

Move, Keep or Cull Her: Tools for Grouping & Culling Decisions



Part 1: The Economic Value of a Dairy Cow, Value of a Pregnancy, and Cost of a Pregnancy Loss

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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

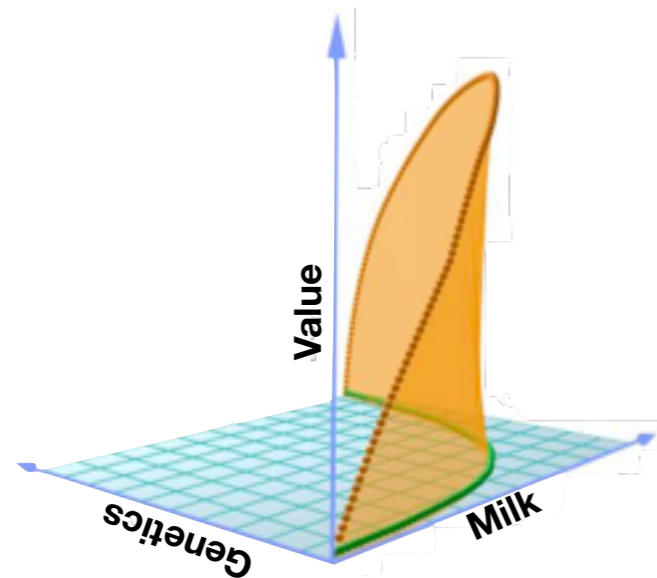


Vs.



Important factors

Variables with large impact

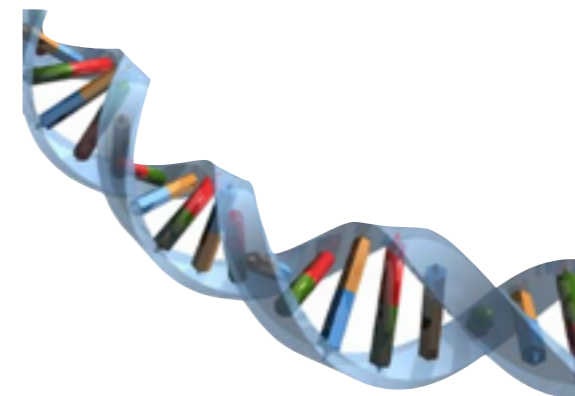


Cow expected milk production

- 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

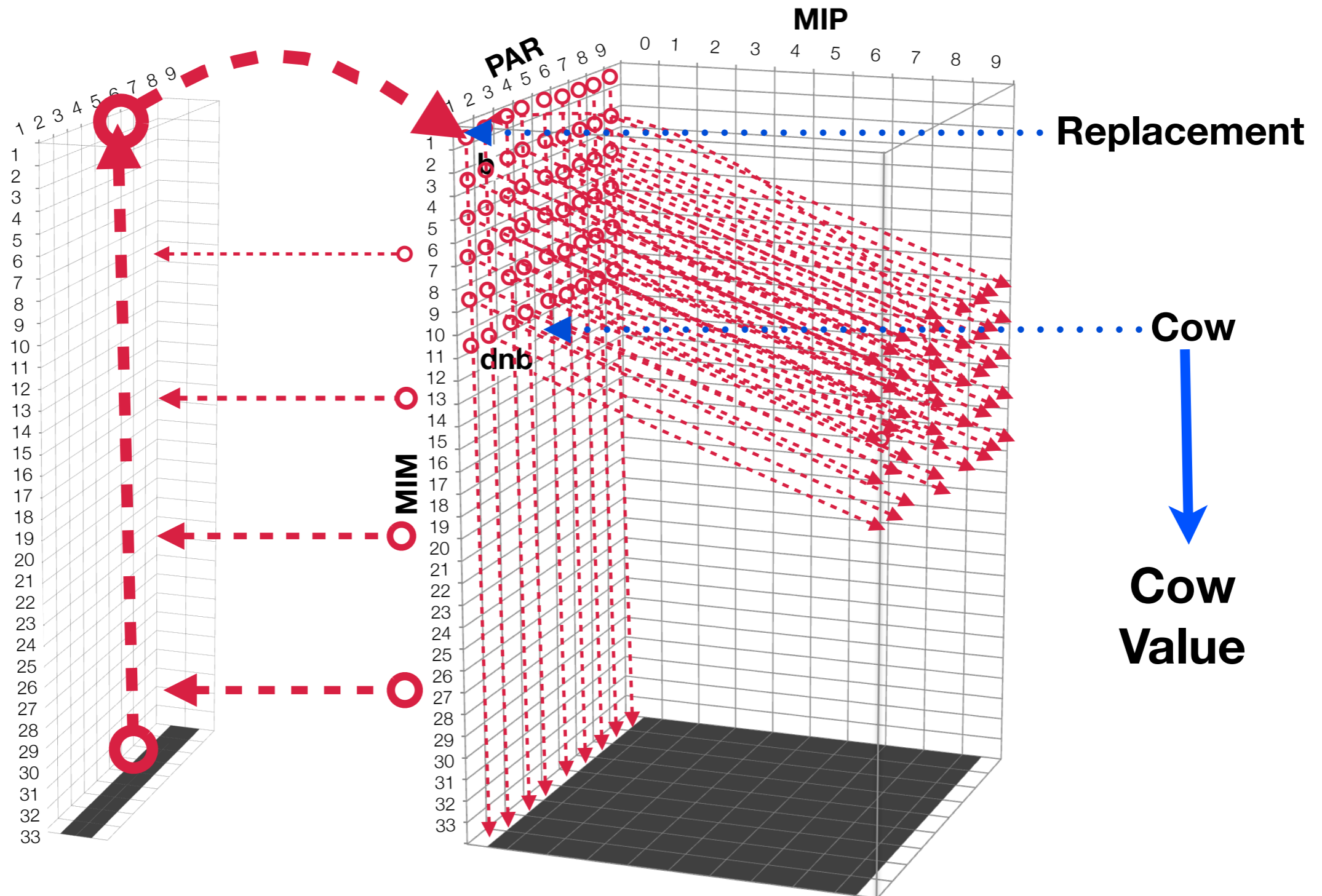
Important information

- 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

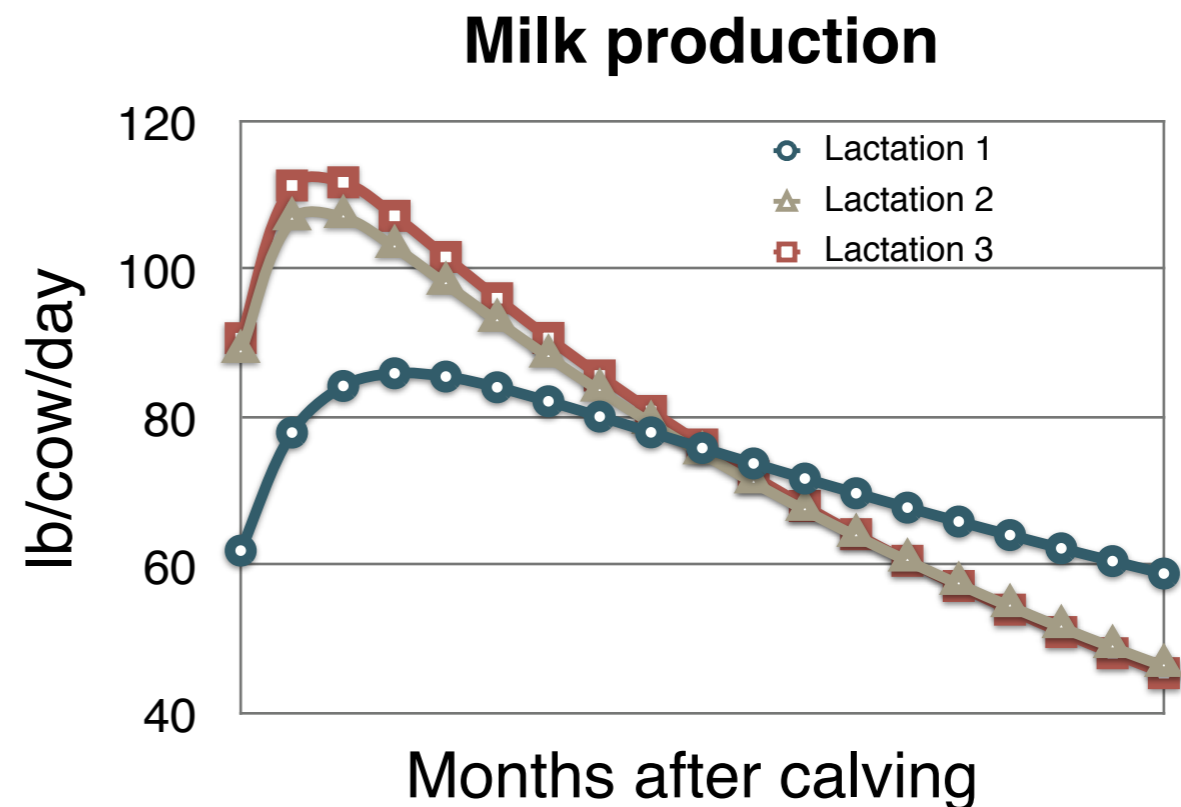
Herd level

Milk production

- Rolling herd average
- Butterfat content

21-d pregnancy rate

Percentage of cows becoming pregnant every 21 days



Data required for model

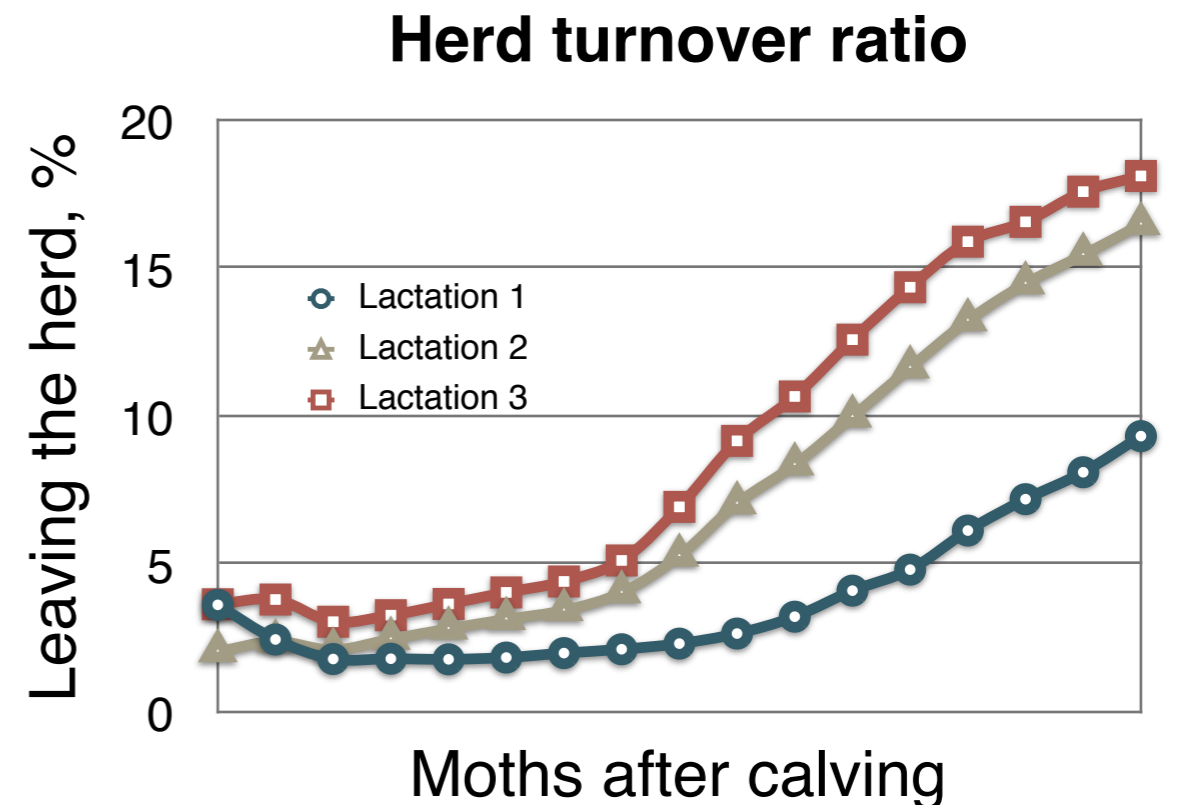
Herd level

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

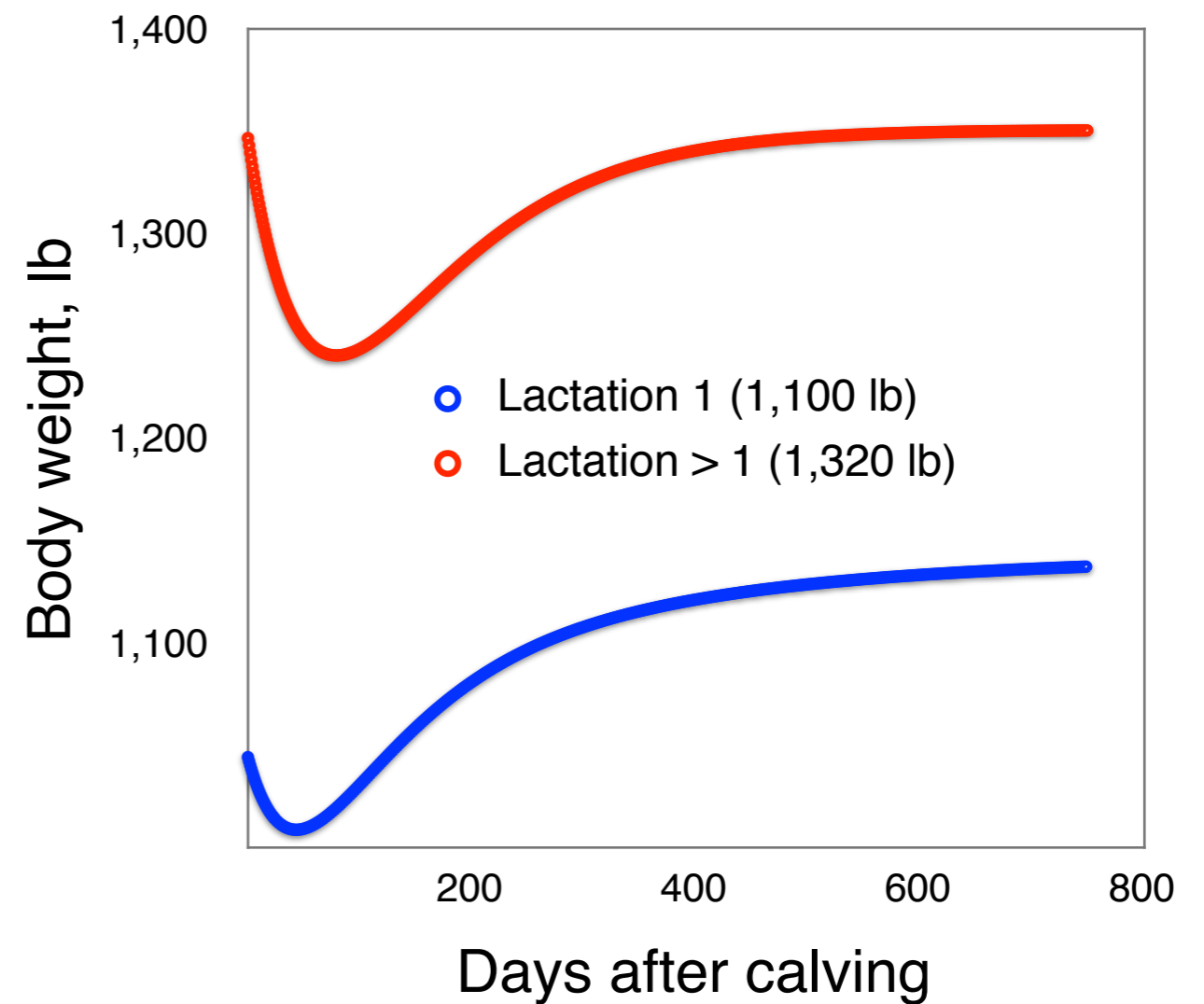
Herd level

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

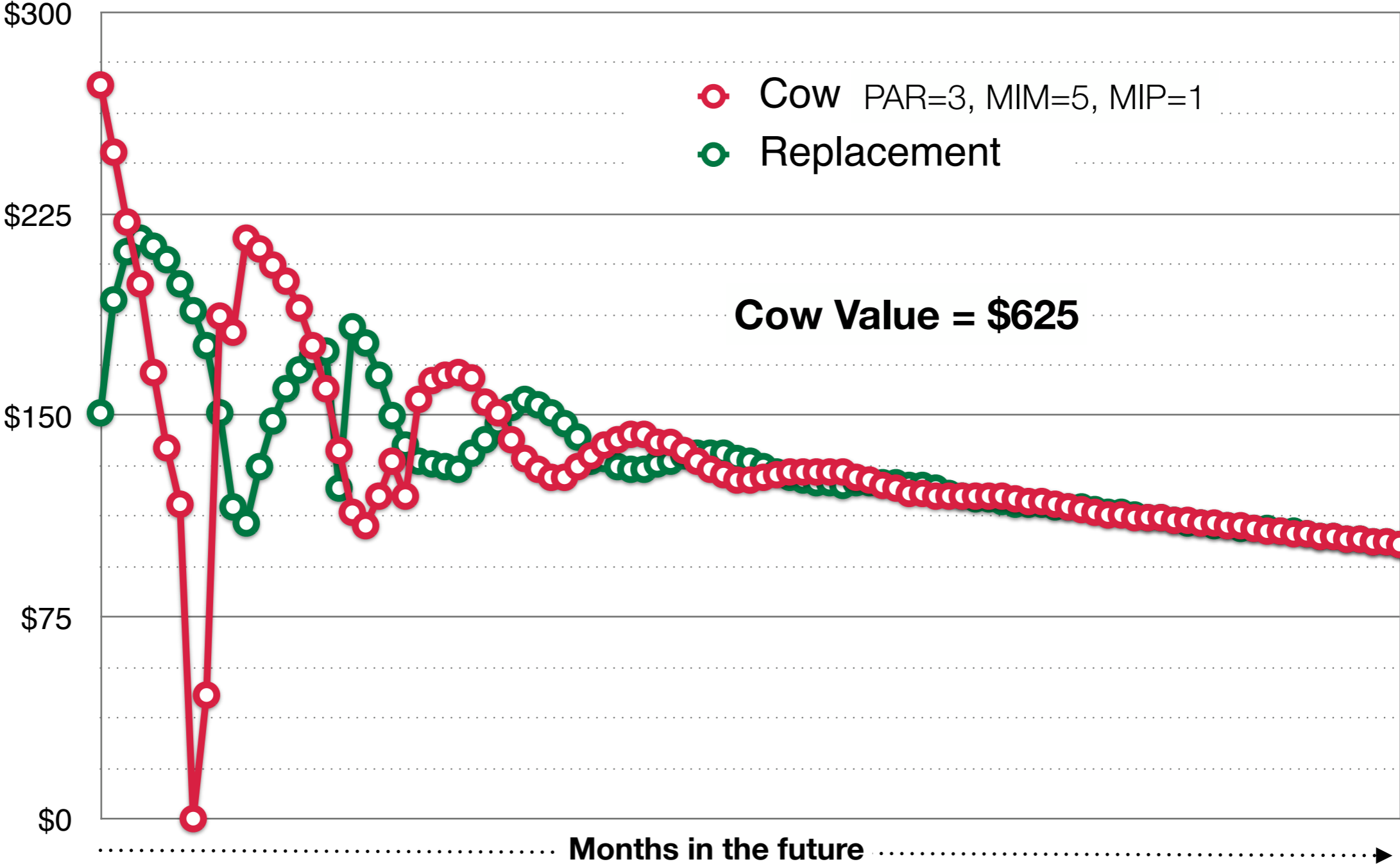
Calf value

Interest rate



Economic net return

Expected future net returns

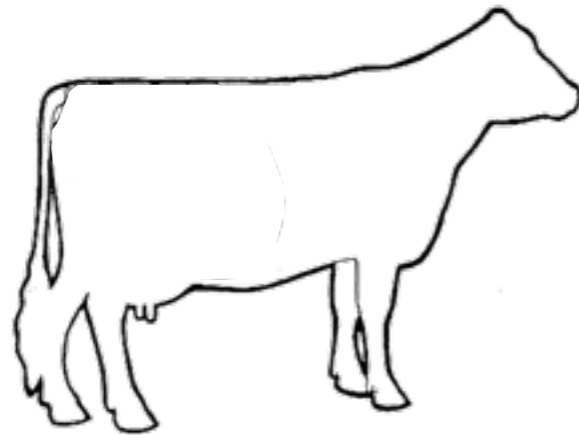


The value of a new pregnancy

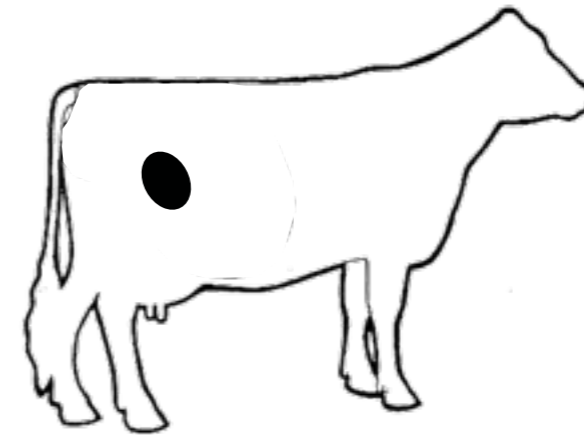
How much more when a cow becomes pregnant?

Difference in cow value:

- Cow becoming pregnant
- Cow remaining non-pregnant



Vs.

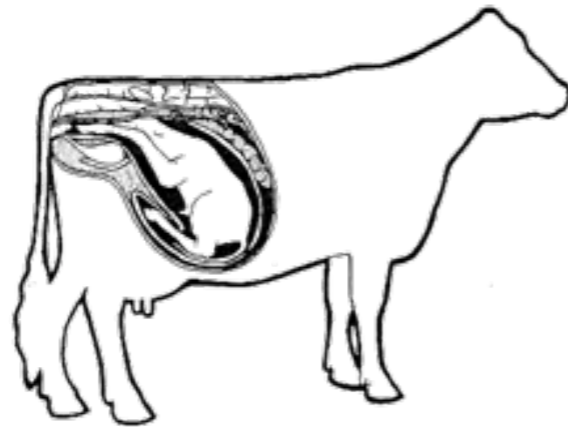


The cost of a pregnancy loss

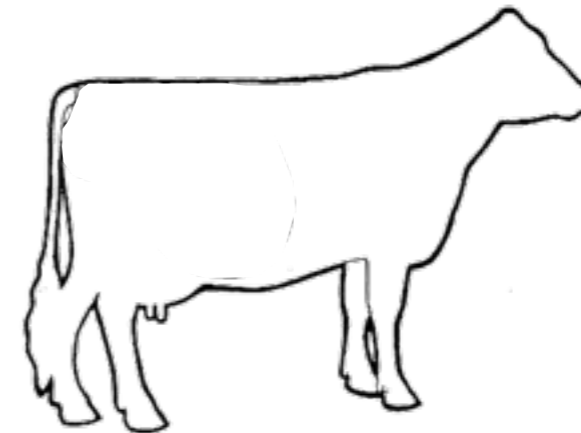
How much less when a cow aborts?

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

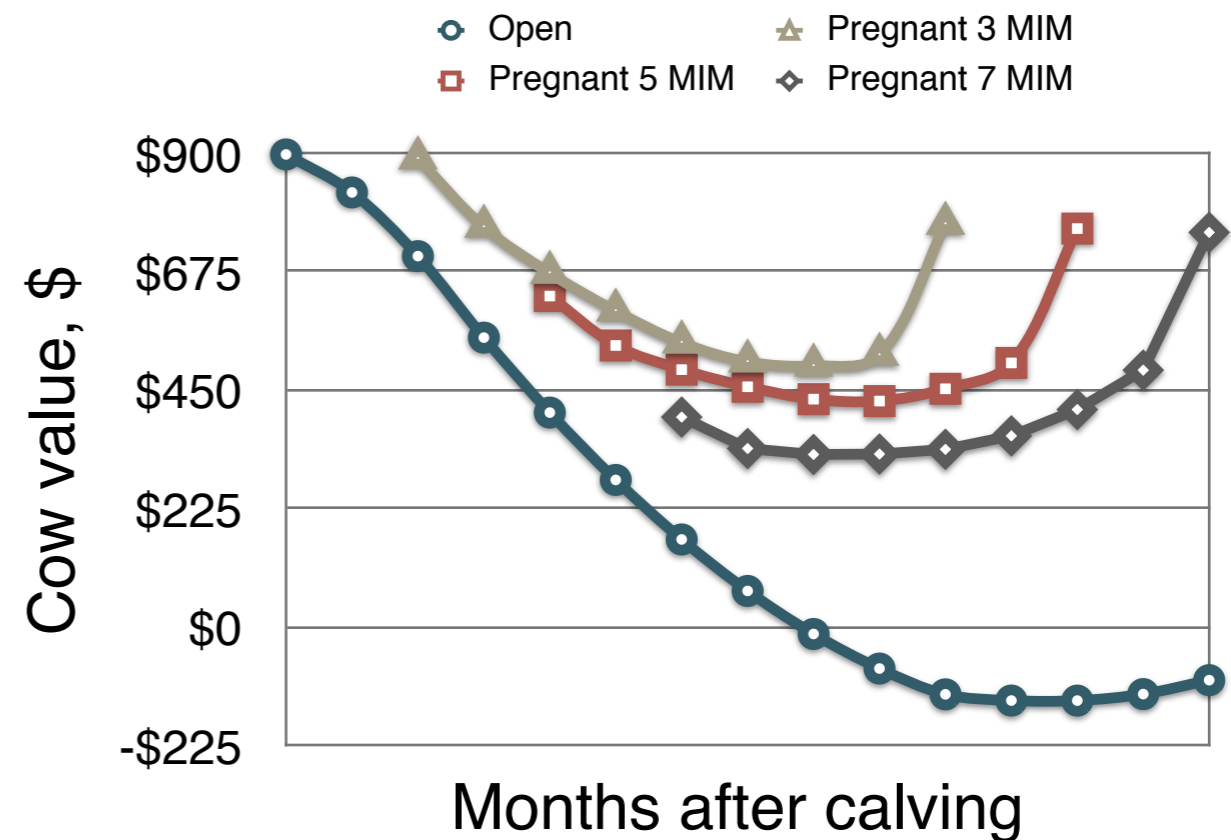
- Decreases
- Becomes negative

Pregnant cow value

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

Overall cow value

- Increases to 3rd or 4rd 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 st parity cows	43
Percent of 2 nd parity cows	27
Percent of 3 rd parity cows	15

Model illustration

The value of a new pregnancy, \$

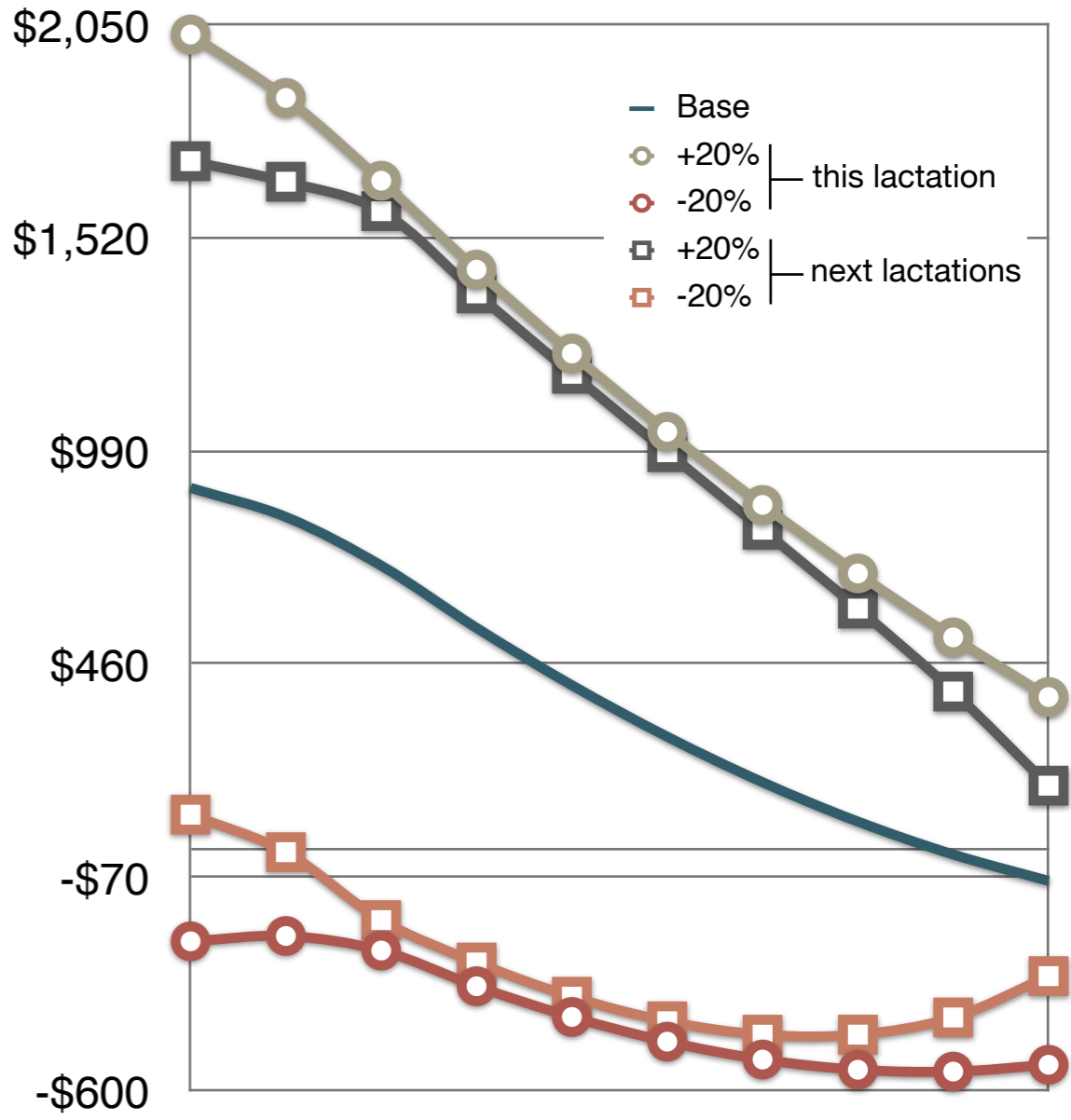
PAR	MIM	Cow value	Milk	Feed	Culling			Calf	Repro. cost
					Repro.	Non-Repro.	Mortality		
1	4	151	36	-34	45	26	5	29	45
1	6	194	40	-40	73	39	8	32	41
1	8	233	22	-43	116	55	10	36	36
3	4	202	46	-17	43	46	9	26	49
3	6	215	39	-25	69	50	9	27	47
3	8	203	-9	-29	108	53	10	27	43
5	4	196	36	-17	37	55	10	26	49
5	6	203	25	-22	60	57	11	26	47
5	8	186	-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
100	100	479	338	304
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 nd Lactation, %	27
> 3 rd 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

 **UW Extension**
University of Wisconsin-Extension

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

Herd Economic Variables

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

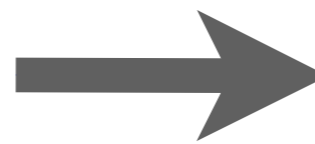
NOTE: Please limit the number of cows in the spreadsheet to 1,600 as the server cannot support larger number of calculations at the moment. If the herd contains a larger number of cows, please split the data into multiple spreadsheets so that the maximum number of cows in each spreadsheet is 1,600 and 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

The screenshot shows the homepage of DairyMGT.info, a website from the University of Wisconsin-Madison. The header features the university's logo and navigation menus for 'Home', 'Tools', 'Projects', 'Publications', 'Presentations', 'Links', and 'Find'. Below the header, there is a section titled 'Dairy Management' with a descriptive paragraph about the site's purpose. To the left, there are sections for 'Latest Projects' and 'UW' with various links. To the right, there is a 'Helpful Link' section and a 'Contact' section featuring a profile for Victor E. Cabrera, Ph.D., an Assistant Professor and Extension Specialist in Dairy Management. A 'TOOLS' section is also visible, with a button to 'Click to find out more about tools provided by DairyMGT'.



Tools

The screenshot shows the 'Replacement' tool interface. The title is 'Replacement' and the main heading is 'The Economic Value of a Dairy Cow'. Below this, there are links for 'Excel Spreadsheet (Download)', 'Online (Open)', and 'Demo (Click to View/Hide the Video)'. The interface is a complex form with various input fields and dropdown menus, organized into sections like 'Basic Production and Reproduction Variables', 'Replacement Transactions', and 'Economic Value of an Average Cow, \$/cow'. A large play button icon is centered over the form, indicating a video demonstration. The background is a light yellow color.

A blurred screenshot of the tool interface, showing a similar layout to the one above but with significantly reduced contrast and detail.

Economic Value of a Dairy Cow



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

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United States Department of Agriculture
National Institute of Food and Agriculture

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Thanks