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
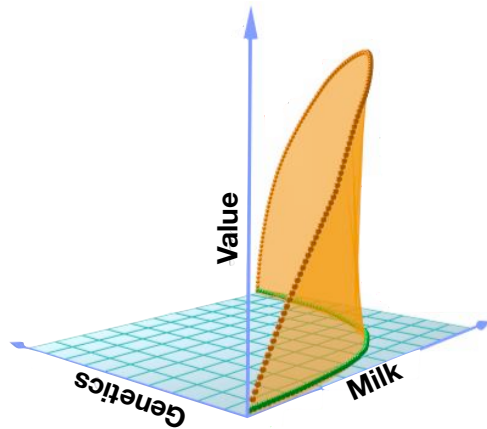- Negative cow value = replace

Vs.

Important factors
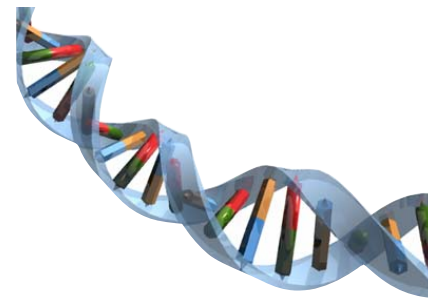
Variables with large impact

Cow expected milk production
•This lactation
•Future lactations

Replacement
Expected genetic gain

Why to worry about the cow value?
Critical economic implications

Optimal management
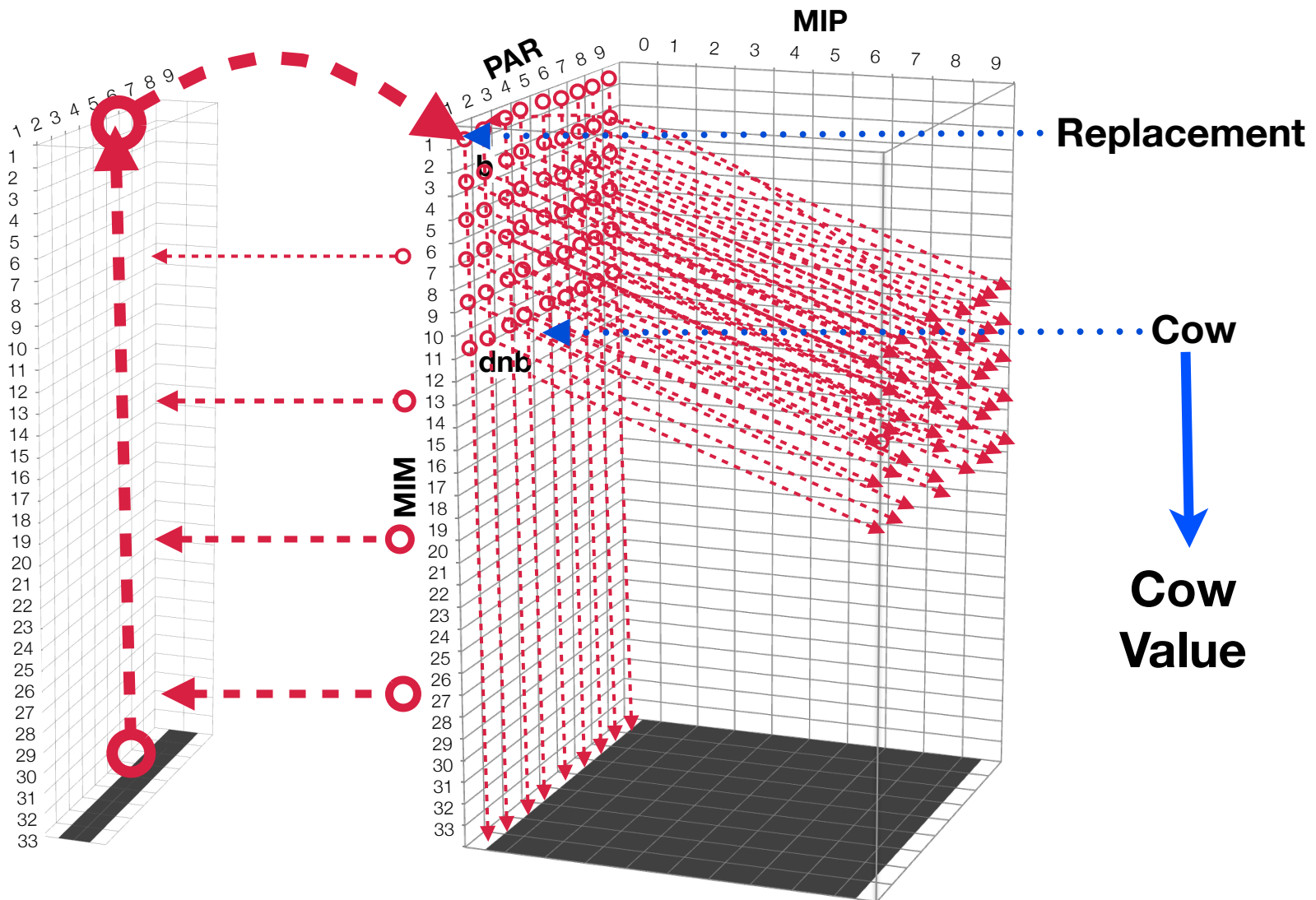Keep or replace

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

Cabrera, 2012

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
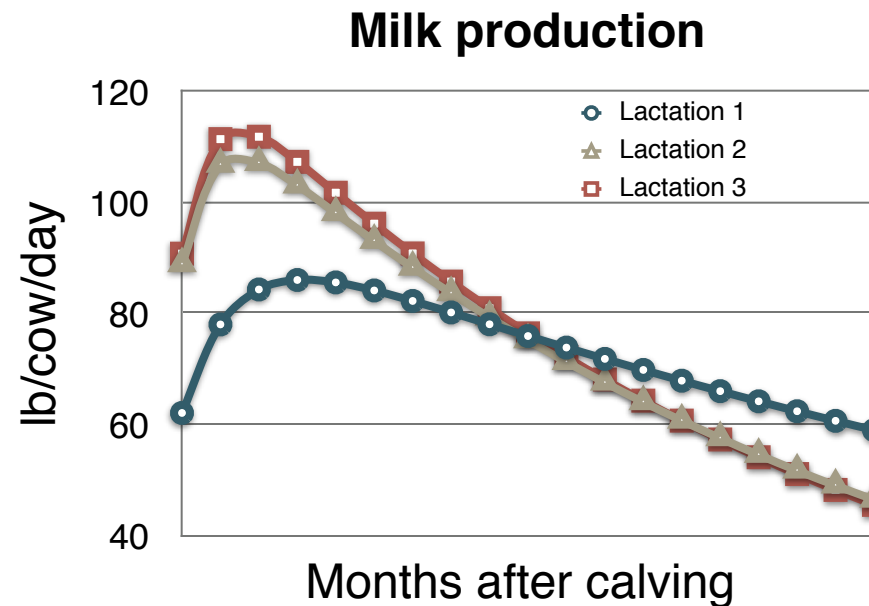- Expected productivity gain with the replacement

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

Milk production

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

Herd turnover ratio

Legend:
- Lactation 1
- Lactation 2
- Lactation 3

Y-axis: Leaving the herd, %
X-axis: Moths after calving
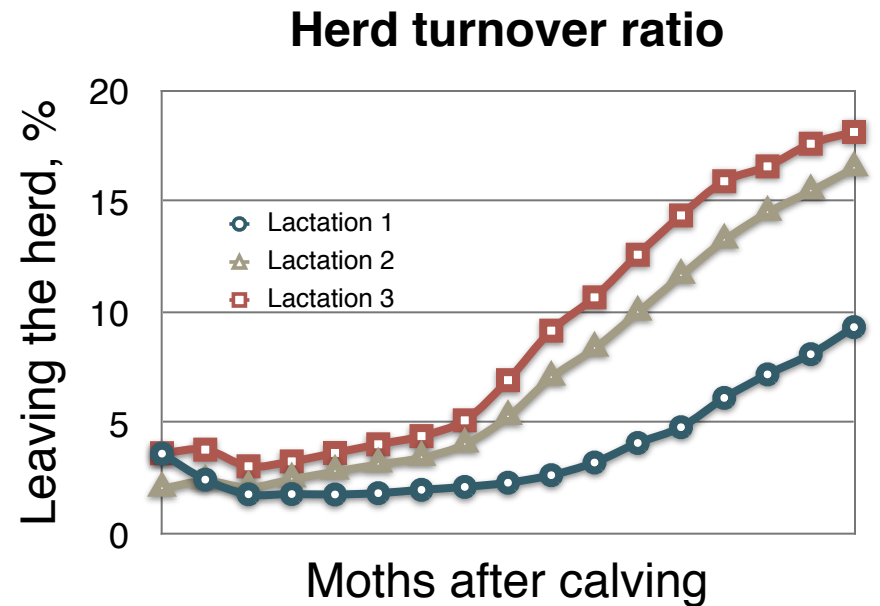
Data required for model
Herd level

Body weight
- Within a lactation
- Between lactations

Pregnancy loss
Abortion of pregnant cows between 35 days and end of gestation
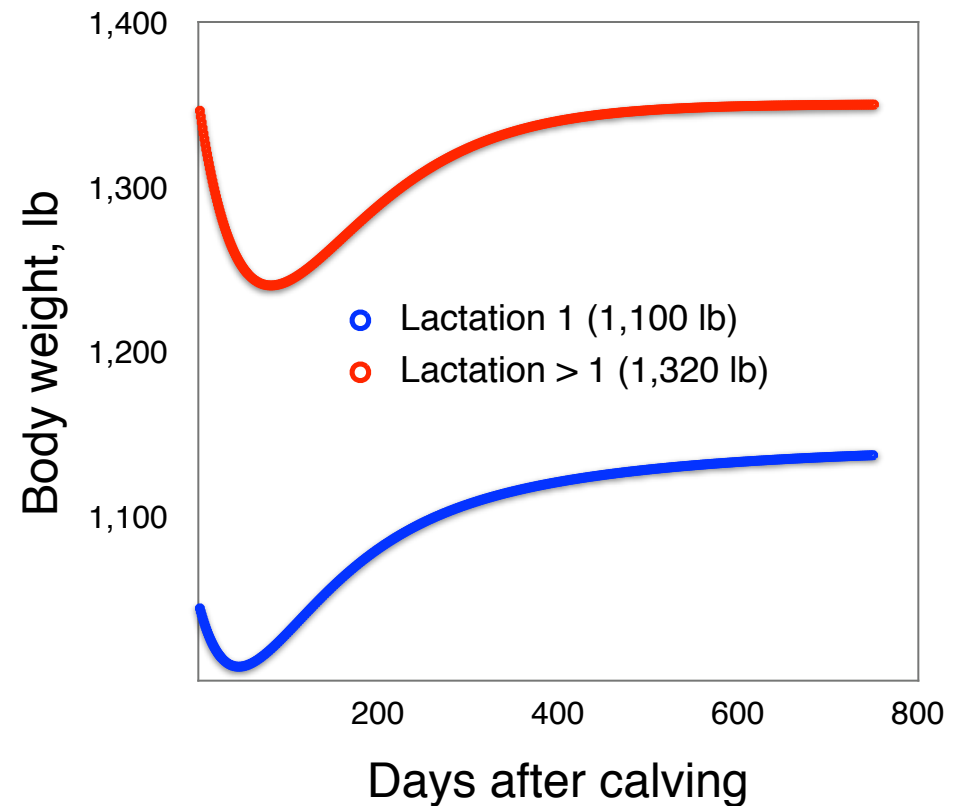
Data required for model
Farm data, economic variables

Milk price

Feed cost

Reproductive cost

Replacement cost

Salvage value

Calf value

Interest rate

Economic net return
Expected future net returns
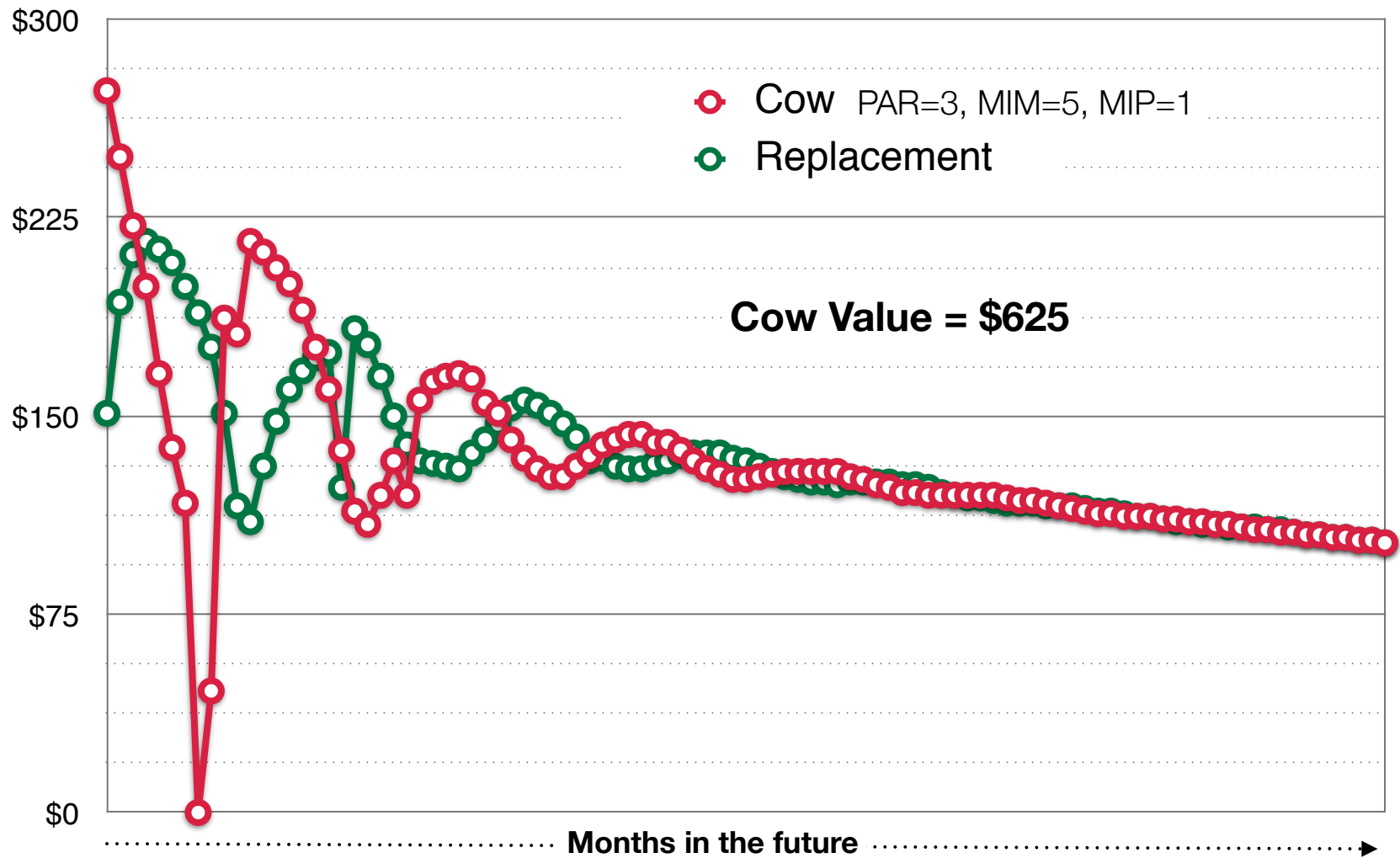
The value of a new pregnancy
How much more when a cow becomes pregnant?

Difference in cow value:
- Cow becoming pregnant
- Cow remaining non-pregnant
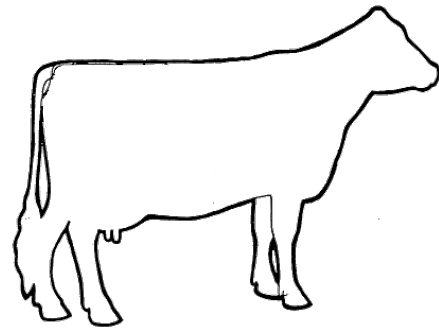
Vs.
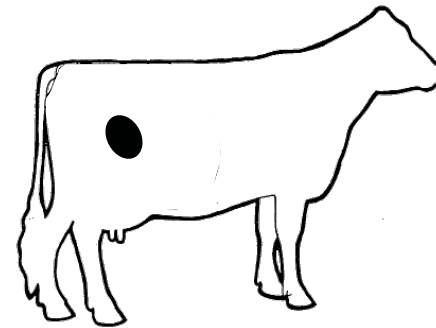
The cost of a pregnancy loss
How much less when a cow aborts?

Difference in cow value:
- Cow being pregnant
- Cow losing pregnancy
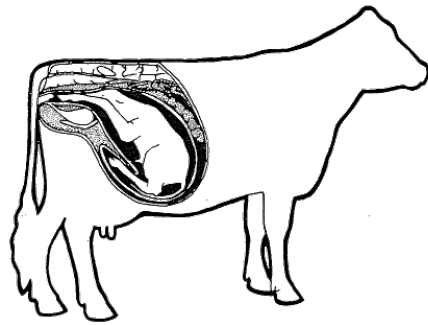
Vs.
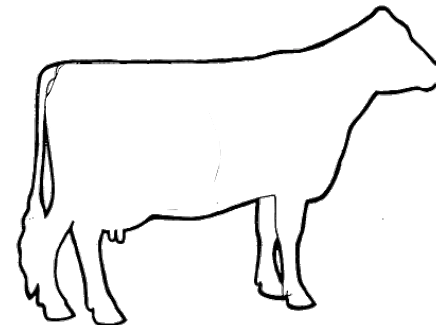
Model illustration

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

Cabrera, 2012

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

Cabrera, 2012

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
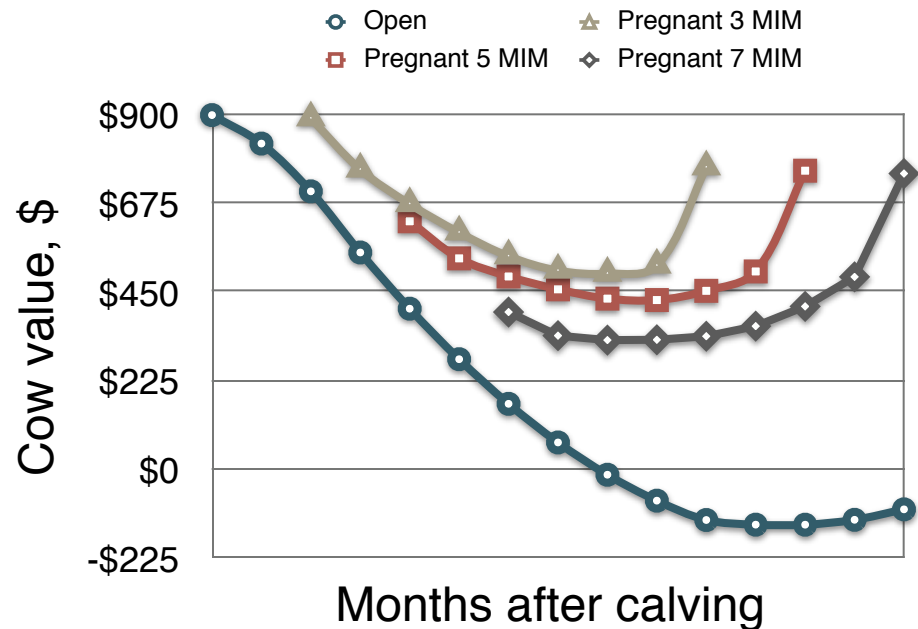
Model illustration

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 1st parity cows	43
Percent of 2nd parity cows	27
Percent of 3rd 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	**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
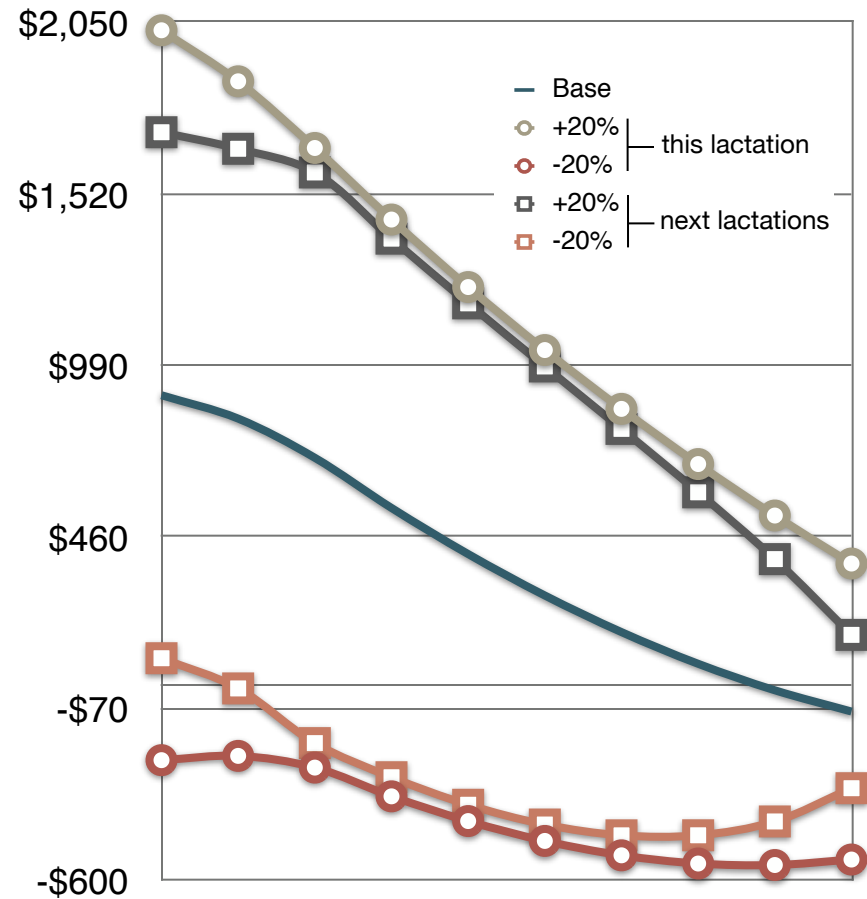
Model illustration

The impact of genetic gain with a replacement

Replacement genetic gain

- Cow value is $211 lower for every 1% expected milk productivity of replacement
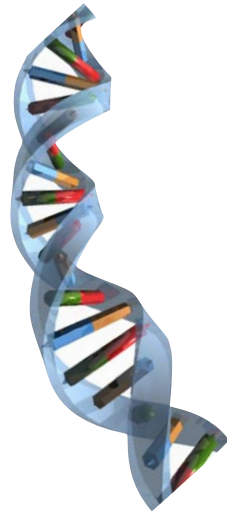
Decision support system
Perform your own calculations

Cow value is farm specific
Every farm is different

Farm conditions change dynamically
Cow value and cow net return change

User-friendly application
Easy to use, still robust

Market conditions change permanently
Might impact decisions

The economic value of a dairy cow
Freely and openly available

The economic value of all cows in a herd
Use the herd analysis

The economic value of a dairy cow
Where to find it

DairyMGT.info

Tools

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

Thanks