



# **The Economic Value of a Dairy Cow**

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# What is the cow value?

What the cow value means?

## Discounted future net return of a cow

Compared to a replacement

## Net return of a cow minus net return of a replacement

Includes the replacement transaction cost

## General interpretation

- Positive cow value = keep
- Negative cow value = replace

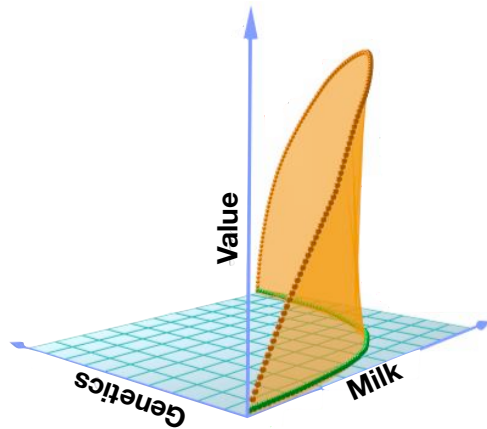


Vs.



# Important factors

Variables with large impact

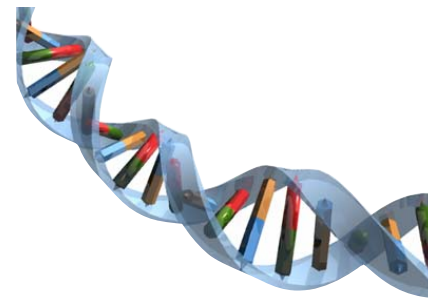


## Cow expected milk production

- This lactation
- Future lactations

## Replacement

Expected genetic gain



# Why to worry about the cow value?

Critical economic implications

## Optimal management

Keep or replace

## Crucial decisions

Breed or not breed

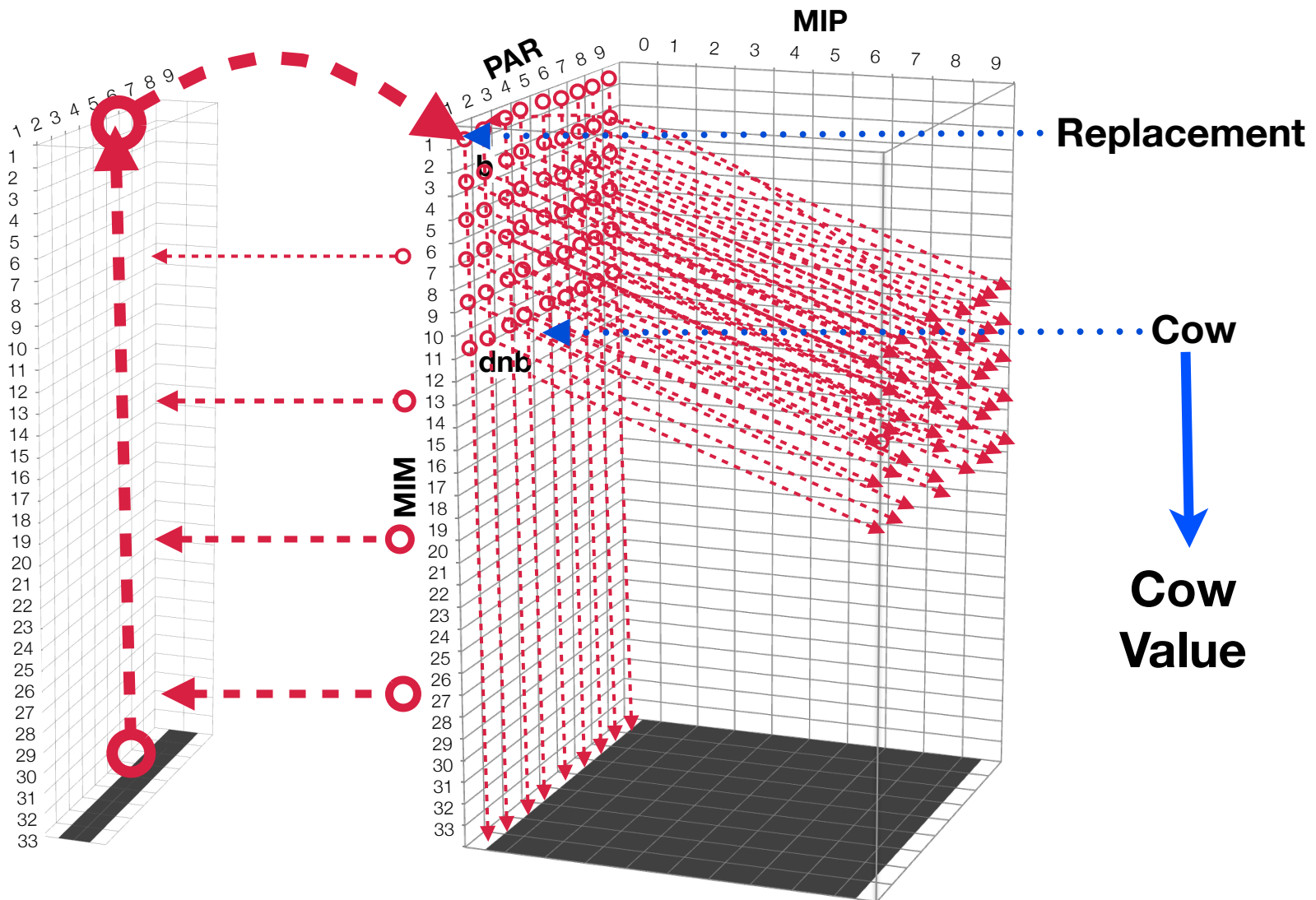
## Important information

- Value of pregnancy
- Cost of pregnancy loss
- Cost of a day open



# How to calculate the cow value?

Markov chains to simulate herd dynamics



# Data required for model

## Evaluated cow

### **Current state**

- Lactation (PAR)
- Months after calving (MIM)
- Pregnancy (MIP)

### **Expected milk production**

- Rest current lactation
- Next lactations



# Data required for model

Replacement heifer

## Genetic improvement

- Expected productivity gain with the replacement



# Data required for model

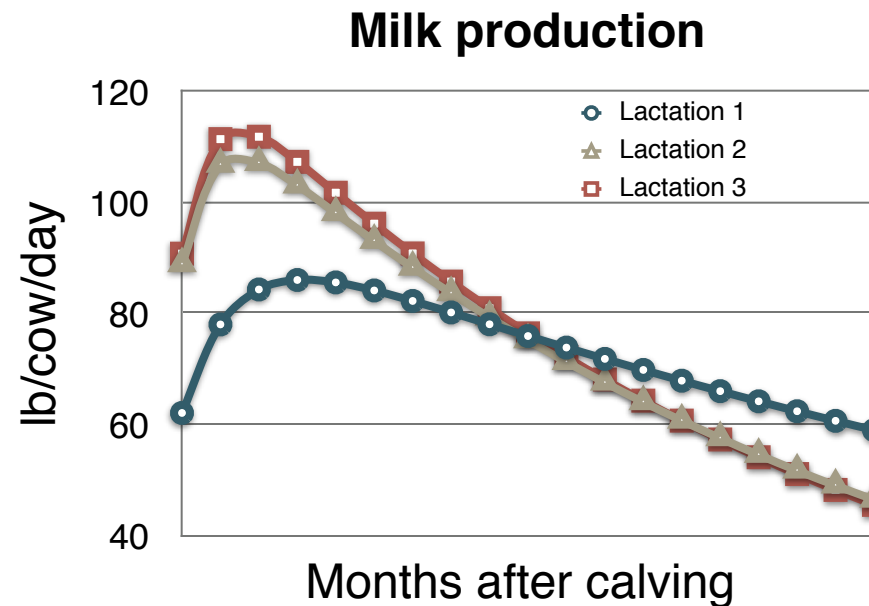
Herd level

## Milk production

- Rolling herd average
- Butterfat content

## 21-d pregnancy rate

Percentage of cows becoming pregnant every 21 days





# Data required for model

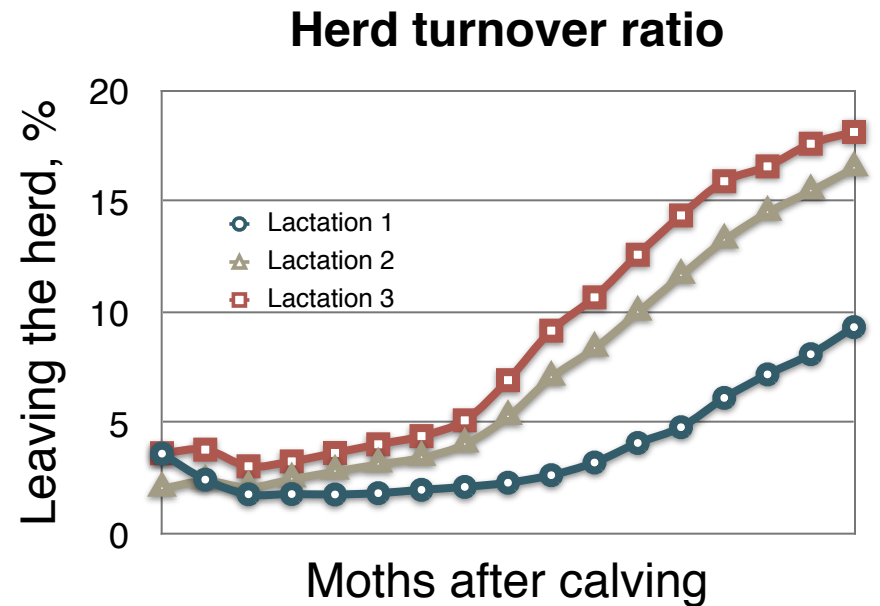
Herd level

## Herd turnover ratio

Percentage of animals leaving the herd

## Reproductive replacement

- Last month to breed non-pregnant cows
- Milk threshold to replace do-not-breed cows



# Data required for model

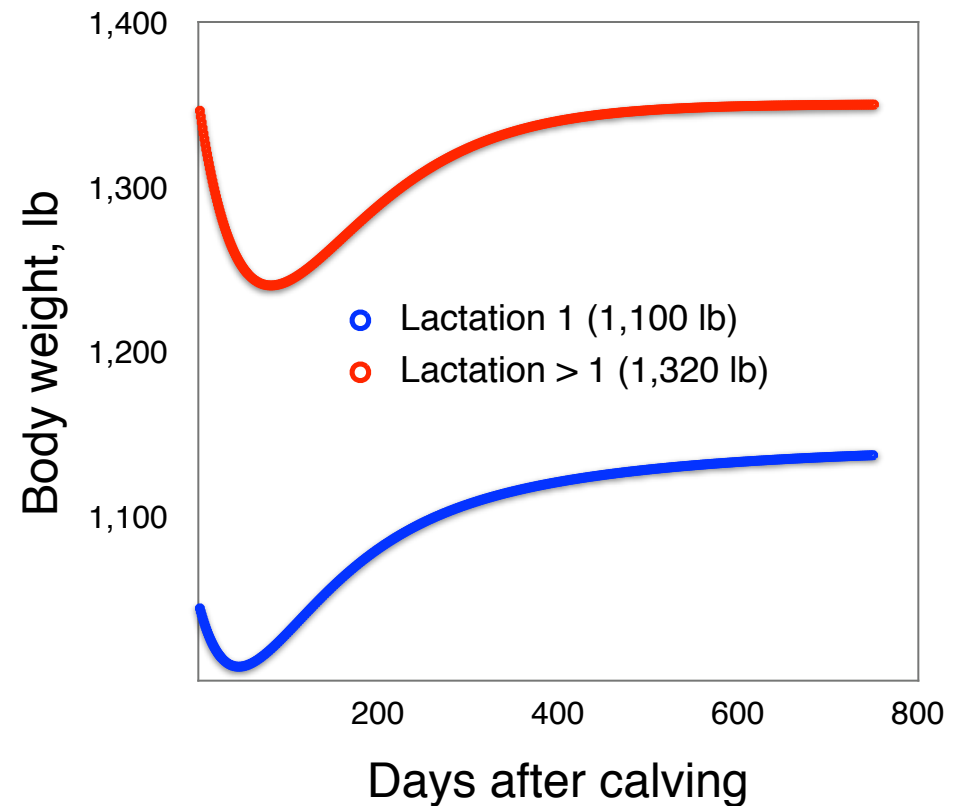
Herd level

## Body weight

- Within a lactation
- Between lactations

## Pregnancy loss

Abortion of pregnant cows between 35 days and end of gestation



# Data required for model

Farm data, economic variables

**Milk price**

**Feed cost**

**Reproductive cost**

**Replacement cost**

**Salvage value**

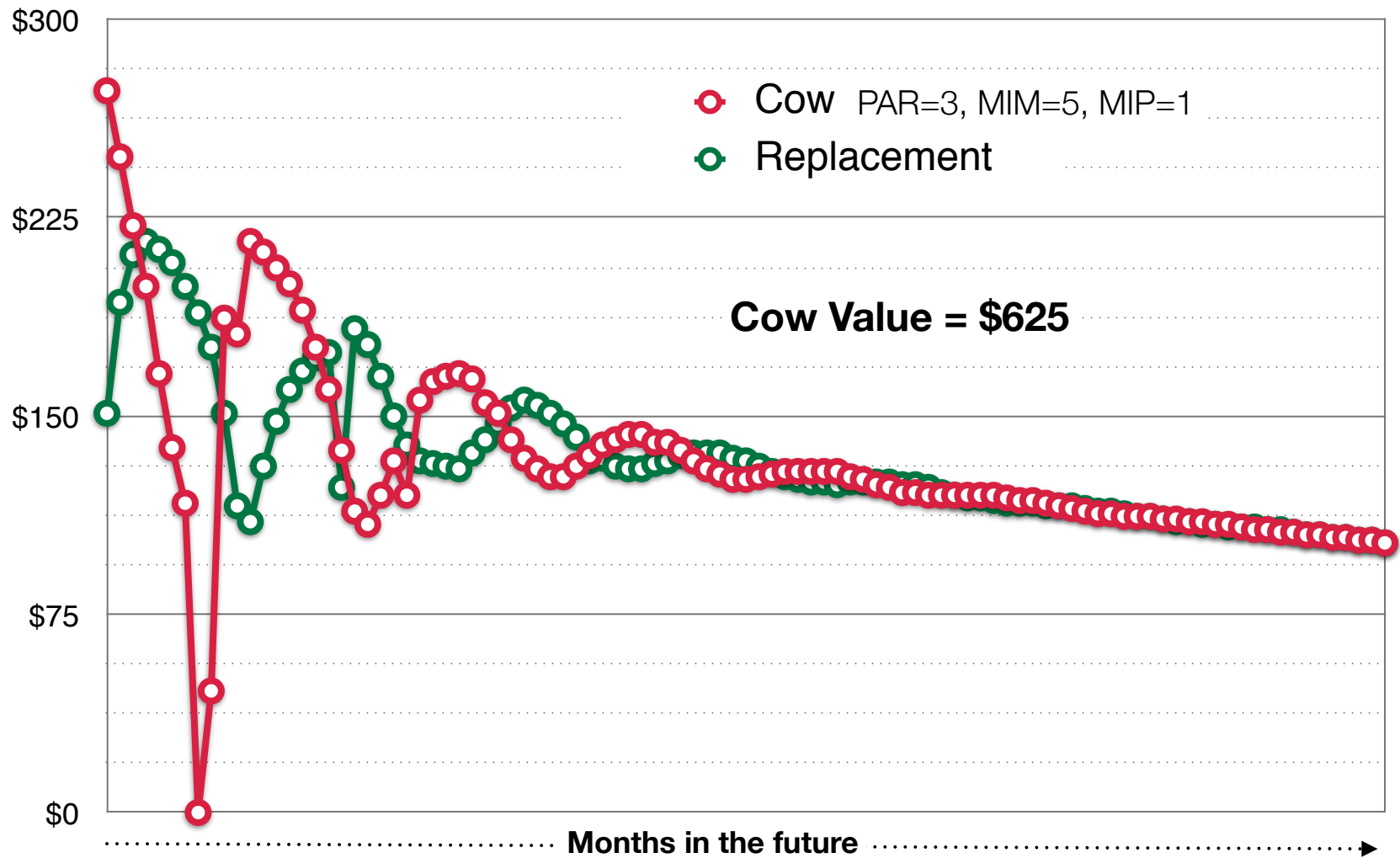
**Calf value**

**Interest rate**



# Economic net return

Expected future net returns

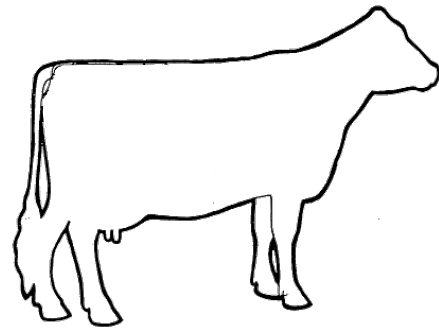


# The value of a new pregnancy

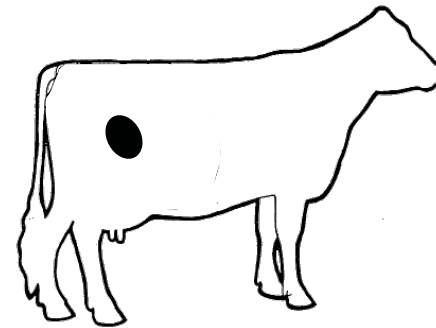
How much more when a cow becomes pregnant?

## Difference in cow value:

- Cow becoming pregnant
- Cow remaining non-pregnant



Vs.

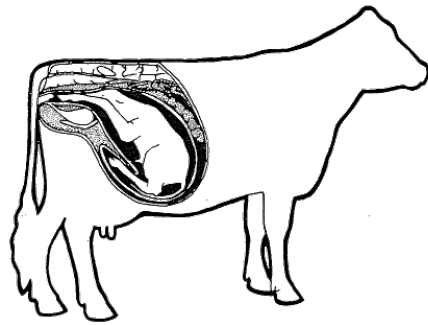


# The cost of a pregnancy loss

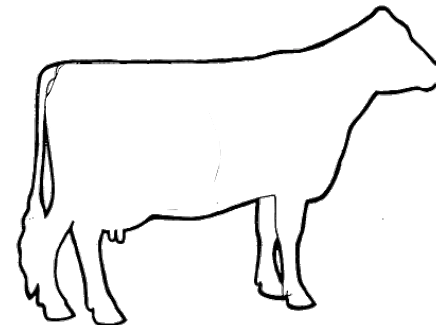
How much less when a cow aborts?

## Difference in cow value:

- Cow being pregnant
- Cow losing pregnancy



Vs.



# Model illustration

## Herd baseline data

Herd turnover ratio, %/year	35
Rolling herd average, kg/cow per year	10,896
21-d pregnancy rate, %	18
Reproduction cost, \$/cow per month	20
Last MIM to breed a cow	10
Milk threshold, kg/cow per day	22.7
Pregnancy loss after 35 d pregnant, %	22.6
Average cow body weight, kg	593

# Model illustration

## Herd baseline data

Replacement cost, \$/cow	1,300
Salvage value, \$/kg live weight	0.84
Calf value, \$/calf	100
Milk price, \$/kg	0.35
Milk butterfat, %	3.5
Feed cost for lactating cows, \$/kg dry matter diet	0.22
Feed cost for dry cows, \$/kg dry matter diet	0.18
Interest rate, %/year	6



# Model illustration

## Average cow and replacement

### Open cow value

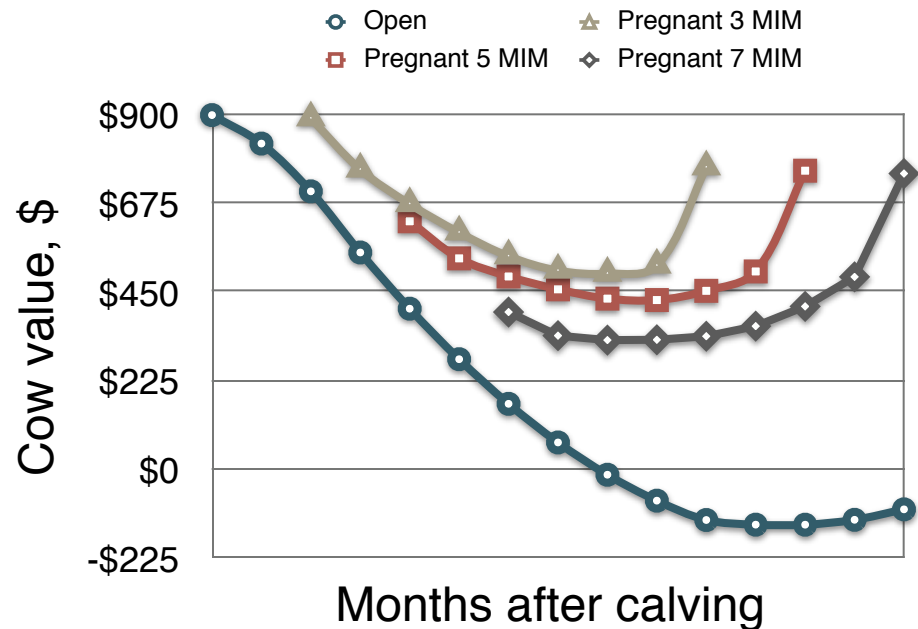
- Decreases
- Becomes negative

### Pregnant cow value

- Higher than open
- U-shaped
- Similar value at calving

### Overall cow value

- Increases to 3<sup>rd</sup> or 4<sup>rd</sup> lactation



# Model illustration

## Herd statistics

### Economic values, \$/cow per year

Milk sales revenue	3,834
Feed cost	1,522
Calf sales revenue	96
Non-reproductive culling cost	197
Mortality cost	38
Reproductive culling cost	58
Reproductive cost	80

### Herd structure

Days in milk	224
Days to conception	122
Percent of pregnant	52
Reproductive culling, %	8
Percent of 1 <sup>st</sup> parity cows	43
Percent of 2 <sup>nd</sup> parity cows	27
Percent of 3 <sup>rd</sup> parity cows	15

# Model illustration

The value of a new pregnancy, \$

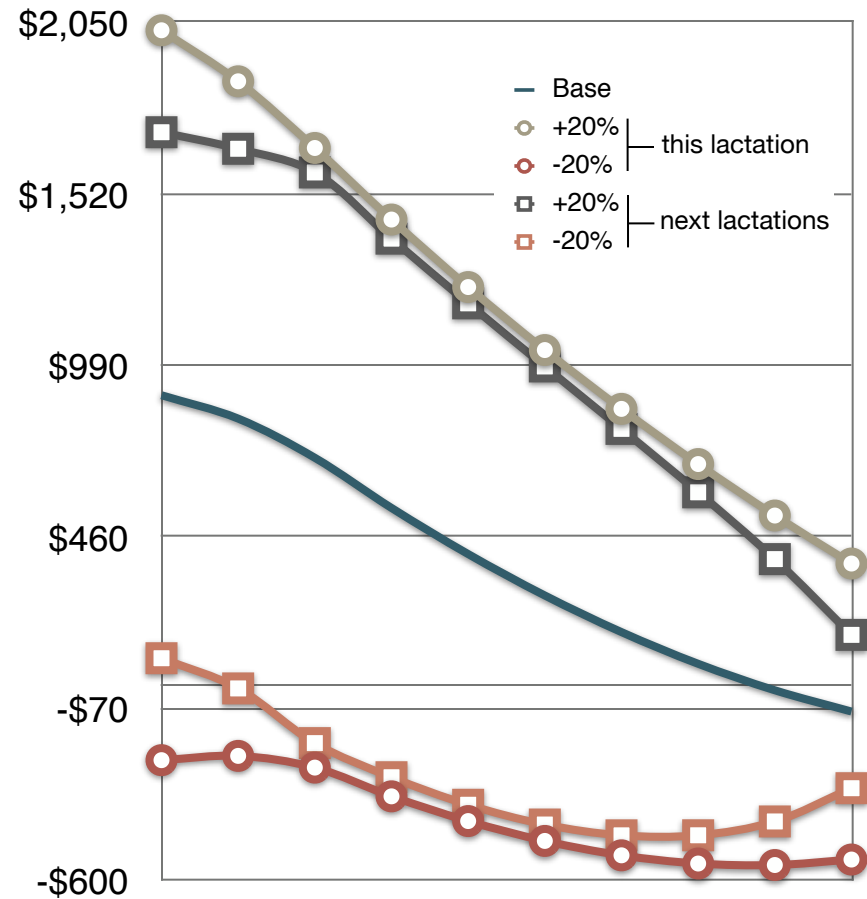
PAR	MIM	Cow value	Milk	Feed	Culling			Calf	Repro. cost
					Repro.	Non-Repro.	Morta- lity		
1	4	<b>151</b>	36	-34	45	26	5	29	45
1	6	<b>194</b>	40	-40	73	39	8	32	41
1	8	<b>233</b>	22	-43	116	55	10	36	36
3	4	<b>202</b>	46	-17	43	46	9	26	49
3	6	<b>215</b>	39	-25	69	50	9	27	47
3	8	<b>203</b>	-9	-29	108	53	10	27	43
5	4	<b>196</b>	36	-17	37	55	10	26	49
5	6	<b>203</b>	25	-22	60	57	11	26	47
5	8	<b>186</b>	-24	-25	94	61	12	26	44

# Model illustration

The impact of expected milk productivity

**Cow MIM = 8 and MIP = 2**

Rest lact.	Next lact.	1st lact.	2nd lact.	3rd lact.
120	120	2,458	2,038	2,002
120	100	1,045	877	829
120	80	-380	-284	-345
100	120	1,891	1,499	1,477
<b>100</b>	<b>100</b>	<b>479</b>	<b>338</b>	<b>304</b>
100	80	-934	-823	-870
80	120	1,325	961	952
80	100	-88	-200	-221
80	80	-1,501	-1,361	-1,395

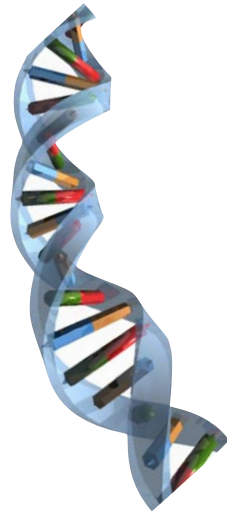


# Model illustration

The impact of genetic gain with a replacement

## Replacement genetic gain

- Cow value is \$211 lower for every 1% expected milk productivity of replacement



# Decision support system

Perform your own calculations

## Cow value is farm specific

Every farm is different



## Farm conditions change dynamically

Cow value and cow net return change

## Market conditions change permanently

Might impact decisions




## User-friendly application

Easy to use, still robust


# The economic value of a dairy cow

Freely and openly available



**WISCONSIN**  
UNIVERSITY OF WISCONSIN-MADISON

**The Economic Value of a Dairy Cow**  
Victor E. Cabrera, Department of Dairy Science



**UW**  
**Extension**  
University of Wisconsin-Extension

Overview | **Single Cow Analysis** | Herd Analysis

**INPUTS - Edit Values in This Block**

**Evaluated Cow Variables**

Current Lactation	3
Current Months after Calving	5
Current Months in Pregnancy	1
Expected Milk Production Rest of Lactation, %	100
Expected Milk Production Next Lactations, %	100

**Replacement Cow Variable**

Expected genetic improvement, % additional milk	0
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**Herd Production and Reproduction Variables**

Herd Turnover Ratio, %/year	35
Rolling Herd Average, lb/cow per year	24,000
21-d Pregnancy Rate, %	18
Reproduction Cost, \$/cow per month	20
Last Month After Calving to Breed a Cow	10
Do-not-Breed Cow Minimum Milk, lb/day	50
Pregnancy Loss after 35 Days Pregnant, %	22.6
Average Cow Body Weight, lb	1306

**Herd Economic Variables**

Replacement Cost, \$/cow	1300
Salvage Value, \$/lb live weight	0.38
Calf Value, \$/calf	100
Milk Price, \$/cwt	16
Milk Butterfat, %	3.5
Feed Cost Lactating Cows, \$/lb dry matter	0.1
Feed Cost Dry Cows, \$/lb dry matter	0.08
Interest Rate, %/year	6

[Analyze](#)

**OUTPUTS - Interactive Results**

**Value of the Cow, \$** 628

**Compared Against a Replacement, \$**

Milk Sales, \$	148
Feed Cost, \$	-157
Calf Value, \$	26
Non-reproductive Cull, \$	-126
Mortality Cost, \$	-24
Reproductive Cull, \$	12
Reproduction Costs, \$	45
Replacement Transaction, \$	704

**Herd Structure at Steady State**


Days in milk	224
Days to Conception	122
Percent of Pregnant	52
Reproductive Culling, %	8
Mortality, %	3
1st Lactation, %	43
2 <sup>nd</sup> Lactation, %	27
> 3 <sup>rd</sup> Lactation, %	30

**Economics of an Average Cow, \$/year**


Net Return, \$	1998
Milk Sales, \$	3834
Feed Cost, \$	-1522
Calf Sales, \$	60
Non-Reprod. Culling Cost, \$	-198
Mortality Cost, \$	-38
Reproductive Culling Cost, \$	-59
Reproductive Cost, \$	-80

# The economic value of all cows in a herd

## Use the herd analysis



**The Economic Value of a Dairy Cow**  
Victor E. Cabrera, Department of Dairy Science



Overview Single Cow Analysis Herd Analysis

**INPUTS - Edit Values in This Block**

**Download Parameter Excel File**  
[Download Parameters File](#)

**Upload Parameters as Excel File**  
Select the Excel File:  
 no file selected

**Replacement Cow Variable**  
Expected genetic improvement, % additional milk

**Herd Production and Reproduction Variables**

Herd Turnover Ratio, %/year	<input style="width: 50px;" type="text" value="35"/>
Rolling Herd Average, lb/cow per year	<input style="width: 50px;" type="text" value="24,000"/>
21-d Pregnancy Rate, %	<input style="width: 50px;" type="text" value="18"/>
Reproduction Cost, \$/cow per month	<input style="width: 50px;" type="text" value="20"/>
Last Month After Calving to Breed a Cow	<input style="width: 50px;" type="text" value="10"/>
Do-not-Breed Cow Minimum Milk, lb/day	<input style="width: 50px;" type="text" value="50"/>
Pregnancy Loss after 35 Days Pregnant, %	<input style="width: 50px;" type="text" value="22.6"/>
Average Cow Body Weight, lb	<input style="width: 50px;" type="text" value="1306"/>

**Herd Economic Variables**

Replacement Cost, \$/cow	<input style="width: 50px;" type="text" value="1300"/>
Salvage Value, \$/lb live weight	<input style="width: 50px;" type="text" value="0.38"/>
Calf Value, \$/calf	<input style="width: 50px;" type="text" value="100"/>
Milk Price, \$/cwt	<input style="width: 50px;" type="text" value="16"/>
Milk Butterfat, %	<input style="width: 50px;" type="text" value="3.5"/>
Feed Cost Lactating Cows, \$/lb dry matter	<input style="width: 50px;" type="text" value="0.1"/>
Feed Cost Dry Cows, \$/lb dry matter	<input style="width: 50px;" type="text" value="0.08"/>
Interest Rate, %/year	<input style="width: 50px;" type="text" value="6"/>

**OUTPUTS - Interactive Results**

Select an Excel file containing the farm data on the left and click the Analyze button at the bottom to analyze the data.

The evaluated data will be available for download as an Excel spreadsheet.

**NOTE:** Please limit the number of cows in the spreadsheet to 1,600 as the server cannot support larger number of calculations at the moment. If the herd contains a larger number of cows, please split the data into multiple spreadsheets so that the maximum number of cows in each spreadsheet is 1,600 and try performing the calculations by uploading each spreadsheet individually. The data gathered from the downloaded spreadsheets can then be merged using a spreadsheet program like Microsoft Excel or [LibreOffice Calc](#).



# The economic value of a dairy cow

Where to find it

## DairyMGT.info

Dairy Management UW-Extension  
University of Wisconsin-Madison

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### Dairy Management

Dairy Management site is designed to support dairy farming decision-making focusing on model-based scientific research. The ultimate goal is to provide user-friendly computerized decision support systems to help dairy farms improve their economic performance. Dr. Victor Cabrera focuses on model-based decision support in dairy cattle and in dairy farm production systems. Dr. Cabrera's primary interest is to improve cost-efficiency and profitability along with environmental stewardship in dairy farms by using simulation techniques, artificial intelligence, and expert systems. Dr. Cabrera's research and Extension programs involve interdisciplinary and participatory approaches towards the creation of user-friendly decision support systems. As an Extension Specialist, Dr. Cabrera works in close relationships with county-based Extension faculty, dairy producers, consultants, and related industry.

- Latest Projects
  - Genomic Selection and Herd Management
  - Dairy Reproduction Decision Support Tools
  - Strategies of Pasture Supplementation
  - Improving Dairy Cow Fertility
  - LGM-Dairy
- UW
  - University of Wisconsin - Madison
  - UW - Cooperative Extension
  - UW - Dairy Science
  - Understanding Dairy Markets
  - UW Dairy Nutrient
  - UW Center for Dairy Profitability
- Dairy News
  - UW-Extension Dairy News

**Helpful Link**

- Repro Money Program
- Contact

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Professional Page

**Admin Portal**  
Click Above to reach the Administrator Portal.

### TOOLS

Dairy Management Tools  
Click to find out more about tools provided by DairyMGT

READ MORE



## Tools

### Replacement

The Economic Value of a Dairy Cow

The Economic Value of a Dairy Cow

Excel Spreadsheet (Download)  
Online (Open)  
Demo (Click to View/Hide the Video)

Variable	Value
Herd Turnover Ratio, %/year	1.0
Reproductive Ratio, %/year	0.85
21-d Pregnancy Rate, %	85
Reproductive Cost, \$/cows per month	30
Cost/Heifer After Calfing to Breed a Cow	30
Do not Breed Cow More Than 180 Days	0
Frequency Cost after 180 days pregnant, %	25
Average Live Body Weight, lb	1300
Herd Structure Variables	
Replacement Cost, \$/cows	100
Salvage Value, \$/lb live weight	0.05
Calf Value, \$/calf	100
Milk Price, \$/cwt	15
Milk Butterfat, %	3.5
Feed Cost Lactating Cows, \$/lb dry matter	0.15
Feed Cost Dry Cows, \$/lb dry matter	0.1
Interest Rate, %/year	0.05
Replacement Turnover, %	100
Days to Calfing	270
Percent of Pregnant	85
Reproductive Cows, %	85
Mortality, %	1
1 <sup>st</sup> Lactation, %	45
2 <sup>nd</sup> Lactation, %	25
3 <sup>rd</sup> Lactation, %	10
Structure of an Average Cow, \$/year	
Heifer, \$	100
Milk, \$	15
Feed Cost, \$	15
Non-Feed, \$	10
Mortality Cost, \$	1
Reproductive Cows, \$	85
Replacement Cost, \$	100

# Examples of uses

How the tool could help decision making

## Time to replace a cow

- Cow value is negative
- Include milk expectancy
- Include genetic gain

## Herd performance

- Herd demographics
- Herd net returns

## The value of a:

- Pregnancy
- Day open
- Pregnancy loss

## Sorted list of cow values

- Candidates for replacement
- Best performing animals
- Treatment decisions

Cow ID	Cow value, \$
5892	-1,123
6344	-243
435	-10
221	269
5543	2,213

# Acknowledgement

## Project support

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National Institute of Food and Agriculture

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**Thanks**