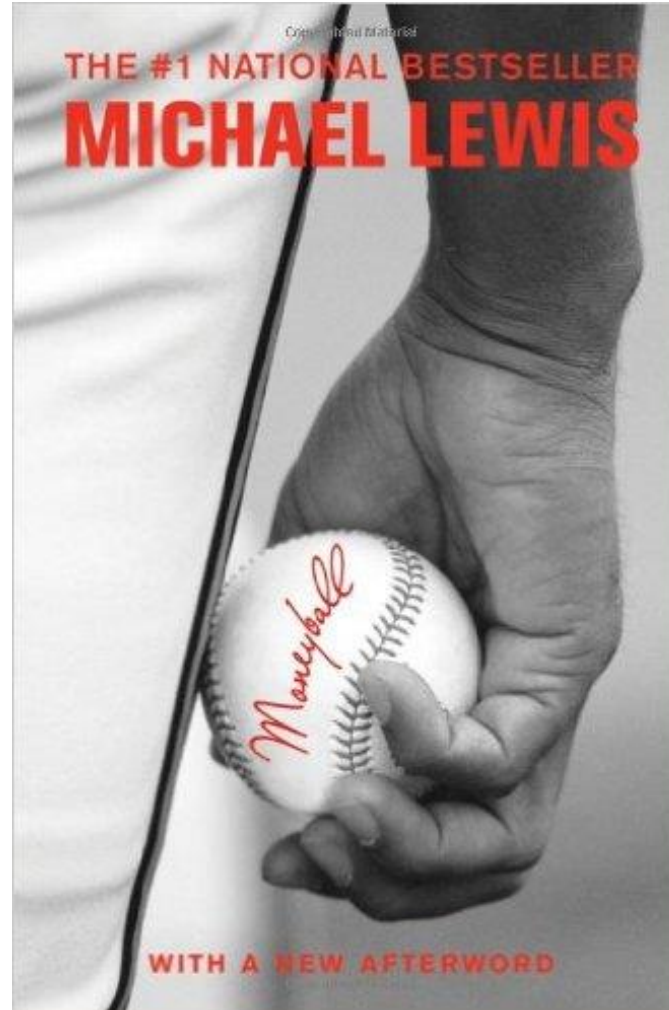




# WHAT DRIVES FINANCIAL SUCCESS ON A DAIRY?



# MONEYBALL: THE ART OF WINNING AN UNFAIR GAME

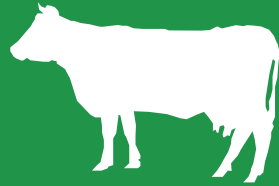


# DAIRY AT A GLANCE



**43,000**

Commercial Producers



**9.40 MM**

Cows  
(Sept 2017)  
73,000 over Sept  
2016



**162.4 B**

Pounds of milk in 9 mo of  
2017  
102% of 2016 production  
when adjusted for leap year



**\$18.00 /cwt**

2018 all-milk price  
est. \$17.45 to \$18.35  
for 2018

2018

Prices Average ,  
And Feed Costs,  
Energy Remain Lower

Margins  
Looking Slim  
if Trade Options  
are Maintained

Stocks Still High

US Dairy Prices  
Trending Down and  
look to be lower than  
1<sup>st</sup> half of 2017

# SUMMARY



US DAIRY INDUSTRY  
HAS EVOLVED  
SIGNIFICANTLY  
OVER LAST DECADE



- Herd demographics dominated by consolidation and expansion



- Globalization of dairy markets dominates current and future growth opportunities



- Recognition that domestic consumption needs protection:

- Innovation required to meet needs of changing demographics and competition for position

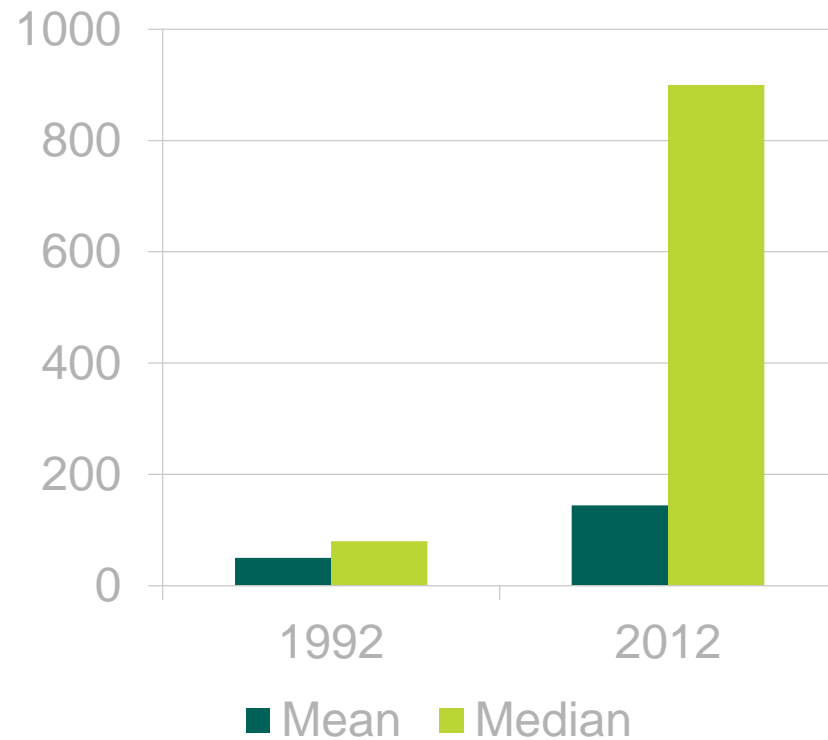


- Significant price volatility will remain; Focus on margin, not price

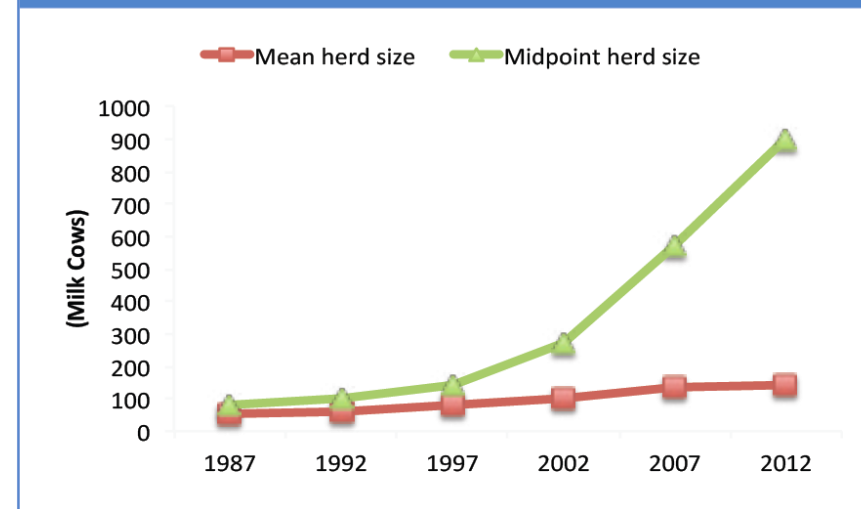
# Accelerating Consolidation

Means, Medians and the Lie of Averages

## Mean and Median US Herd Sizes



## Changes in U.S. Herd Size





# AGENDA

1 THE EVOLUTION OF THE DAIRY INDUSTRY

2 WHAT WE DID

3 KEY TAKEAWAYS

# STUDY GOAL

TO IDENTIFY SPECIFIC  
**DAIRY PRODUCTION  
MEASURES**  
THAT ARE CORRELATED  
WITH THE  
**FINANCIAL HEALTH  
OF A DAIRY**



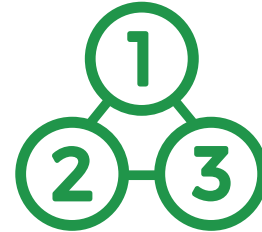
# DATA SOURCE AND PROCESS



## SOURCE

.....

- Data was provided by the Dairy Consulting team of Compeer, a major provider of agricultural lending and financial consulting services in the Upper Midwest.
  - The majority of the herds are based in MN, WI, SD, MI & OH
  - Data collection began in 2006



## PROCESS

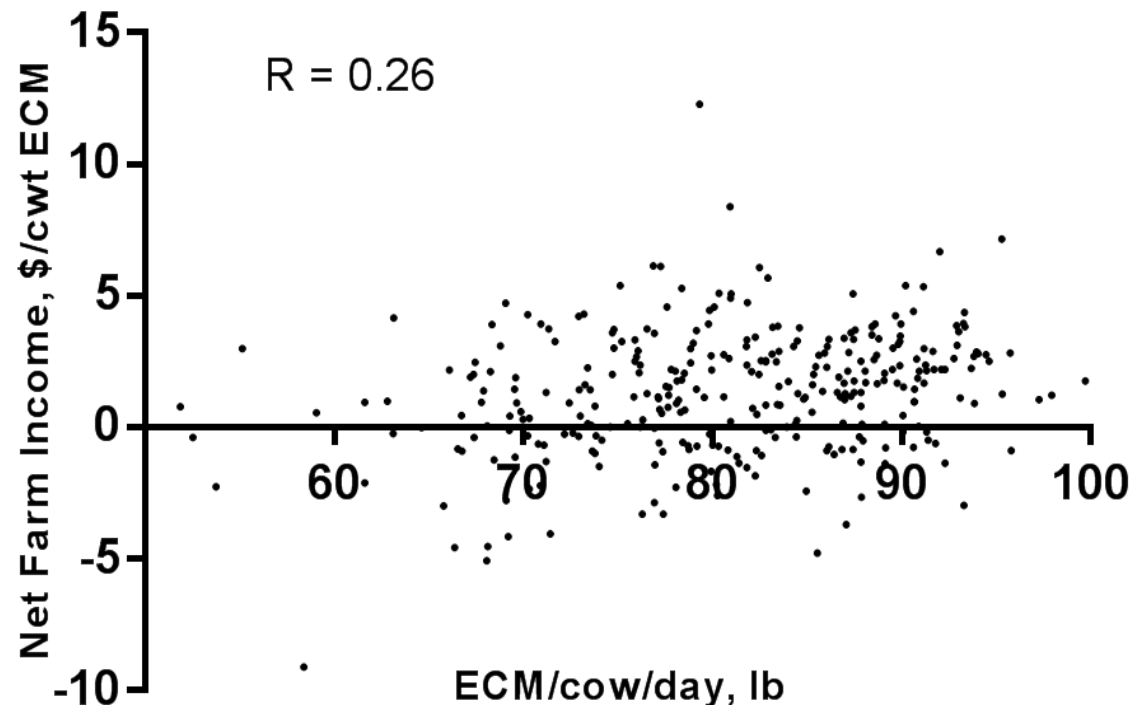
.....

- Once the source was identified, Zoetis performed a regression analysis to determine which metrics have the highest correlation to profitability.



# WHAT IS A CORRELATION COEFFICIENT (R)?

A MEASURE OF THE RELATIONSHIP BETWEEN TWO VARIABLES;  
CAN RANGE FROM -1 TO 1.  
CORRELATION DOES NOT NECESSARILY EQUATE TO CAUSATION



## Can be positive:

NFI (Y) increases as milk yield increases (X)

## Can be negative:

NFI (Y) decreases as SCC increases (X)

## Can be at or near zero:

Little relationship between X and Y

# THE DATA



**425**

farm-year records from clients in upper Midwest

**90**

total variables, 54 numeric

**85**

farms represented (not counting censored)

**10**

calendar years

**5.0**

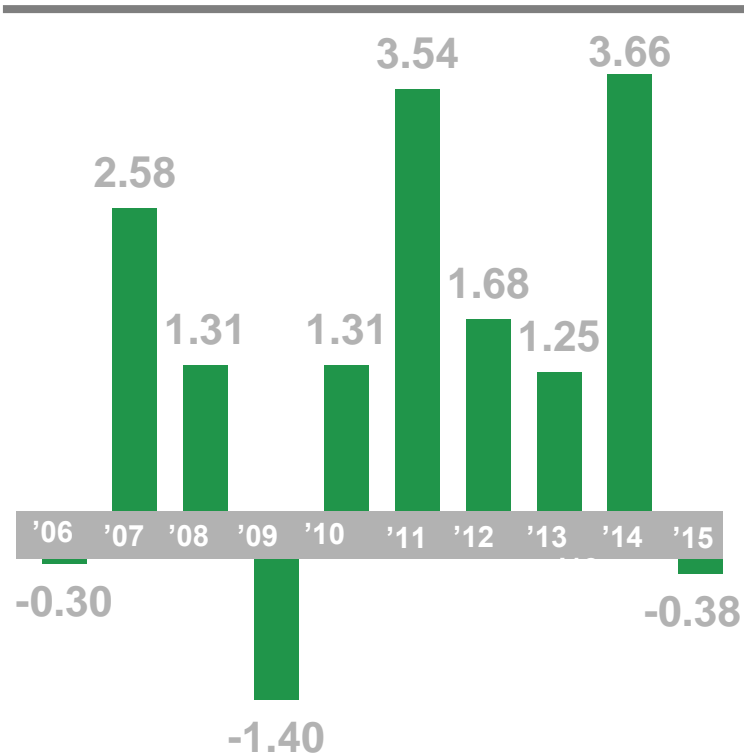
year-end records per farm (avg.)

**1071**

average lactating cows per farm (range from 95 to 4700 )

# STATISTICAL ANALYSIS

## NFI, \$/cwt ECM (BY ACCOUNTING YEAR)



- Net Farm Income was the profitability measure investigated

**AVG: \$1.52; RANGE: (\$5.07) - \$12.29**

- Can also be expressed on a herd or cow basis
- NFI is computed as:

**\$ RECEIPTS - (EXPENSES + DEPRECIATION)**

- Farm and year accounted for 71% of variation in profit

**SOME GOOD, SOME BAD YEARS; 2015 WAS NOT PROFITABLE**

# RELATIONSHIPS BETWEEN SELECT TRAITS AND ANNUAL PROFITABILITY

VARIABLE	PROFITABILITY AS NET FARM INCOME		
	Most positive years	Average years	Most negative years
Calendar Years	2007, 2011, 2014	2008, 2010, 2012, 2013	2006, 2009, 2015
Milk price with marketing costs, \$/cwt ECM	21.35	18.98	16.08
Feed cost, \$/cwt ECM (whole herd)	10.01	10.05	8.77
ECM lb./cow/d	82.1	82.9	82.9
NFI, \$/cwt ECM	3.50	1.43	-0.43
Working capital, \$/cow	857.34	608.55	482.30
Return on equity, %	21.0	9.0	-6.0
Cost of production, \$/cwt ECM after owner draw	17.46	17.30	16.36
Income over feed cost, \$/cwt	10.95	8.68	7.62
Somatic cell count (x 1000)	212.0	206.9	205.1

# RELATIONSHIP BETWEEN NFI AND KEY MEASURES

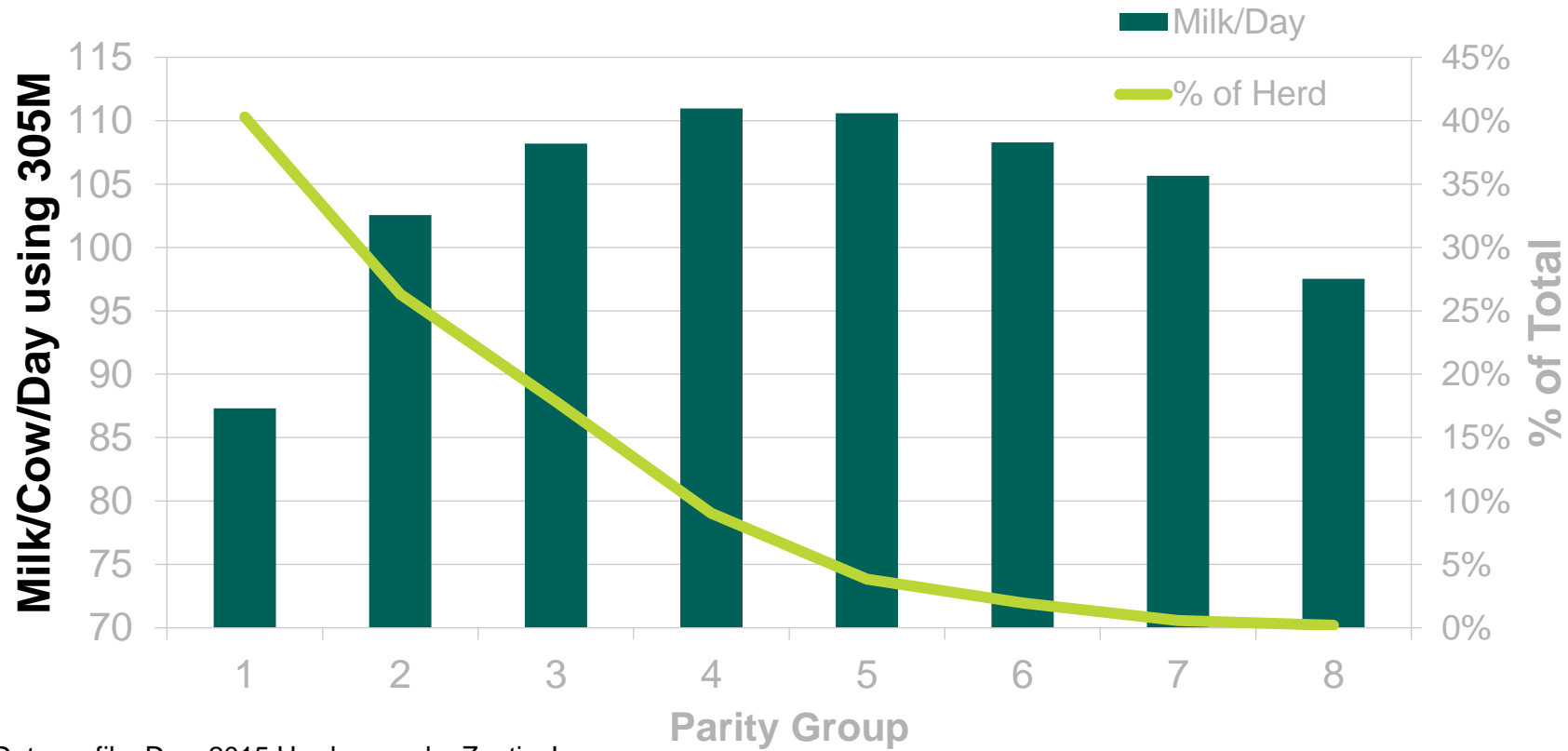
VARIABLE	CORRELATION w/NFI	KEY LEARNINGS
21 day pregnancy risk	0.17	Increased days open is expensive (small sample)
ECM shipped, lb./cow/day	0.15	More milk per cow is profitable – effect of marginal milk
Heifer survival rate, %	0.15	Keeping calves healthy is beneficial
Number heifers	0.07	Heifer inventory not related to profitability – supports culling strategy
Milk shipped, herd total, cwt	0.05	Profitability not related to total lb. shipped
Herd size, lactating	-0.03	Herd size not related to profit
Labor cost*	-0.06	Labor cost is unrelated to profitability
Death loss (%)	-0.10	Death losses negatively impact profitability
Somatic cell count	-0.14	Investing to produce high quality milk is profitable
Net herd replacement cost**	-0.30	Lowering replacement costs helps profitability, value of cull cows

\*Labor cost, \$/cwt ECM (includes wages, benefits, SS, owner draw)

\*\*Net herd replacement cost, \$/cwt ECM (difference between replacement cow value and book value of dead + sold cull cows [for dairy or beef])

# Longevity - driven profit

Performance and Percent of Herd by Parity  
Cows >100DIM



Data on file, Dec. 2015 Herd example, Zoetis, Inc.

# RELATIONSHIPS BETWEEN KEY MEASURES AND NFI

VARIABLE	CORRELATION w/NFI	PROFITABILITY AS NET FARM INCOME (\$/cwt ECM)			KEY LEARNINGS
		LOW (<1.00)	MID (1. - 2.50)	HIGH (>2.50)	
21 day pregnancy risk	0.17	22.5	21.1	22.9	Increased days open is expensive (small sample: 106 observations)
Heifer survival rate, %	0.16	93.7	94.6	94.9	Keeping calves healthy is beneficial
ECM lb./cow/d	0.15	80.6	83.8	84.2	Higher production per cow is related to increased profitability
Death loss (%)	-0.10	7.5	7.1	6.5	Death losses hurt profitability
Somatic cell count	-0.14	225	196	196	Investing to produce high quality milk is profitable
Net herd replacement cost**	-0.31	1.65	1.39	1.24	Lowering replacement costs helps profitability, value of cull cows

\*Labor cost, \$/cwt ECM (includes wages, benefits, SS, owner draw)

\*\*Net herd replacement cost, \$/cwt ECM (difference between replacement cow value and book value of dead + sold cull cows [for dairy or beef])

# RELATIONSHIPS BETWEEN SCC AND OTHER MEASURES

VARIABLE	CORRELATION w/SCC
Death loss, %	0.44
Days open*	0.32
Profitability (NFI, \$/cwt ECM/day)	-0.14
21-day pregnancy risk*	-0.21
ECM/cow/day, lb/day	-0.41

**DIFFERENCE IN PROFIT BETWEEN  
HIGHEST 1/3 AND LOWEST 1/3  
(BASED ON SCC, \$/cwt ECM, COP);**

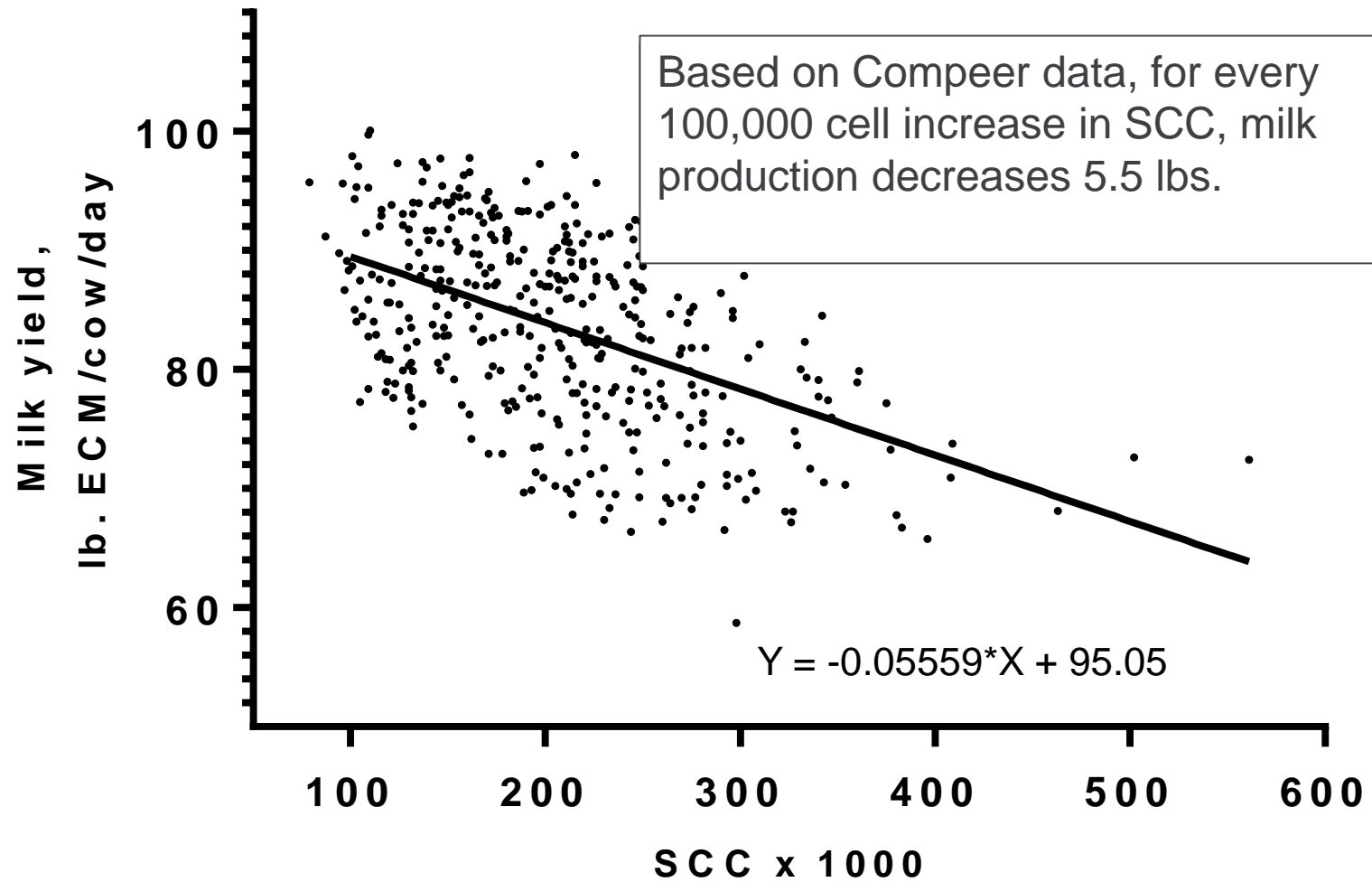
**~\$268 K/year  
for 1071 cow herd\***

\* Top third (SCC = 134) produced 86.8 lb. ECM/cow/day; bottom third (SCC = 286) 77.8 lb. ECM/cow/day

\*\* Small but growing sample size



# TEASER: ARE SCCs MORE COSTLY NOW?



# RELATIONSHIPS BETWEEN ECM AND OTHER MEASURES

VARIABLE	CORRELATION w/ECM
Breeding costs, \$/cow	0.35
Profitability (NFI, \$/cwt ECM/day)	0.15
21-day pregnancy rate, %	0.15
Feed cost, \$/cwt ECM	-0.26
Days open	-0.30
Death loss, %	-0.38
SCC x 1000	-0.41

**DIFFERENCE IN PROFIT BETWEEN  
HIGHEST 1/3 AND LOWEST 1/3  
(BASED ON ECM, \$/cwt ECM, COP)**

⋮

**~\$495 K/year  
for 1071 cow herd\***

\* Top third produced 92.0 lb. ECM/cow/day; bottom third produced 72.1 lb. ECM/cow/day

# RELATIONSHIPS BETWEEN 21d PR\* AND OTHER MEASURES

VARIABLE	CORRELATION w/21-d PR
Profitability (NFI, \$/cwt ECM/day)	0.17
ECM, lb./cow/day	0.15
SCC x 1000	-0.21
Days open	-0.26

**DIFFERENCE IN PROFIT BETWEEN  
HIGHEST 1/3 AND LOWEST 1/3  
(BASED ON 21-d PR, \$/cwt ECM, COP)**

**~\$145 K/year  
for 1071 cow herd\*\***

\* Very small data set at this point (106 observations)

\*\* Top third (21-day PR = 26.6%) produced 89.9 lb. ECM/cow/day; bottom third (21-day PR = 18.4%) produced 82.5 lb. ECM/cow/day

# RELATIONSHIPS BETWEEN DEATH RATES AND OTHER MEASURES

VARIABLE	CORRELATION w/Death Rate
SCC x 1000	0.44
Net herd replacement cost, \$	0.31
Days open	0.22
Cost of production, \$/cwt ECM	0.11
Profitability (NFI, \$/cwt ECM/day)	-0.10
ECM/cow/day, lb/day	-0.38

**DIFFERENCE IN PROFIT BETWEEN HIGHEST 1/3 AND LOWEST 1/3 (BASED ON DEATH RATE, \$/cwt ECM, COP) : ~\$198 K/year for 1071 cow herd\***

\* Top third (DR = 4.2%) produced 85.1 lb. ECM/cow/day; bottom third (DR = 10.0%) produced 77.8 lb. ECM/cow/day

# RELATIONSHIPS BETWEEN NET HERD REPLACEMENT COSTS AND OTHER MEASURES

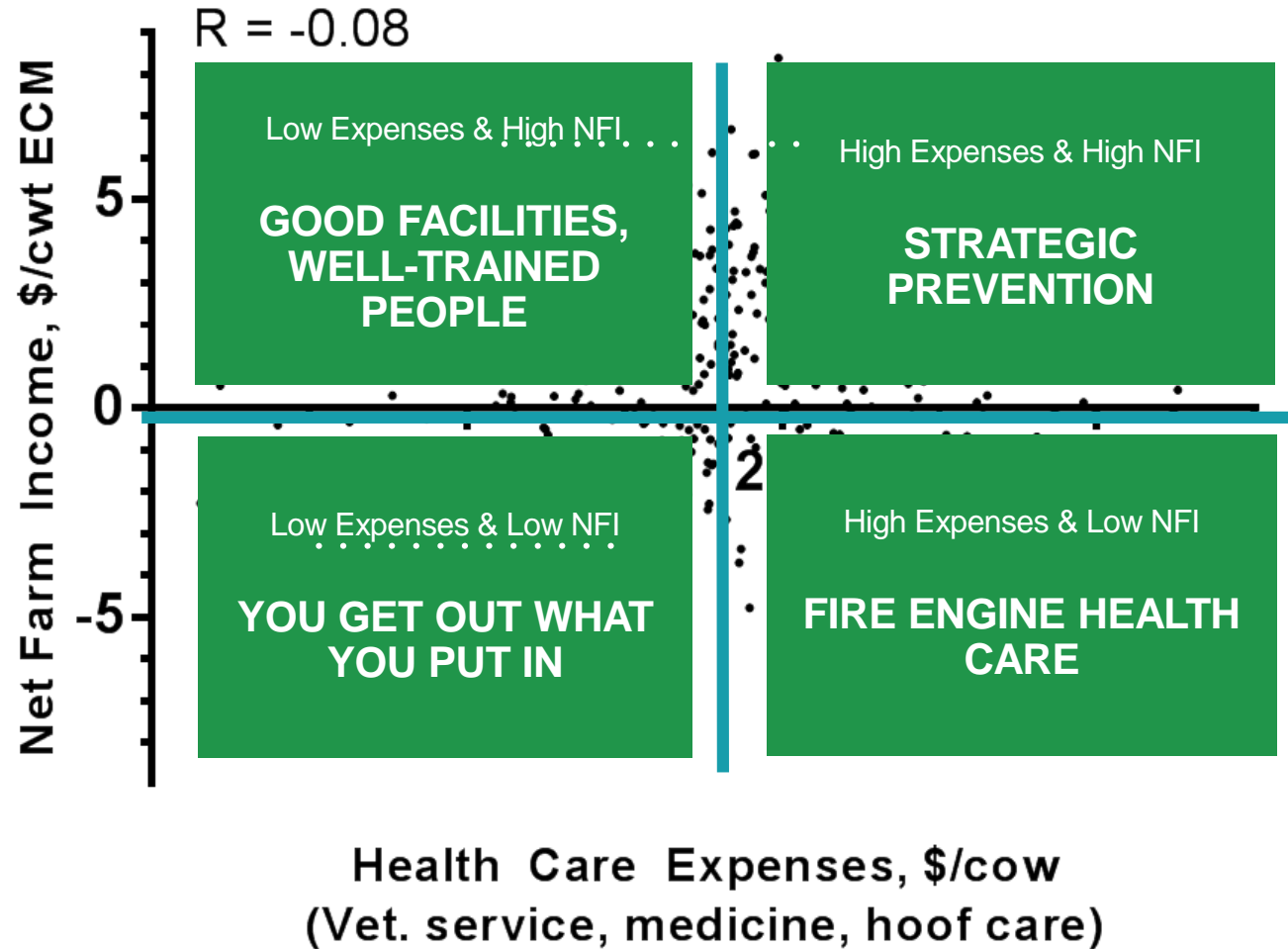
VARIABLE	CORRELATION w/ NHRC
Cull + death rate, %	0.38
SCC x 1000	0.35
Profitability (NFI, \$/cwt ECM/day)	-0.32
ECM/cow/day, lb./day	-0.46

**DIFFERENCE IN PROFIT BETWEEN HIGHEST 1/3 AND LOWEST 1/3 (BASED ON NHRC, \$/cwt ECM, COP) : ~\$633 K/year for 1071 cow herd\***

\* Top third (NHRC = \$0.88/cwt) produced 88.5 lb. ECM/cow/day; bottom third (NHRC = \$2.02/cwt) produced 76.4 lb. ECM/cow/day

# THE FOUR QUADRANTS OF HERD HEALTH

## TENDENCIES BETWEEN NFI & HEALTHCARE EXPENSES





# AGENDA

1 THE EVOLUTION OF THE DAIRY INDUSTRY

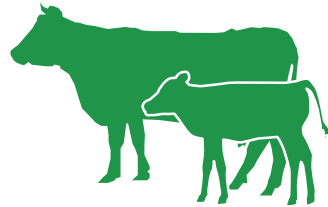
2 WHAT WE DID

3 KEY TAKEAWAYS

# MAJOR MESSAGES



Milk production per cow is the single most important variable in determining farm profitability



SCCs are highly correlated to all major profit drivers

Reproductive efficiency measured as 21-d pregnancy rates is highly correlated to farm profitability



Replacement costs have a significant correlation with farm profitability.

Heifer management and survival impacts profitability from many angles and successful heifer management substantially supports successful ongoing operations



Excellent animal husbandry skills, as assessed by herd health parameters and death rates, have tremendous impact on herd profitability: (a) animal replacement costs, (b) Mastitis



# QUESTIONS MOVING FORWARD...



.....

Better characterization of reproductive performance, particularly around 21-day pregnancy rates and age at first calving (Data on 21 day pregnancy rates was limited; There was very limited variation in age at first calving among these herds)



.....

Better characterization of the use of veterinarians and other external farm professionals



.....

Improved understanding of labor metrics and their association with profitability. Labor is often the #2 or #3 expense on dairies behind feed (#1) and often replacements



.....

Enhance understanding of technology application and its relation to profitability (monitoring devices, robotics, data management systems, genomics, other)

# GOT QUESTIONS?



Photo courtesy of Dairy Management, Inc

# Thank You

**STEVE BODART**  
**SR. DAIRY CONSULTANT**  
**715-928-2946**  
**STEVE.BODART@COMPEER.COM**