transfer benefits
- Use of market-based price risk tools

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## Supply Response

- Bozic and Gould (2012) find a declining trend in long-run supply elasticity from 1975 through 2005.
  - Ever larger price swings needed to equilibrate the market in face of demand shocks.
- However, they find that milk supply is becoming more responsive since 2005 both to milk and feed price changes.
- Increasing responsiveness to feed prices justifies focusing the next generation of the dairy policy instruments on managing dairy profit margins.

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## Conclusions

- Large herds more profitable, more uniform and more resilient
- Given economic realities of herd size and supply response, what is the goal of govt. policy?
- Can MPP-Dairy achieve the goals?

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## Thank You

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## A Simple Tool to Assess Farm Financial Risk Position

- Dairymarkets.org
  - MPP/Tool/ Advanced
  
- Is my operation's financial position robust to market risk?

To answer that question, you need to:

- 1) Know your basic cost of production, revenues, and balance sheet
- 2) Execute a stress-test analysis


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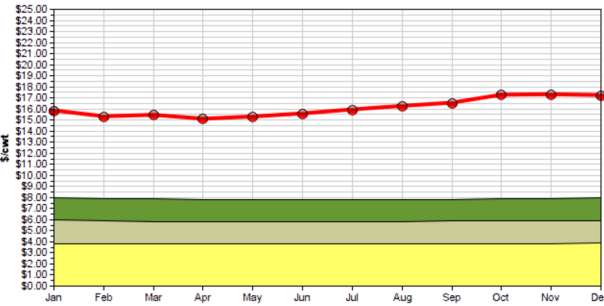
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MPP MPP Advanced LGM **Margin Protection Program Decision Tool**  
[www.DairyMarkets.org](http://www.DairyMarkets.org)


### 2016 Margin Protection Program

Change All Milk Prices





**Annual Avg Payment**



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<input checked="" type="checkbox"/> All Milk Price:	15.83	15.30	15.43	15.08	15.28	15.56	15.92	16.24	16.53	17.25	17.29	17.22
<input type="checkbox"/> NASS Hay Price:	149	148	148	147	146	145	145	145	145	145	146	147
<input type="checkbox"/> AMS SBM Price:	289	282	278	277	277	278	278	280	280	280	281	281
<input type="checkbox"/> NASS Corn Price:	3.59	3.57	3.53	3.53	3.53	3.53	3.53	3.54	3.55	3.57	3.58	3.61
Ration Value:	8.02	7.93	7.86	7.84	7.82	7.82	7.82	7.84	7.85	7.87	7.91	7.95
Margin:	7.81	7.37	7.57	7.24	7.46	7.74	8.10	8.40	8.68	9.38	9.38	9.27

2016

Average margin for the year is \$8.20

Stress Test

Payment \$cwt Covered: \$0.23

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## Spartan Farms

- 320 milk cows
- 1200 acres operated
- 23,100 pounds/cow in 2012
- 24,300 in 2016
- Have current balance sheet at market values
- Have records of costs and revenues from past years to make projections including basis

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## Inputs for Stress Test

- Herd size – 320 cows
- Milk per cow – 24,300
- Expenses (feed and other) (\$/cwt)
- Worst case basis (from MPP IOFC) (\$/cwt)
- Other revenue (\$/cwt)

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## Financial Inputs for Stress Test

From Current Balance Sheet

- Working capital per cow (\$/cow)
- Assets per cow (\$/cow)
- Debt-to-Asset Ratio (%)

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## Spartan Farms Balance Sheet

Balance Sheet at Market Values			Spartan Farms 2015		
	Beginning	Ending		Beginning	Ending
	(\$)			(\$)	
Current Assets	600,851	426,850	Current Liabilities	242,711	322,869
Intermediate Assets	1,446,966	1,465,611	Intermediate Liabilities	252,550	245,010
Long Term Assets	2,667,573	2,782,991	Long Term Liabilities	835,588	828,346
Total Farm Assets	4,715,390	4,675,452	Total Farm Liabilities	1,330,849	1,396,225
			Farm Net Worth	3,384,541	3,279,227
Assets/cow (\$)	14,736	14,611	Debt-to-Asset (%)	28.2	29.9
			Working capital/cow (\$)	1,119	325

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## Financial Information Input

Production & Prices	
Cows	320
Milk Per Cow (lbs/yr)	24,300
Expenses, Other than Feed (\$/cwt)	\$9.00
Worst-Case IOFC Basis over MPP (\$/cwt)	-\$1.50
Other Revenue (beef, crops, etc.) (\$/cwt)	\$3.00

Risk Management	
MPP-Dairy: Production History	7,650,920
MPP-Dairy: Coverage Percentage	90%
CME & Other: % of 2016 Milk and Feed Hedged	0%
CME & Other: Average Hedged IOFC	\$0.00

Financials	
Working Capital Per Cow	\$325
Assets Per Cow	\$14,000
Debt-to-Asset Ratio (At Market Value)	30%
Effect of Crisis on Assets Value	-5%

Scenario: Average MPP-Dairy Margin in 2016	\$8.10
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Diagnostics	
Expected 2016 Milk Production	7,776,000
Cash-Flow Breakeven MPP-Dairy Margin	\$7.50

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## Stress Test Results \$8.10/cwt margin

	MPP-Dairy		Profitability	Liquidity	Solvency
	Premium Costs		Net Income	Working Capital/Cow	Debt/Asset Ratio
	Total \$	\$/cwt	\$/cwt	\$/cow	%
No MPP			\$0.60	\$471	29.7%
\$4.00	\$100	\$0.00	\$0.60	\$471	29.7%
\$4.50	\$1,077	\$0.01	\$0.59	\$468	29.7%
\$5.00	\$2,254	\$0.03	\$0.57	\$464	29.7%
\$5.50	\$4,586	\$0.06	\$0.54	\$456	29.7%
\$6.00	\$6,773	\$0.09	\$0.51	\$449	29.7%
\$6.50	\$12,069	\$0.16	\$0.44	\$432	29.8%
\$7.00	\$32,732	\$0.42	\$0.18	\$369	29.9%
\$7.50	\$42,689	\$0.55	\$0.09	\$346	30.0%
\$8.00	\$58,347	\$0.75	\$0.07	\$341	30.0%

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## Stress Test Results \$6.20/cwt margin

	MPP-Dairy		Profitability	Liquidity	Solvency
	Premium Costs		Net Income	Working Capital/Cow	Debt/Asset Ratio
	Total \$	\$/cwt	\$/cwt	\$/cow	%
No MPP			-\$1.28	\$14	31.5%
\$4.00	\$100	\$0.00	-\$1.28	\$14	31.5%
\$4.50	\$1,077	\$0.01	-\$1.29	\$12	31.5%
\$5.00	\$2,254	\$0.03	-\$1.31	\$7	31.5%
\$5.50	\$4,586	\$0.06	-\$1.34	-\$1	31.5%
\$6.00	\$6,773	\$0.09	-\$1.29	\$12	31.5%
\$6.50	\$12,069	\$0.16	-\$1.11	\$56	31.4%
\$7.00	\$32,732	\$0.42	-\$1.00	\$83	31.3%
\$7.50	\$42,689	\$0.55	-\$0.70	\$156	31.2%
\$8.00	\$58,347	\$0.75	-\$0.45	\$215	31.0%

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