UW-Dairy Management Decision Support TOOLS

Decision Making Tools for Dairy Producers

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13th INTERLEITE – International Symposium on Competitive Milk Production. Uberlândia, Minas Gerais State, 11 - 12 September 2013.

DairyMGT.info
Decision support tools

Feeding

- FeedVal 2012
- Grouping Strategies for Feeding Lactating Dairy Cattle
- Optigen® Evaluator
- Income Over Feed Supplement Cost
- Dairy Extension Feed Cost Evaluator
- Corn Feeding Strategies
- Income Over Feed Cost
- Dairy Ration Feed Additive Break-Even Analysis

Heifers

- Cost-Benefit of Accelerated Liquid Feeding Program for Dairy Calves
- Economic Value of Sexed Semen Programs for Dairy Heifers
- Heifer Replacement
- Heifer Break-Even

Reproduction

- UW-DairyRepro$Plus: A Reproductive Analysis Tool that Includes Heat Detection Devices
- Economic Value of Sexed Semen Programs for Dairy Heifers
- UW-DairyRepro$: A Reproductive Economic Analysis Tool
- Exploring Timing of Pregnancy Impact on Income Over Feed Cost
- Dairy Reproductive Economic Analysis

Production

- Milk Curve Fitter
- Decision Support System Program for Dairy Production and Expansion
- Economic Analysis of Switching from 2X to 3X Milking
- Lactation Benchmark Curves for Wisconsin
- Economic Evaluation of using rbST
- Alfalfa Yield Predictor: Using a Computer Application to Predict Irrigated Alfalfa Yield

Replacement

- The Economic Value of a Dairy Cow
- Value of a Springer
- Heifer Replacement
- Heifer Break-Even
- Herd Structure Simulation

Financial

- LGM-Dairy Analyzer
- Working Capital Decision Support System
- The Wisconsin Dairy Farm Ratio Benchmarking Tool
- Decision Support System Program for Dairy Production and Expansion
- Least Cost Optimizer
- LGM-Dairy Premium Sensitivity
- Return to Labor
- Estimate Your Mailbox Price
- LGM Dairy Feed Equivalent Calculator
- Net Guarantee Income Over Feed Cost for LGM-Dairy

Price Risk

- LGM-Dairy Premium Sensitivity
- Least Cost Optimizer
- LGM Premium
- LGM Dairy Feed Equivalent Calculator
- Milk Component Price Analysis

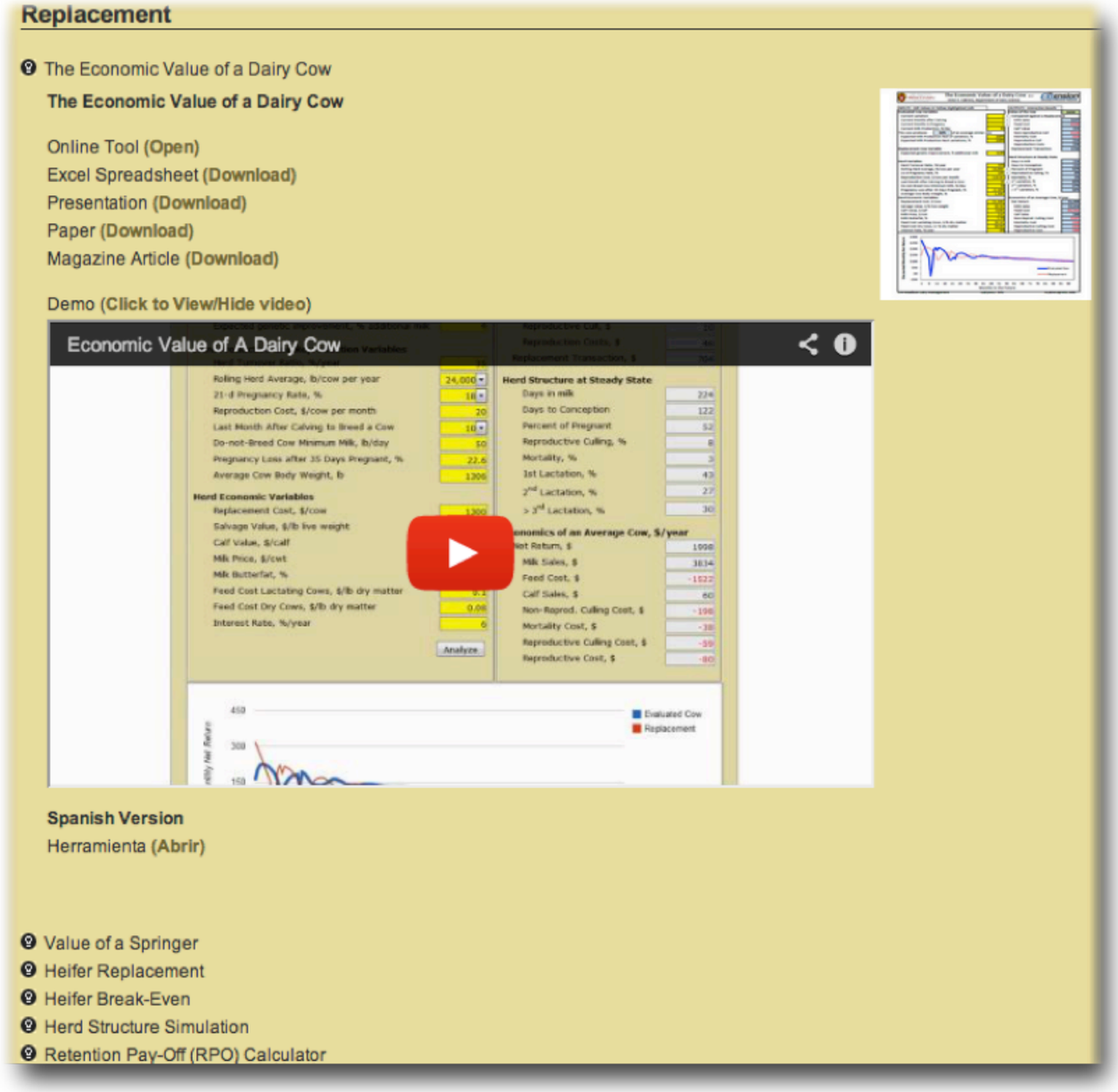
Environment

- Dairy Nutrient Manager
- Grazing-N: Application that Balances Nitrogen in Grazing Systems
- Seasonal Prediction of Manure Excretion
- Dynamic Dairy Farm Model

UW-Dairy Management Tools

Content for each tool

- Descriptive name
- Type:
- Online
- Spreadsheet
- Installable
- Associated documents:
- Guide
- Instructions
- Presentation
- Papers
- Video demonstration
- Language versions
- Unit versions
- Country versions



Why decision support tools?

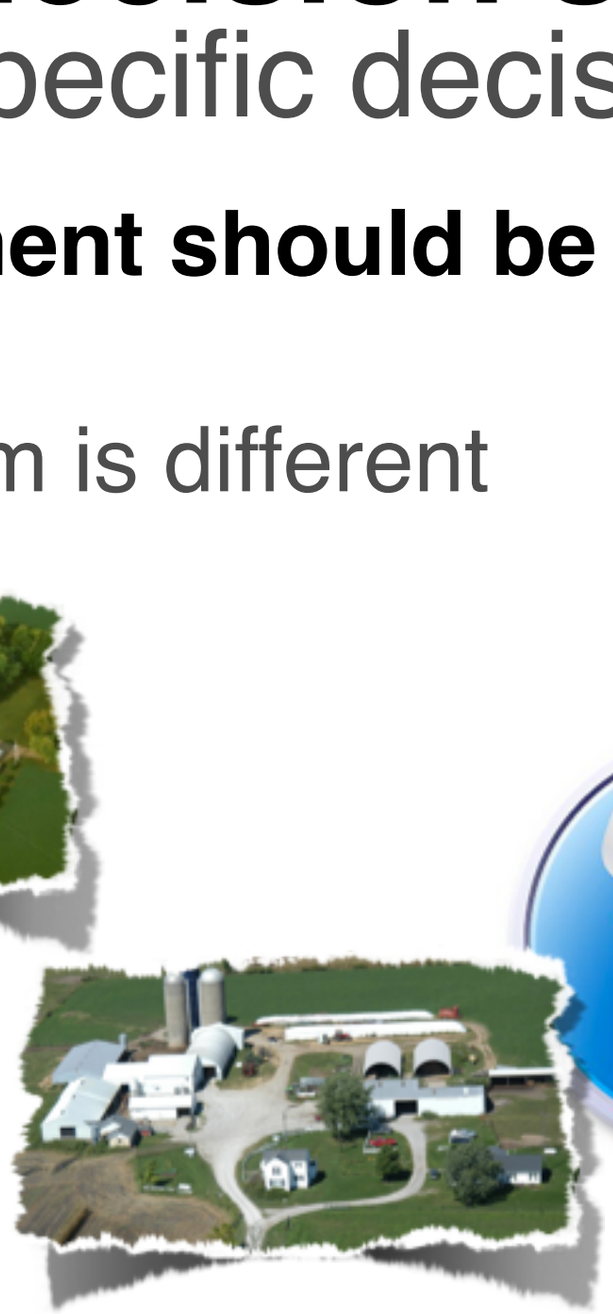
Farm specific decision-making

Assessment should be farm specific

Every farm is different

Farm conditions change dynamically

Decisions should adjust



Market conditions change permanently

Impact decisions

User-friendly applications

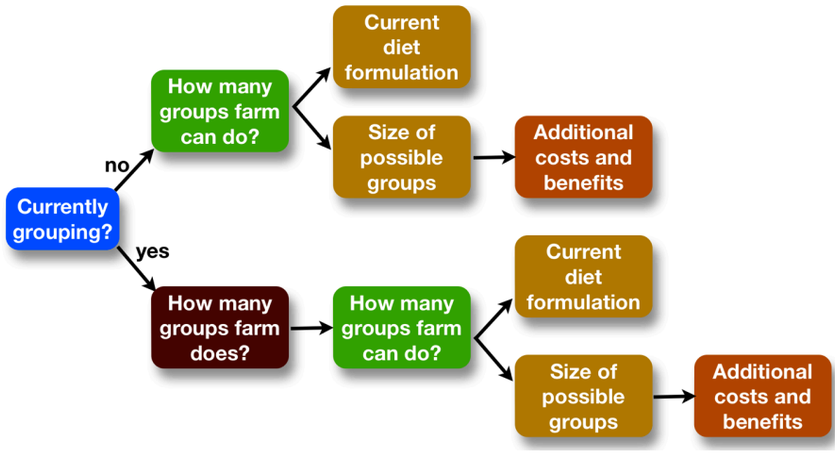
Easy to use, still robust

Demonstration of some tools

3 different areas of dairy management

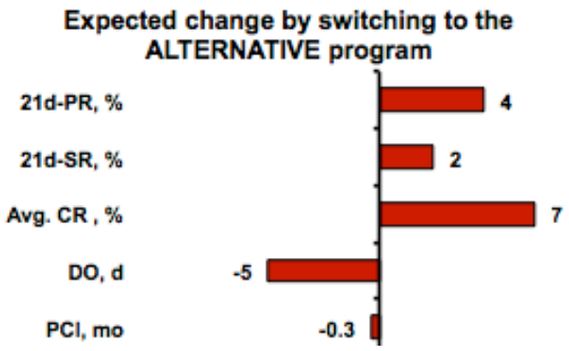
Feeding and nutrition

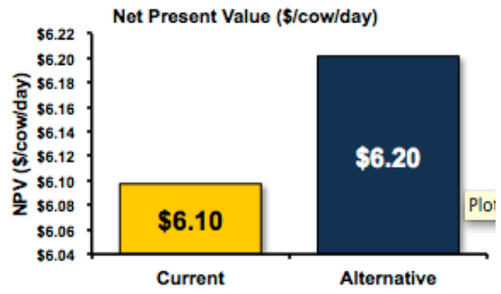
Grouping strategies for feeding lactating cows



Reproduction

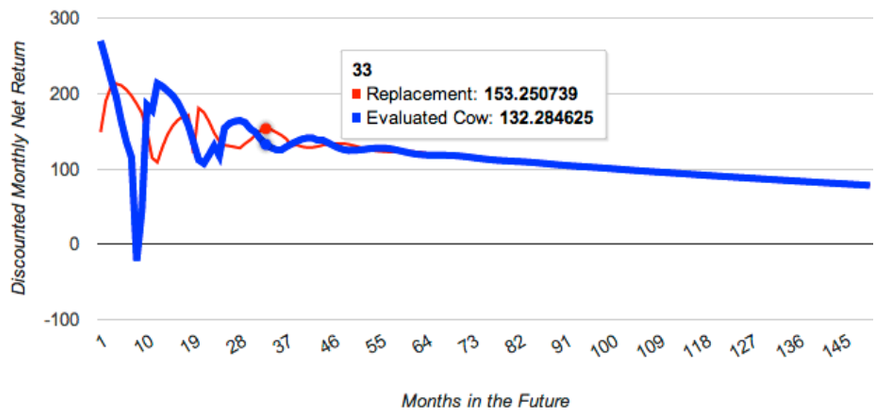
UW-DairyRepro$Plus: A reproductive analysis

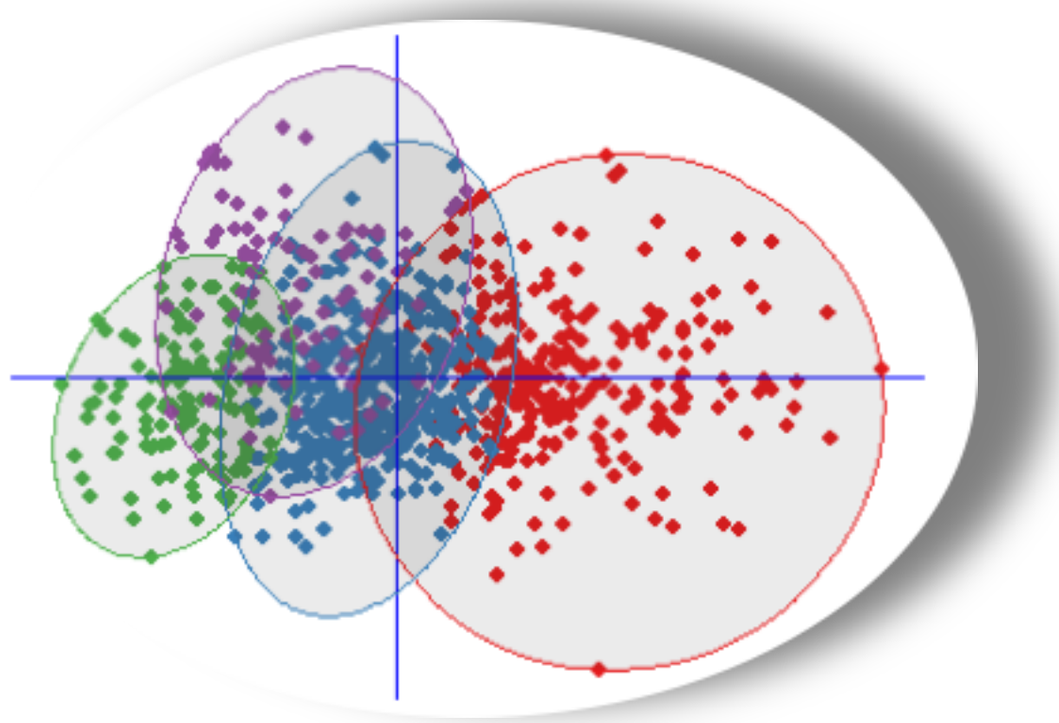




Replacement

Economic value of a dairy cow





Nutritional Grouping Strategies

Strategies for grouping cows

Depend on farm and herd characteristics

Individual cow nutrient requirements

- Energy
- Protein
- DMI

Farm characteristics

Capacity to handle lactating feeding groups

Number of lactating cows on the herd

Adapted from McGilliard et al., 1983; St-Pierre and Thraen, 1999

Nutrient requirement for a group

Energy and protein

Lead factor

Multiplicative factor to adjust nutrient requirements of a group

Stallings and McGilliard, 1984
St-Pierre and Thraen, 1999

$$NE_{group}\ (Mcal) = 83^{rd}\ Percentile\ of\ (NE_{group\_cows})$$

$$CP_{group}\ (\%) = 83^{rd}\ Percentile\ (CP_{group\_cows})$$

Criteria for grouping

Several criteria exist

Days after calving (DIM)

Based on stage of lactation

Fat corrected milk

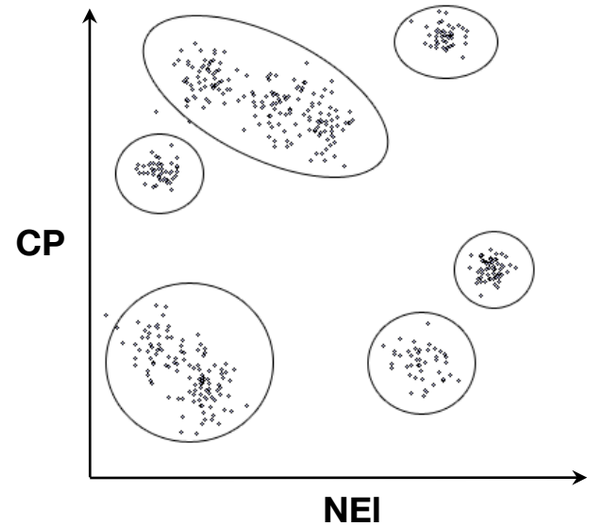
Based on level of production measured as FCM

Dairy merit

Function of both FCM and BW

Cluster (BEST)

Function of NE and CP. Seems to be most efficient criterion.



McGilliard et al., 1983
St-Pierre and Thraen, 1999

Value of NE, CP, and milk

Determine diets' cost (August 2013)

Using referee feeds

Petersen method

St-Pierre and Giamocic, 2000

Corn: 9% CP + 0.91 Mcal = $0.27/kg

SBM: 54% CP + 1.00 Mcal = $5.87/kg

Price NE and CP

NE ($/Mcal) = 0.116

CP ($/kg) = 0.747

http://dairymgt.info/tools/feedval_12/index.php

Price of milk

$0.42/kg

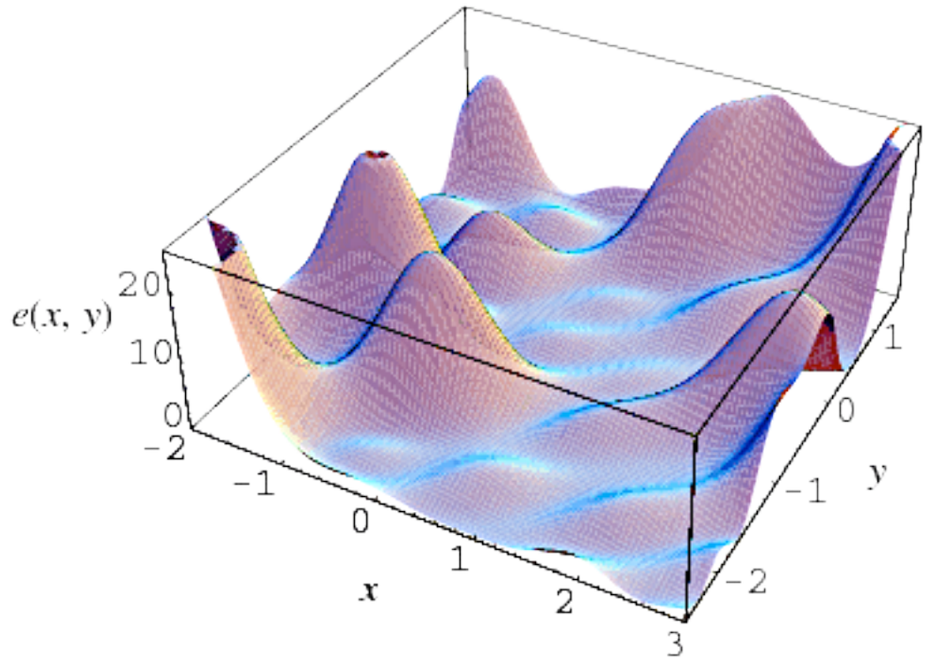
http://future.aae.wisc.edu/

Optimize cows to a feeding group

Maximize the income over feed cost

Non-linear optimization

- Iterative process
- Search for global maxima IOFC

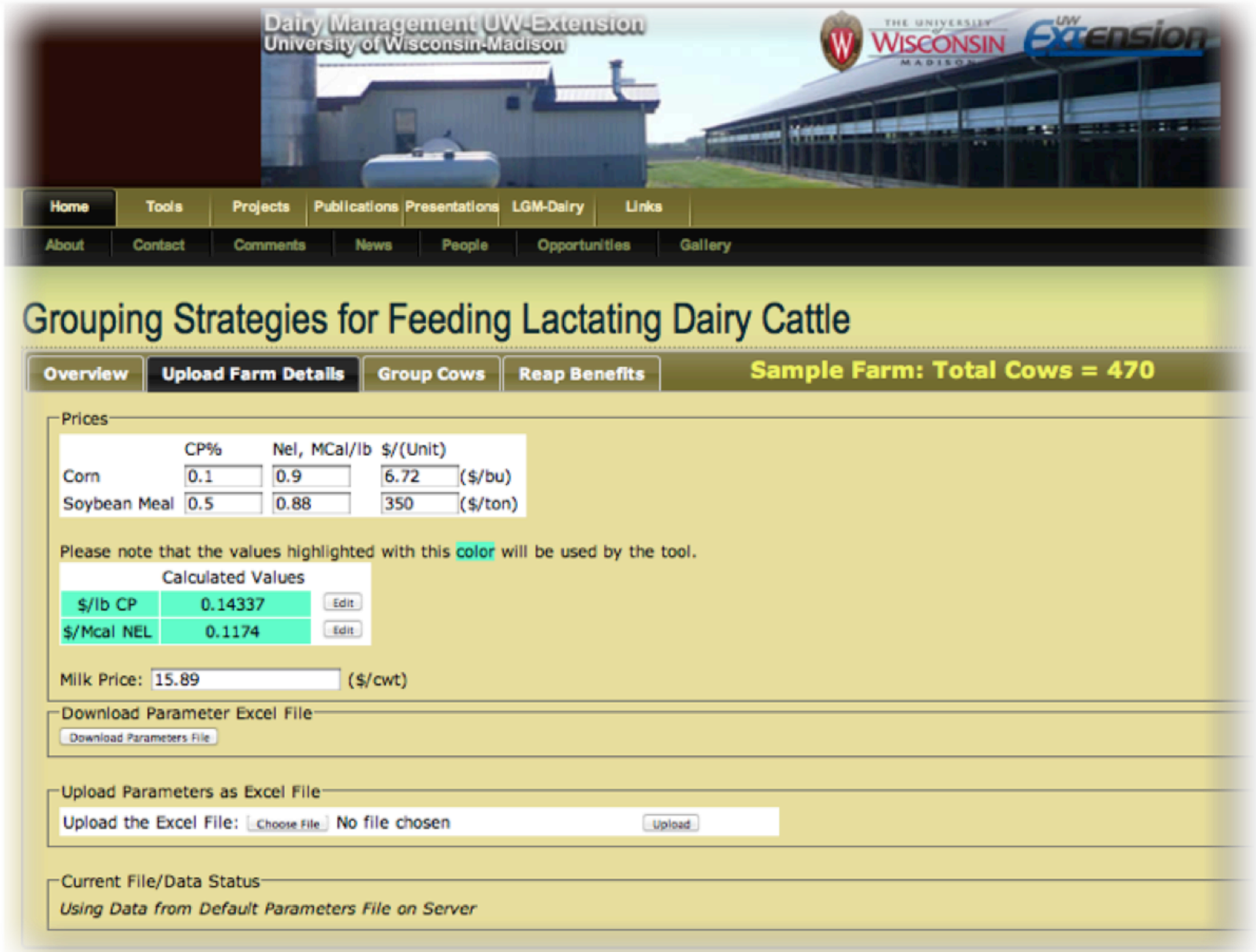


$$Max(IOFC) = SUM(IOFC_{group})$$

$$IOFC_{group} = Milk\ Value - Feed\ Cost$$

Grouping strategies

For feeding lactating dairy cattle



Get the farm data

Farm time specific dataset

NE and CP value

- Farm known value
- Calculated from corn and soybean meal

Milk price

- Farm known value

Grouping strategies

- Farm current situation
- Possible situations

Cow information

Table of specific data

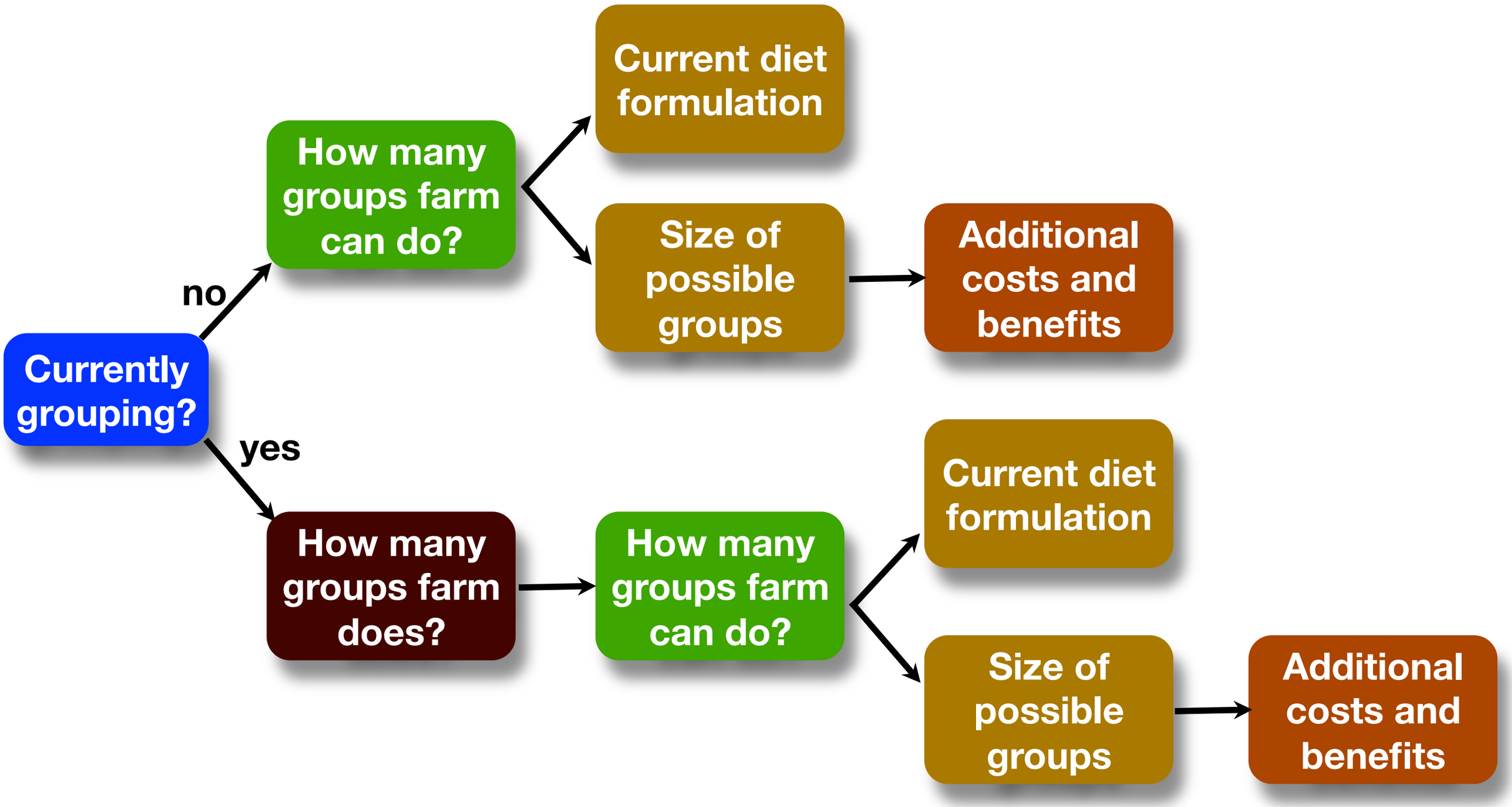
Cow ID	Parity	DIM	Milk, lb/d	Milk fat, %
6234	1	84	62	4.1
132	7	118	73	3.8
6196	1	198	85	3.4
6149	4	199	114	3.6
5045	2	280	81	4.3

Additional information

- Cow's BW, or
- Parity's average BW

Grouping strategies

Farm possibilities



Tool illustration

Economic impact of grouping

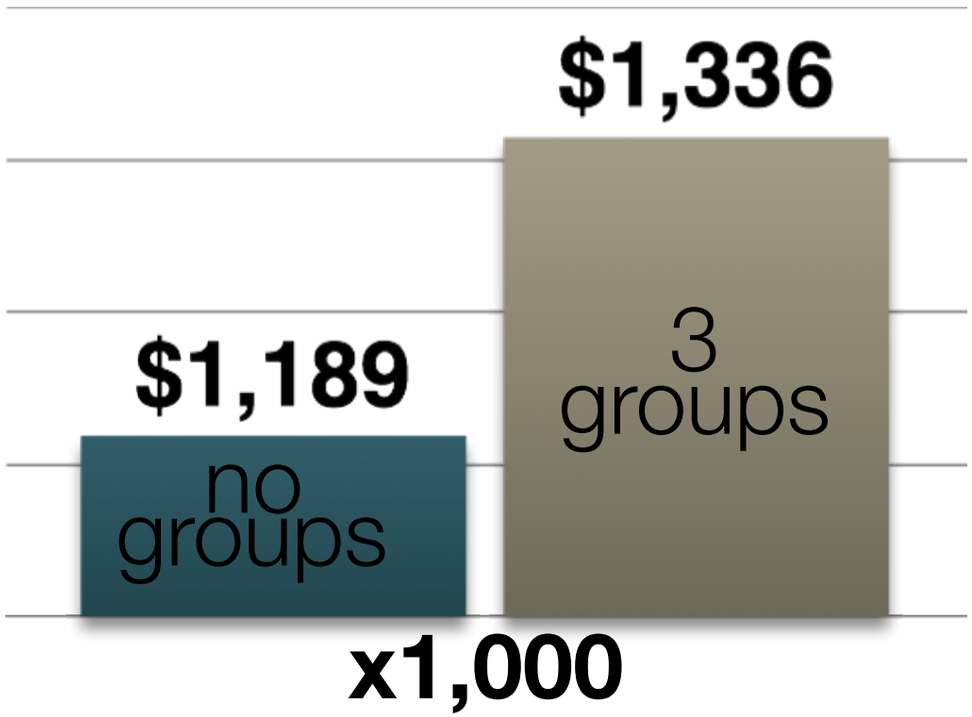
Current situation	
Lactating cows	470
Number groups	1
NE, Mcal/lb	0.80
CP, %	17%

Possible situation	
Number groups	3
Group sizes	100, 100, 270
Added cost, $	$1,000/month
Milk loss	2.27 kg/cow
Milk loss time	4 days
Saved cost, $	$0

Decision support system illustration

Cluster grouping criteria

	Possible situation			
	Cow numbers	NE, Mcal/kg	CP, %	IOFC, $/cow/day
Group 1	270	1.56	16.05	9.3
Group 2	100	1.43	14.18	7.2
Group 3	100	1.37	13.07	4.7



Annual value of grouping
$147,000/470 cows

Cabrera et al., 2012

Analysis from dairy farm records

30 Wisconsin dairy farms

One group vs. 3 groups

- Same size groups

Same prices for all

- $0.35/kg milk
- $0.316/kg CP
- $0.1174/Mcal NEl

Cluster grouping

- 83rd percentile CP and NEl

Projected body weight

- 500 kg primiparous
- 590 kg multiparous

Analysis from dairy farm records

30 Wisconsin dairy farms

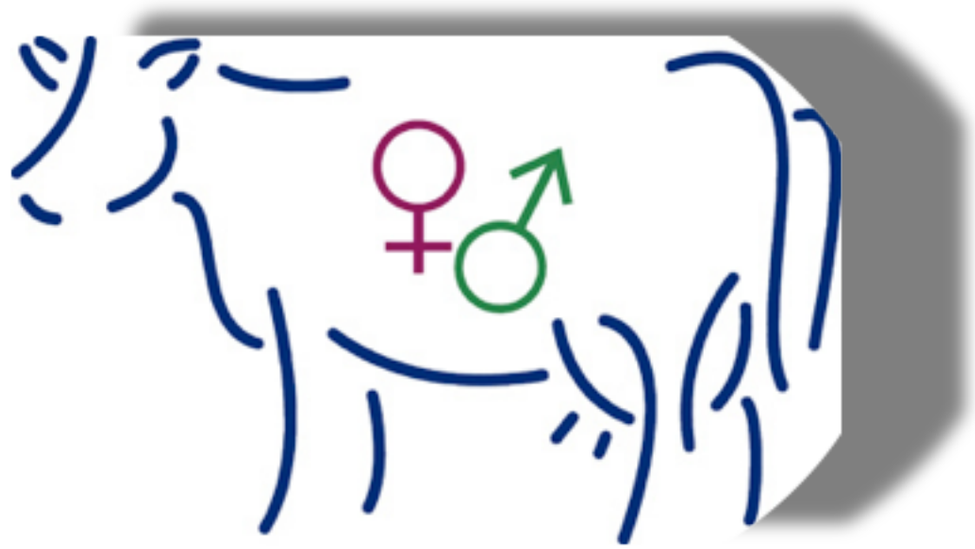
	Number of lactating cows (n=30)	Income over Feed Cost (1 group)	Income over Feed Cost (3 groups)
		$/cow per year	
Mean	788	$2,311	$2,707
Minimum	< 200	$697	$1,059
Maximum	> 1,000	$2,967	$3,285

Increase of IOFC ($/cow per year)

- Between 7 and 52%
- Mean = $396
- Range = $161 to $580

After reasonable extra costs

- Still increased net margin of between 5 and 47%



UW-Dairy Repro$ Plus: A Reproductive Analysis Tool

Reproduction costs and returns

Get the most net benefits

Culling

Hormones

Semen

Labor

Milk

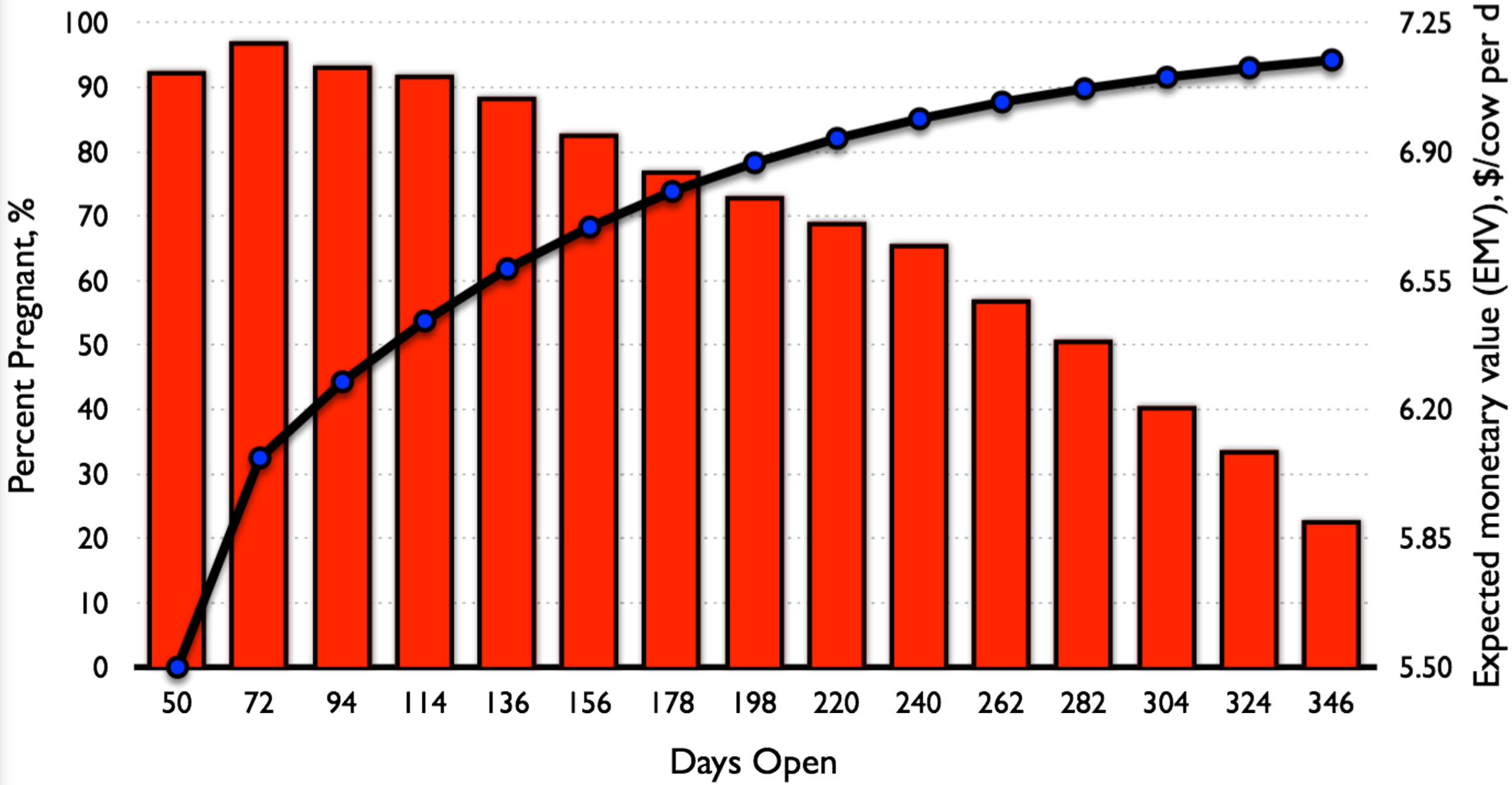
Calves

Costs

Returns

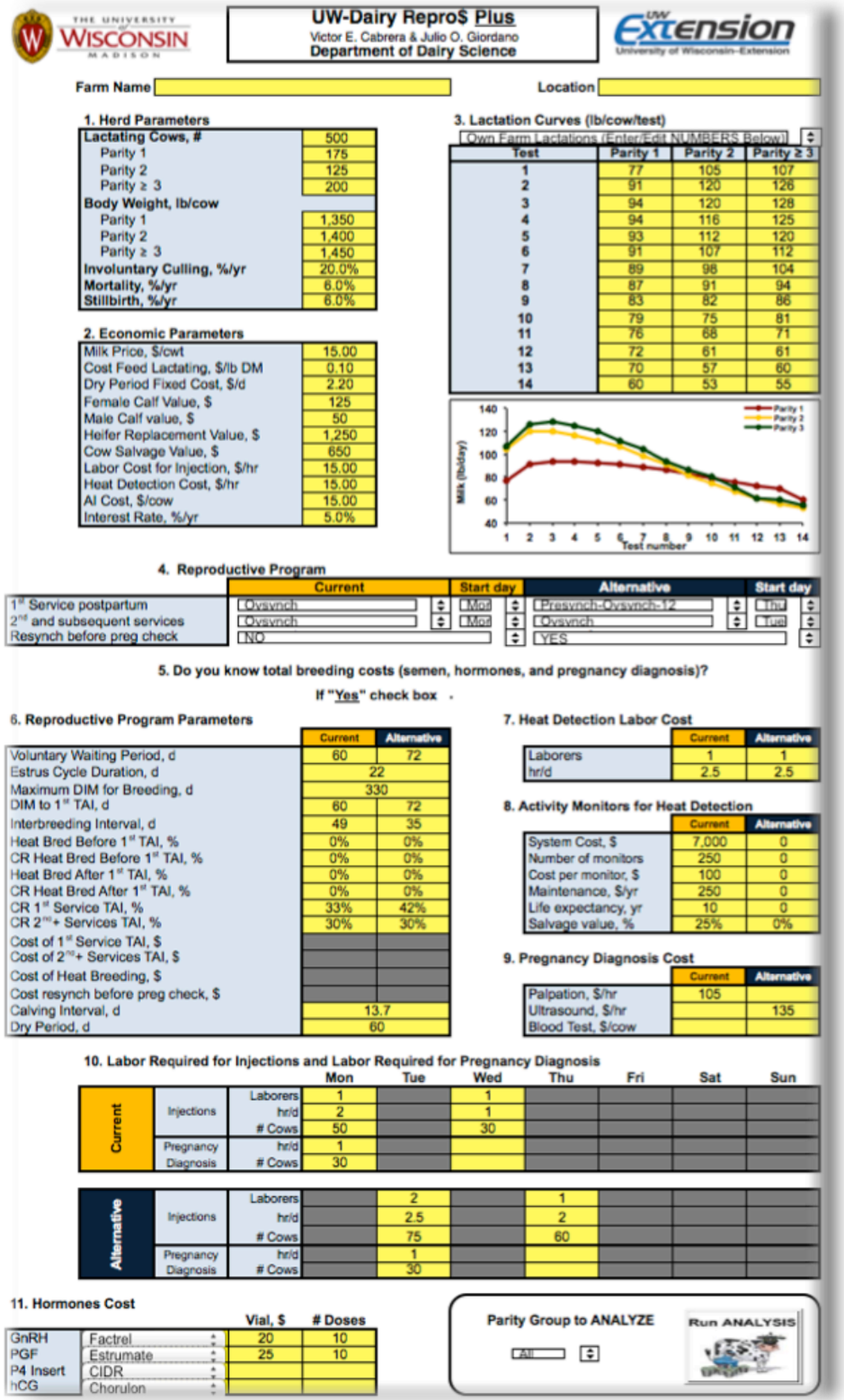
Reproduction vs. expected value

Herd profitability depends on reproduction



UW-Dairy Repro$ Plus

Farm specific economic assessment



UW-Dairy Repro$ Plus
Victor E. Cabrera & Julio O. Giordano
Department of Dairy Science

Farm Name

Location

1. Herd Parameters

Lactating Cows, #	500
Parity 1	175
Parity 2	125
Parity ≥ 3	200
Body Weight, lb/cow	
Parity 1	1,350
Parity 2	1,400
Parity ≥ 3	1,450
Involuntary Culling, %/yr	20.0%
Mortality, %/yr	6.0%
Stillbirth, %/yr	6.0%

2. Economic Parameters

Milk Price, $/cwt	15.00
Cost Feed Lactating, $/lb DM	0.10
Dry Period Fixed Cost, $/d	2.20
Female Calf Value, $	125
Male Calf value, $	50
Heifer Replacement Value, $	1,250
Cow Salvage Value, $	650
Labor Cost for Injection, $/hr	15.00
Heat Detection Cost, $/hr	15.00
AI Cost, $/cow	15.00
Interest Rate, %/yr	5.0%

3. Lactation Curves (lb/cow/test)

Own Farm Lactations (Enter/Edit NUMBERS Below)

Test	Parity 1	Parity 2	Parity ≥ 3
1	77	105	107
2	91	120	126
3	94	120	128
4	94	116	125
5	93	112	120
6	91	107	112
7	89	98	104
8	87	91	94
9	83	82	86
10	79	75	81
11	76	68	71
12	72	61	61
13	70	57	60
14	60	53	55

4. Reproductive Program

	Current	Start day	Alternative	Start day
1st Service postpartum	Ovsynch	Mon	Presynch-Ovsynch-12	Thu
2nd and subsequent services	Ovsynch	Mon	Ovsynch	Tue
Resynch before preg check	NO		YES	

5. Do you know total breeding costs (semen, hormones, and pregnancy diagnosis)?

If "Yes" check box

6. Reproductive Program Parameters

	Current	Alternative
Voluntary Waiting Period, d	60	72
Estrus Cycle Duration, d	22	
Maximum DIM for Breeding, d	330	
DIM to 1st TAI, d	60	72
Interbreeding Interval, d	49	35
Heat Bred Before 1st TAI, %	0%	0%
CR Heat Bred Before 1st TAI, %	0%	0%
Heat Bred After 1st TAI, %	0%	0%
CR Heat Bred After 1st TAI, %	0%	0%
CR 1st Service TAI, %	33%	42%
CR 2nd+ Services TAI, %	30%	30%
Cost of 1st Service TAI, $		
Cost of 2nd+ Services TAI, $		
Cost of Heat Breeding, $		
Cost resynch before preg check, $		
Calving Interval, d	13.7	
Dry Period, d	60	

7. Heat Detection Labor Cost

	Current	Alternative
Laborers	1	1
hr/d	2.5	2.5

8. Activity Monitors for Heat Detection

	Current	Alternative
System Cost, $	7,000	0
Number of monitors	250	0
Cost per monitor, $	100	0
Maintenance, $/yr	250	0
Life expectancy, yr	10	0
Salvage value, %	25%	0%

9. Pregnancy Diagnosis Cost

	Current	Alternative
Palpation, $/hr	105	
Ultrasound, $/hr		135
Blood Test, $/cow		

10. Labor Required for Injections and Labor Required for Pregnancy Diagnosis

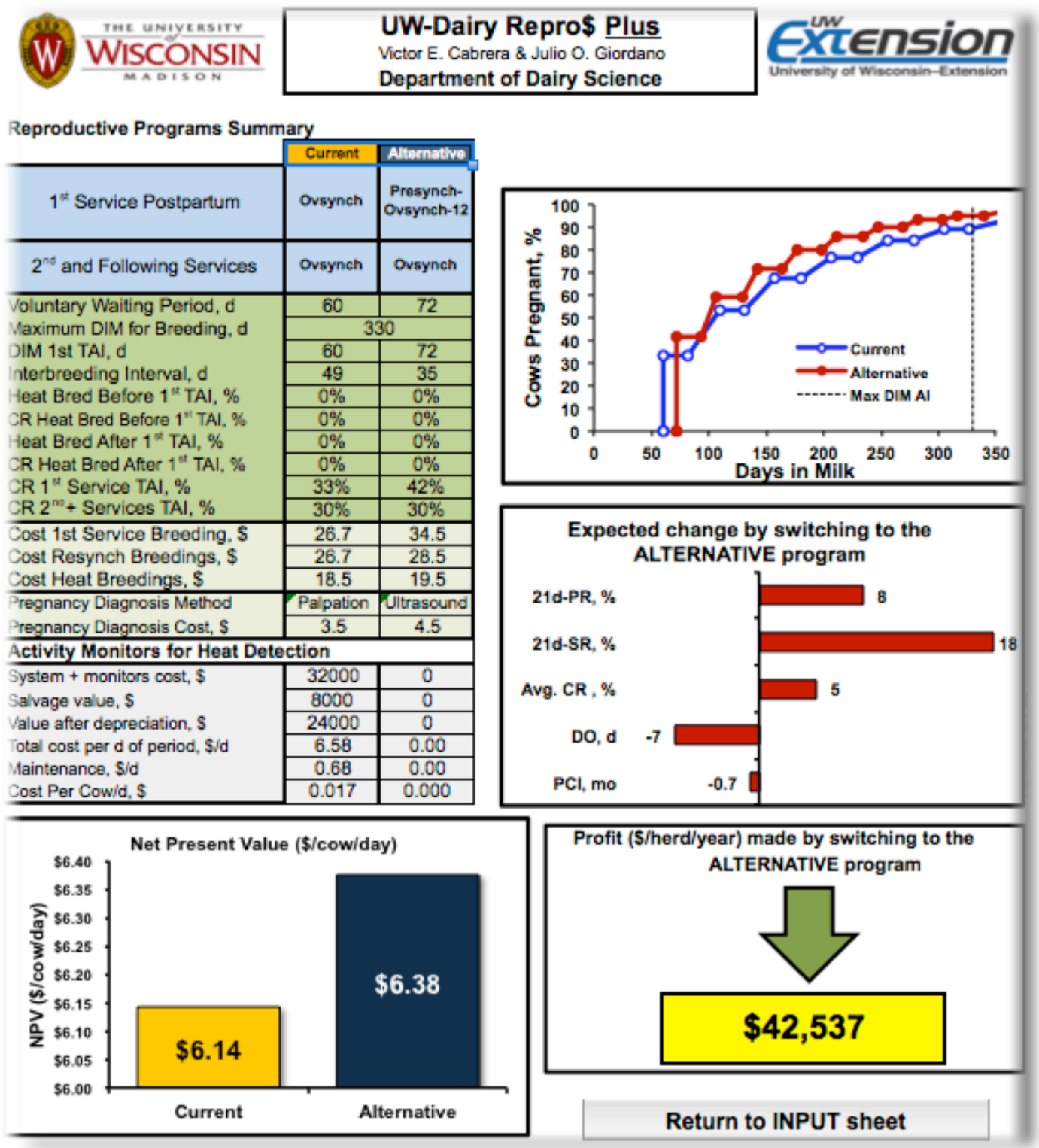
			Mon	Tue	Wed	Thu	Fri	Sat	Sun
Current	Injections	Laborers	1		1				
		hr/d	2		1				
		# Cows	50		30				
	Pregnancy Diagnosis	hr/d	1						
		# Cows	30						
Alternative	Injections	Laborers		2		1			
		hr/d		2.5		2			
		# Cows		75		60			
	Pregnancy Diagnosis	hr/d		1					
		# Cows		30					

11. Hormones Cost

		Vial, $	# Doses
GnRH	Factrel	20	10
PGF	Estrumate	25	10
P4 Insert	CIDR		
hCG	Chorulon		

Parity Group to ANALYZE: All

Run ANALYSIS



UW-Dairy Repro$ Plus
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Department of Dairy Science

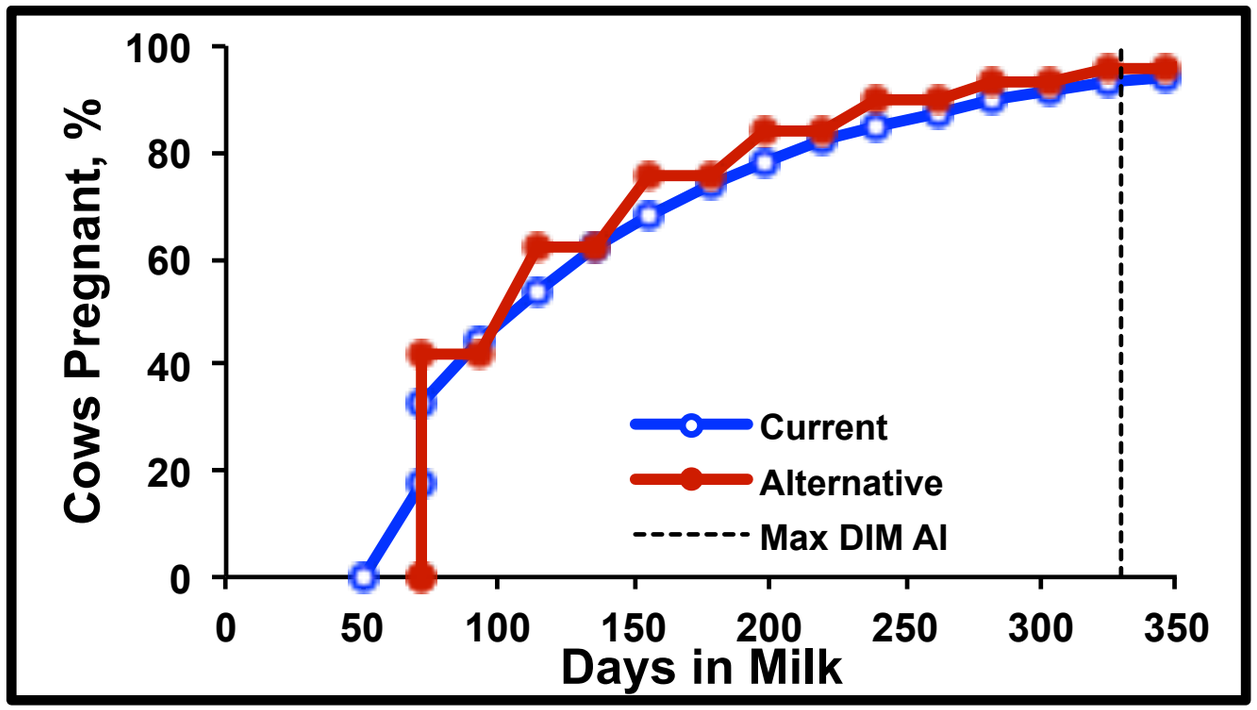
Reproductive Programs Summary

	Current	Alternative
1st Service Postpartum	Ovsynch	Presynch-Ovsynch-12
2nd and Following Services	Ovsynch	Ovsynch
Voluntary Waiting Period, d	60	72
Maximum DIM for Breeding, d	330	
DIM 1st TAI, d	60	72
Interbreeding Interval, d	49	35
Heat Bred Before 1st TAI, %	0%	0%
CR Heat Bred Before 1st TAI, %	0%	0%
Heat Bred After 1st TAI, %	0%	0%
CR Heat Bred After 1st TAI, %	0%	0%
CR 1st Service TAI, %	33%	42%
CR 2nd+ Services TAI, %	30%	30%
Cost 1st Service Breeding, $	26.7	34.5
Cost Resynch Breedings, $	26.7	28.5
Cost Heat Breedings, $	18.5	19.5
Pregnancy Diagnosis Method	Palpation	Ultrasound
Pregnancy Diagnosis Cost, $	3.5	4.5
Activity Monitors for Heat Detection		
System + monitors cost, $	32000	0
Salvage value, $	8000	0
Value after depreciation, $	24000	0
Total cost per d of period, $/d	6.58	0.00
Maintenance, $/d	0.68	0.00
Cost Per Cow/d, $	0.017	0.000

Return to INPUT sheet

Reproductive performance

Always current vs. an alternative program



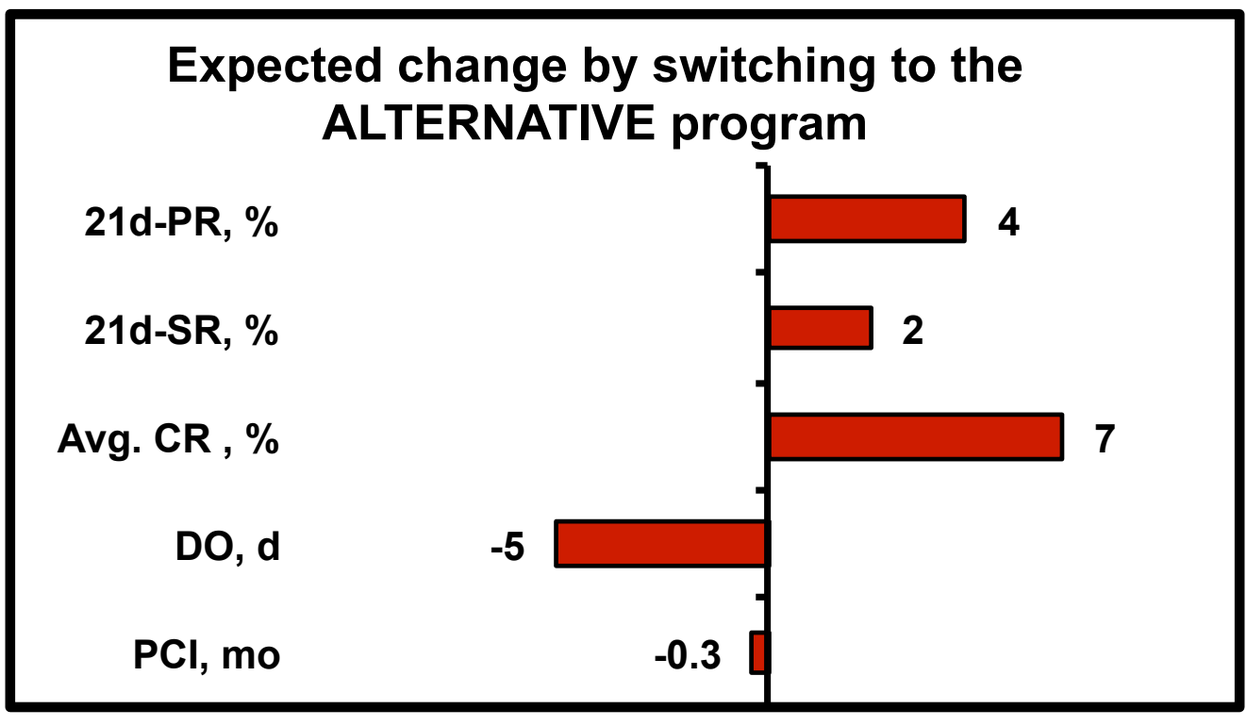
Example: (first service)

OvSynch vs. PreSynch-OvSynch and

Heat detection vs no heat detection

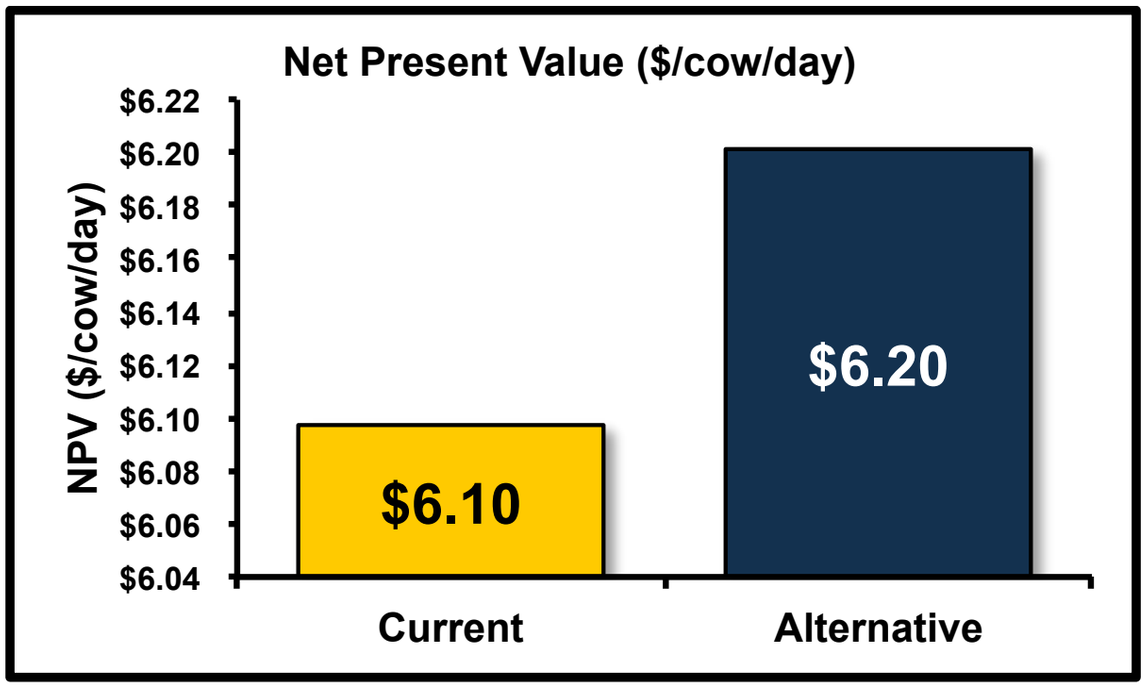
Alternative program is better

Improved 21-d PR, SR, and CR



Economic performance

Always current vs. an alternative program



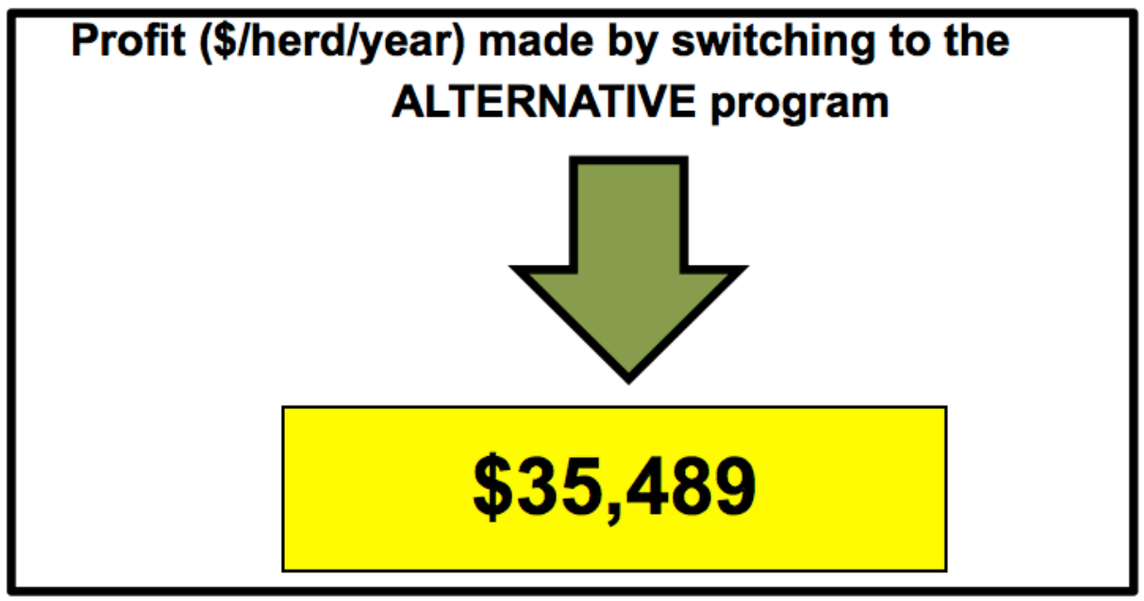
Example: (first service)

OvSynch vs. PreSynch-OvSynch and

Heat detection vs no heat detection

Alternative program brings more net return

$38/cow per year



Repro$ Plus application 1

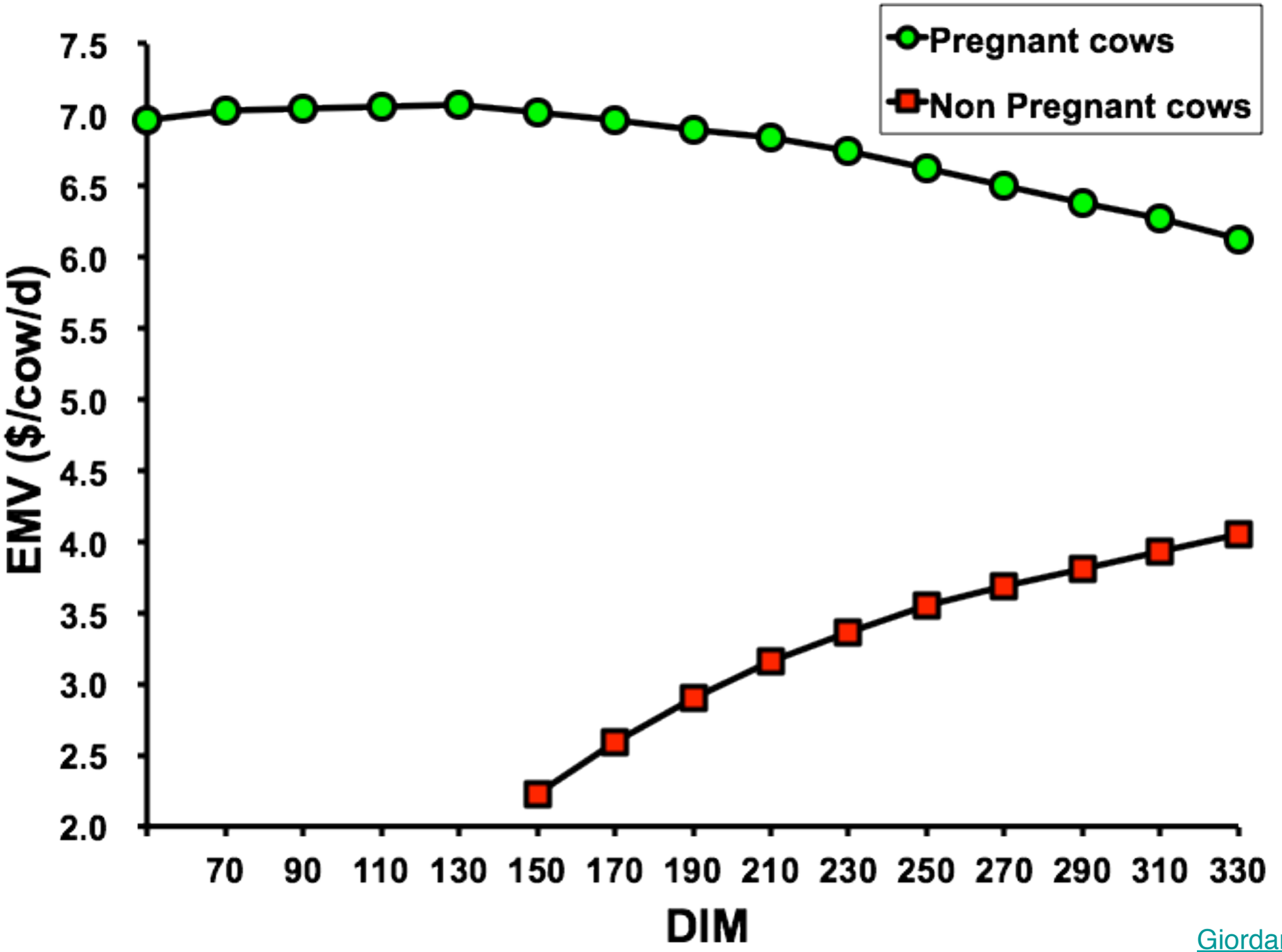
TAI and heat detection interaction

	A	B	C
1st Service	Double-OvSynch		Heat detection
2nd+ Services	ReSynch-D32	Double-OvSynch	Heat detection
Voluntary waiting period, d	82	82	50
Interbreeding interval, d	42	49	21
CR at 1st service, %	45	45	33
CR at 2nd+ services, %	30	39	30

Giordano et al. (2011)

Repro$ Plus application 1

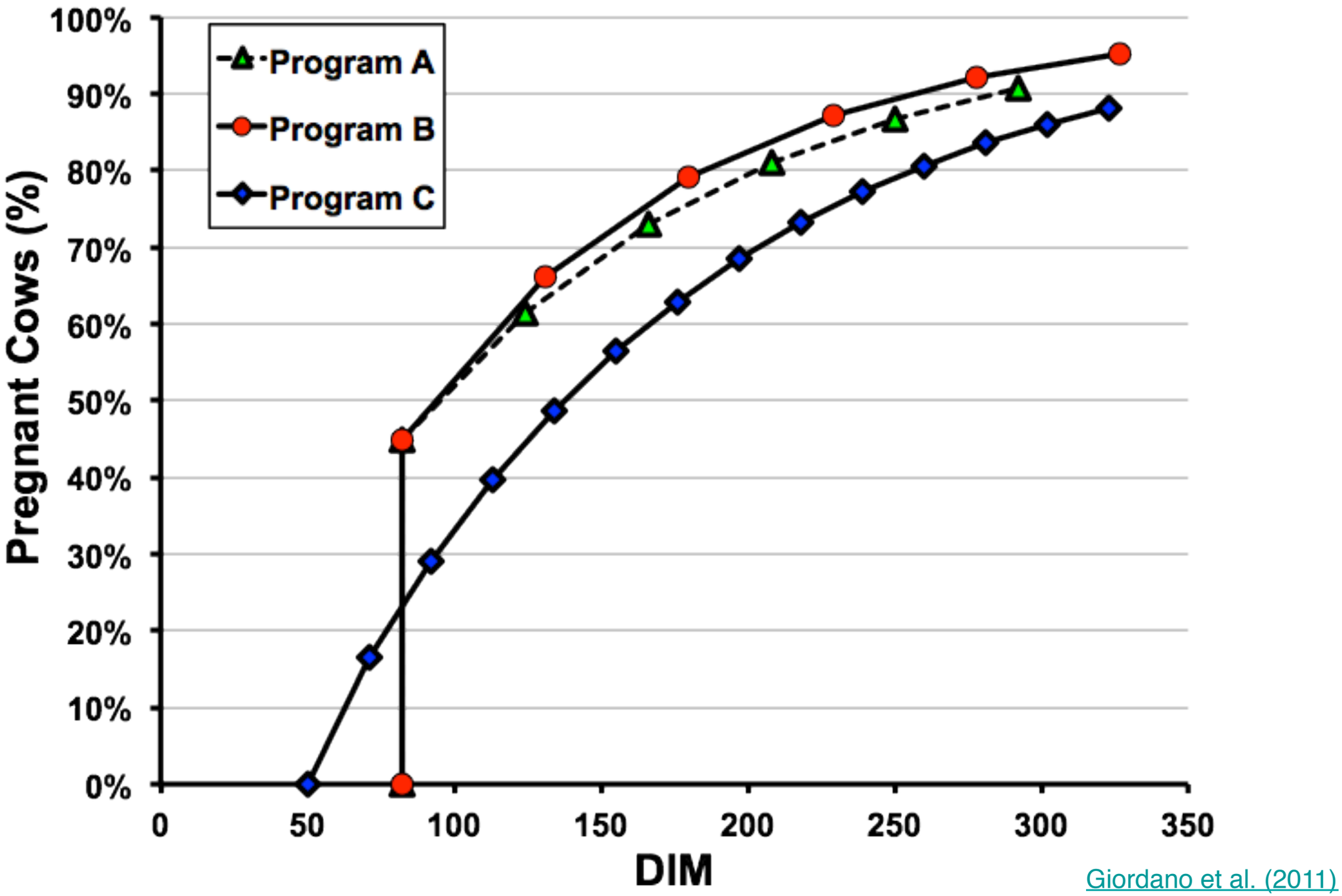
Expected monetary value (EMV)



Giordano et al. (2011)

Repro$ Plus application 1

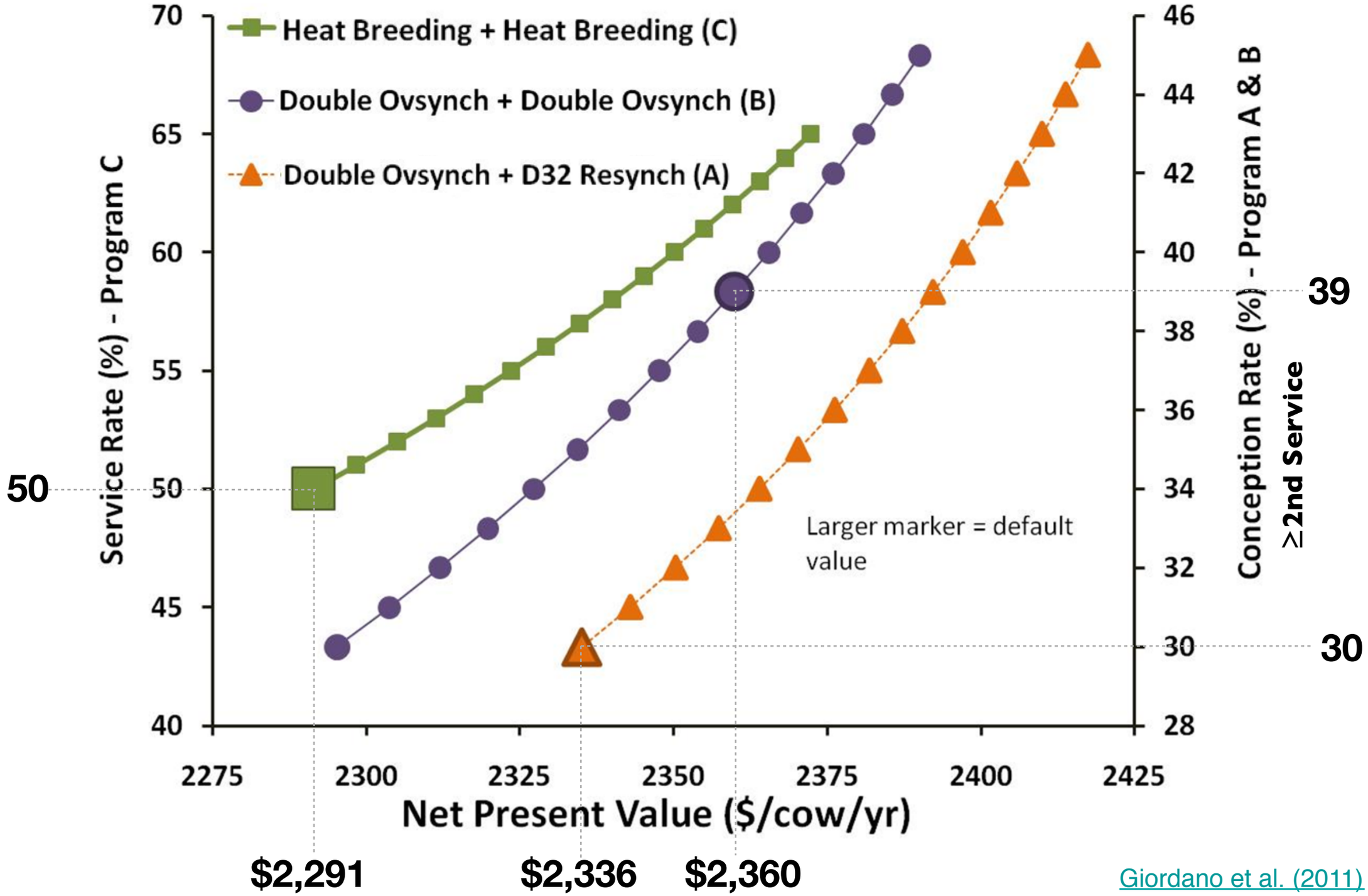
Reproductive performance



Giordano et al. (2011)

Repro$ Plus application 1

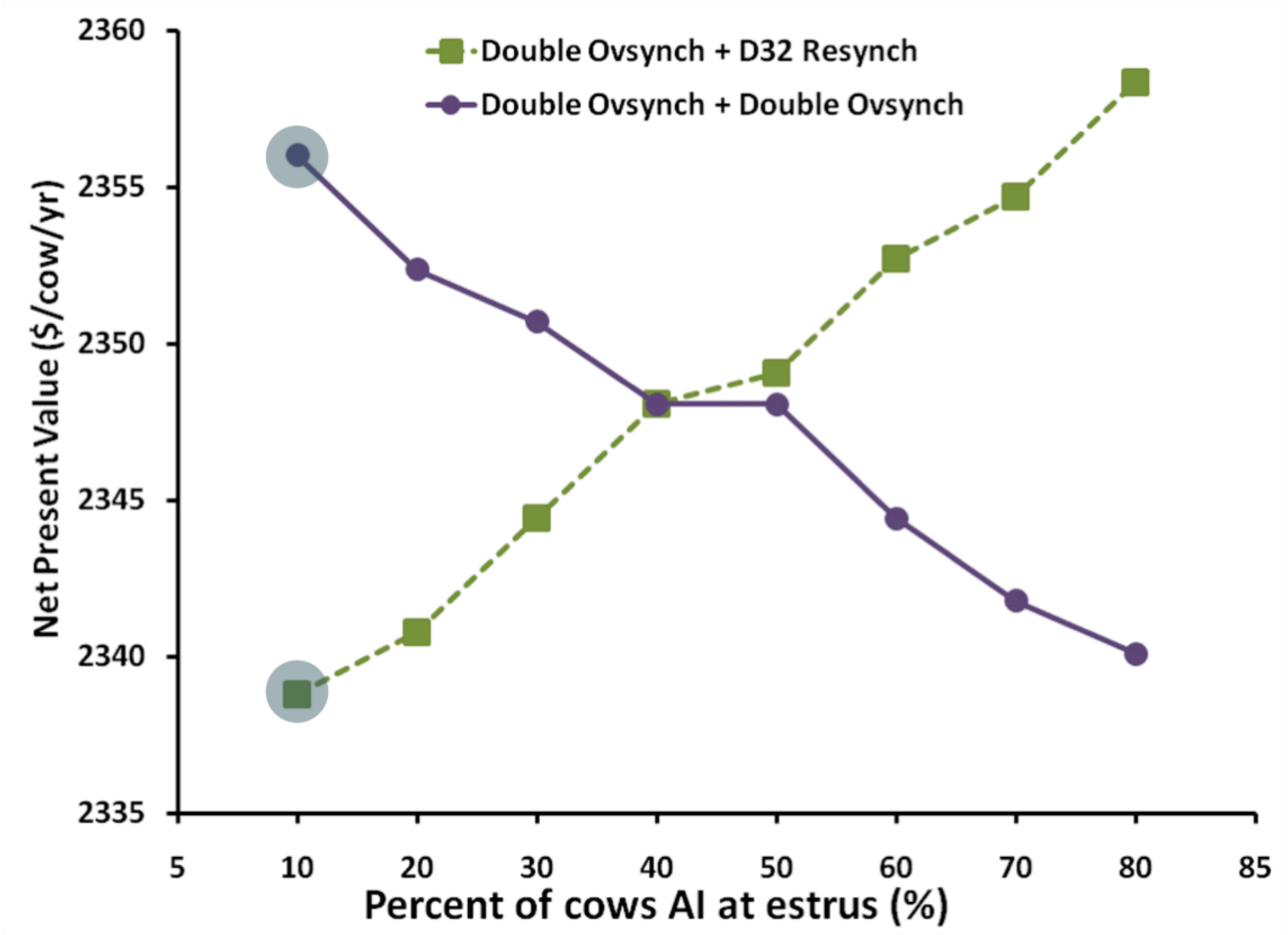
Sensitivity to service and conception rates



Giordano et al. (2011)

Repro$ Plus application 1

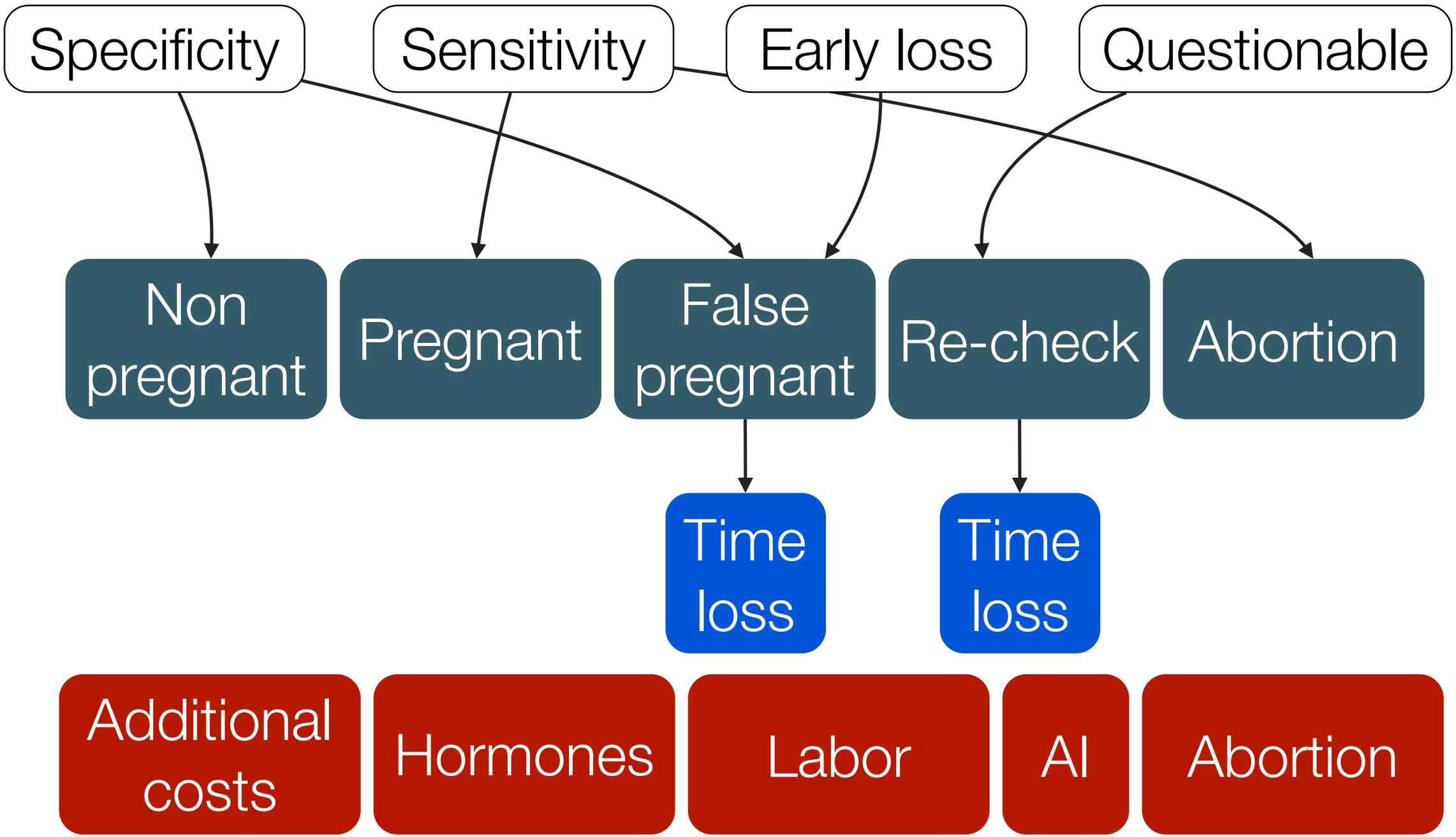
Impact of heat AI services for ≥ 2 services



Giordano et al. (2011)

Repro$ Plus application 2

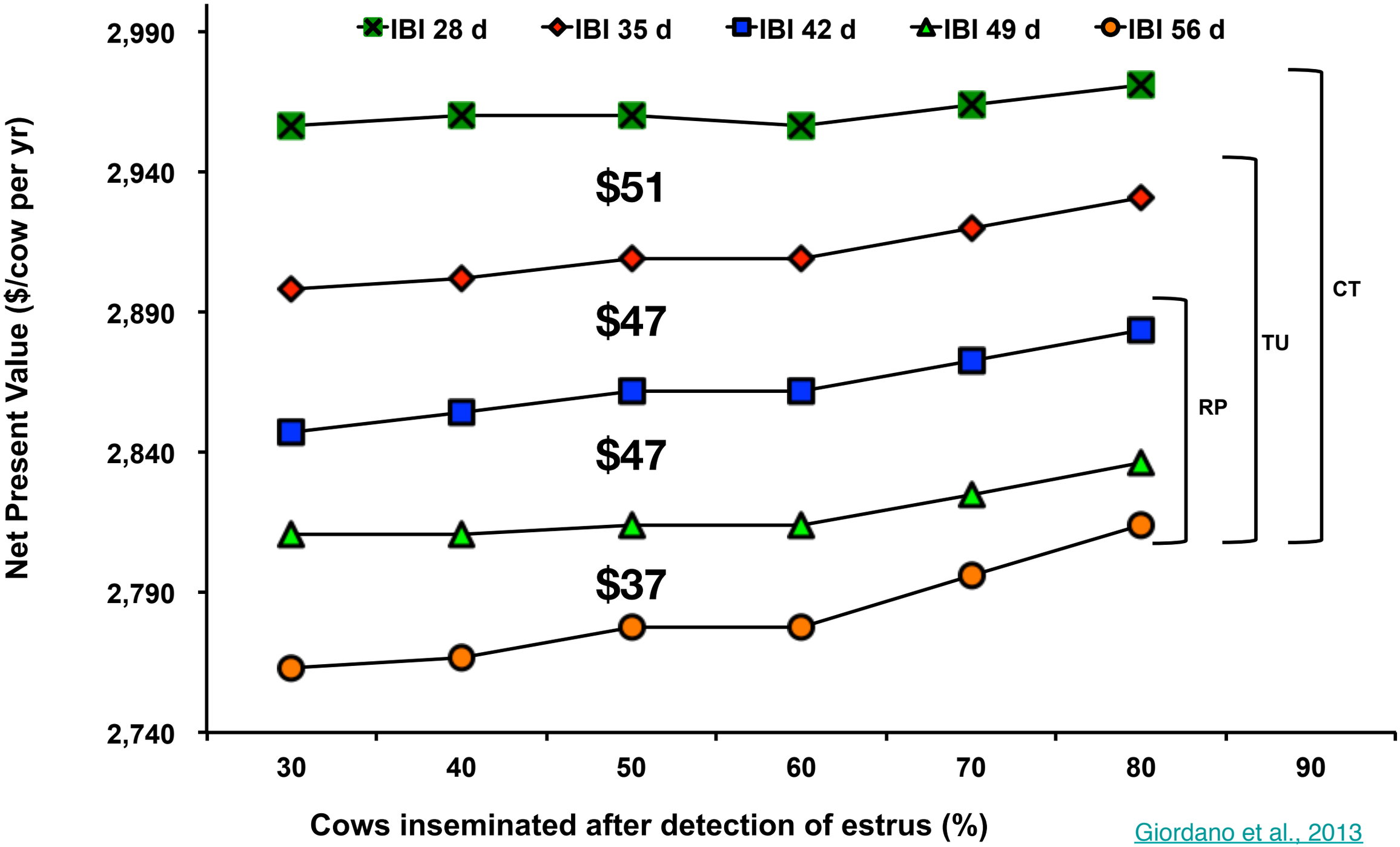
Chemical test for early pregnancy detection



Giordano et al., 2013

Repro$ Plus application 2

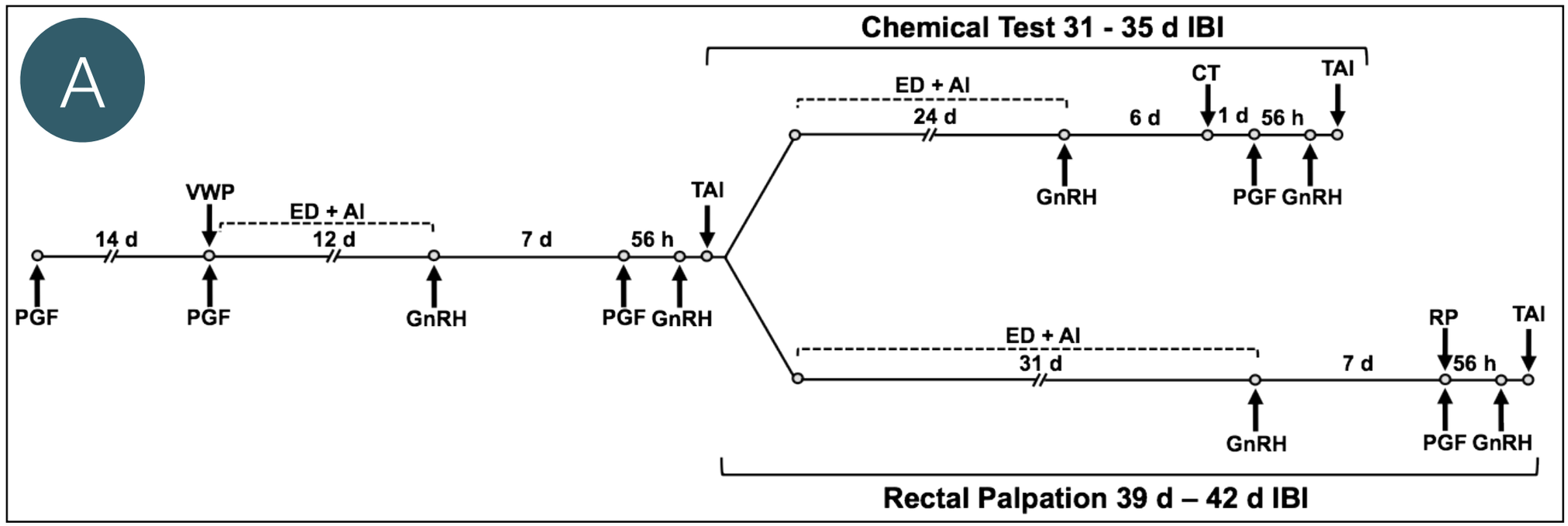
The value of shorter interbreeding (IBI)

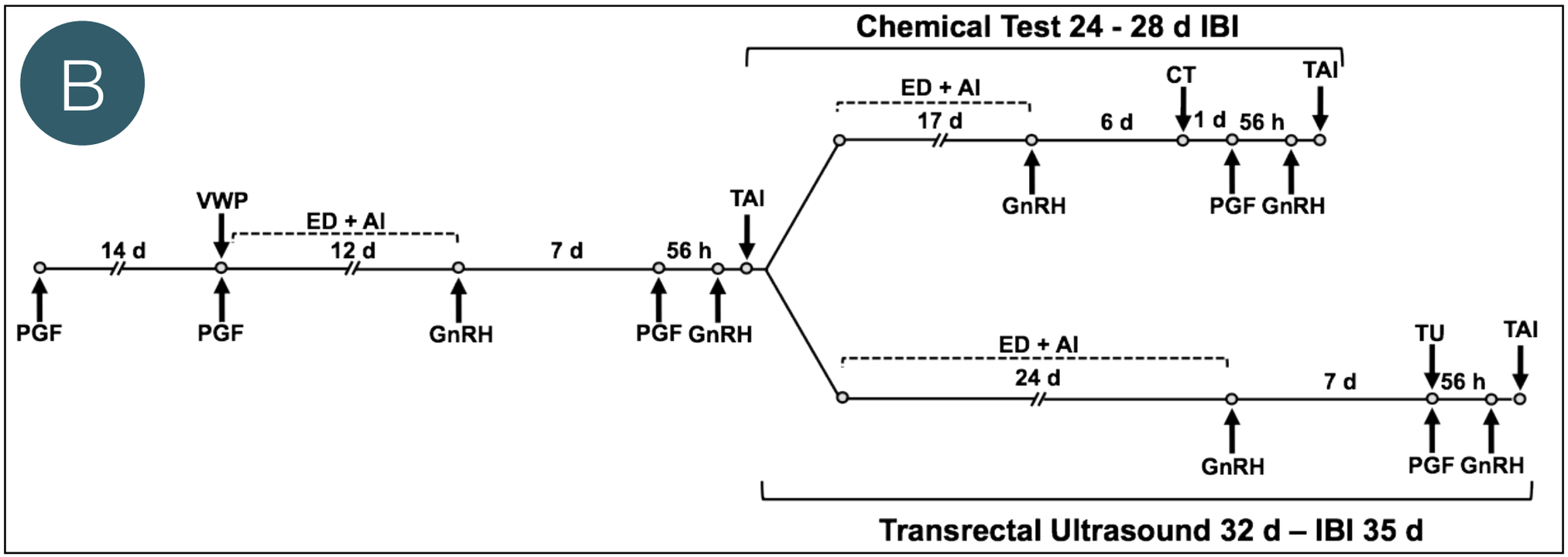


Giordano et al., 2013

Repro$ Plus application 2

Test of shorter IBI programs

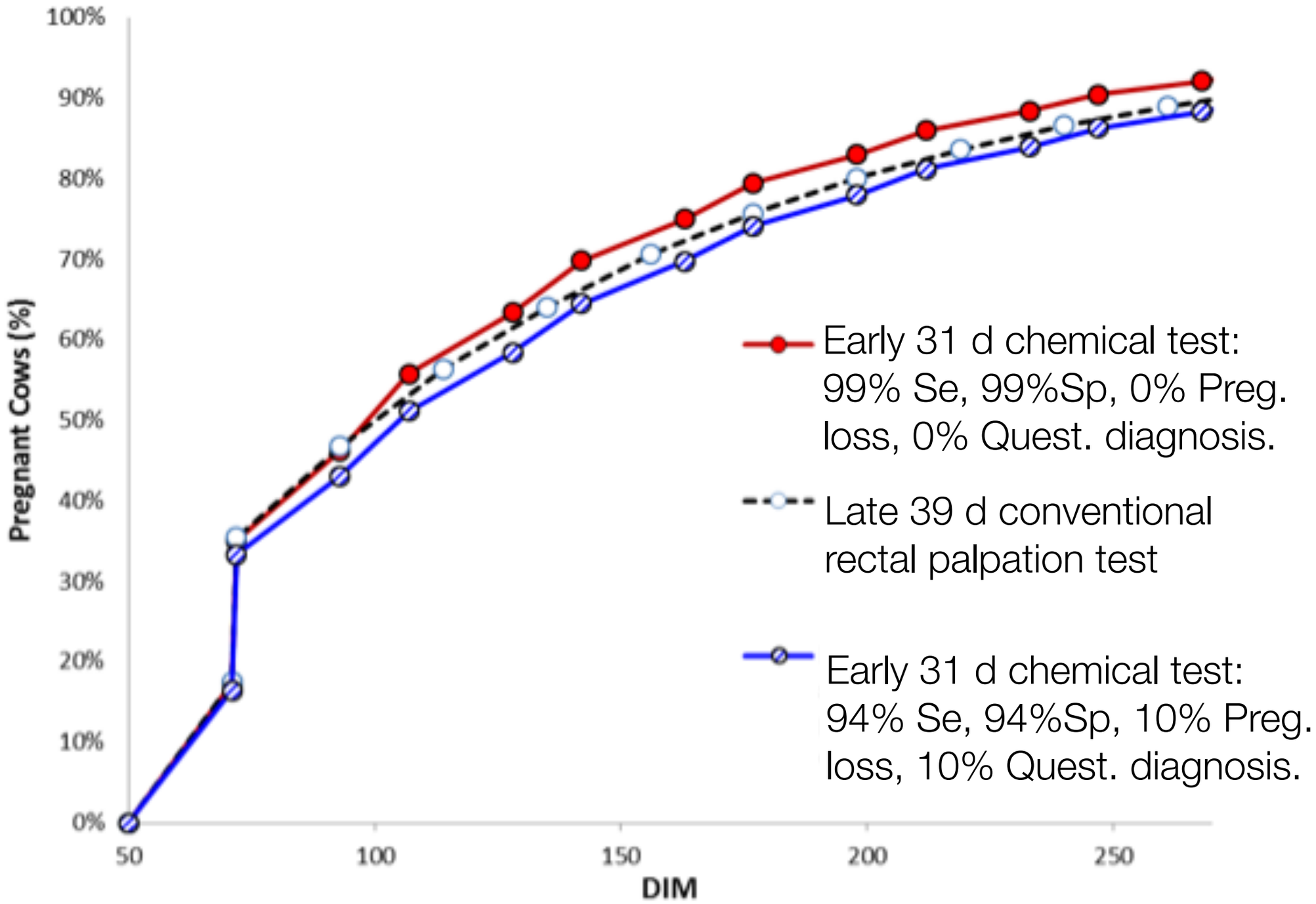




Giordano et al., 2013

Repro$ Plus application 2

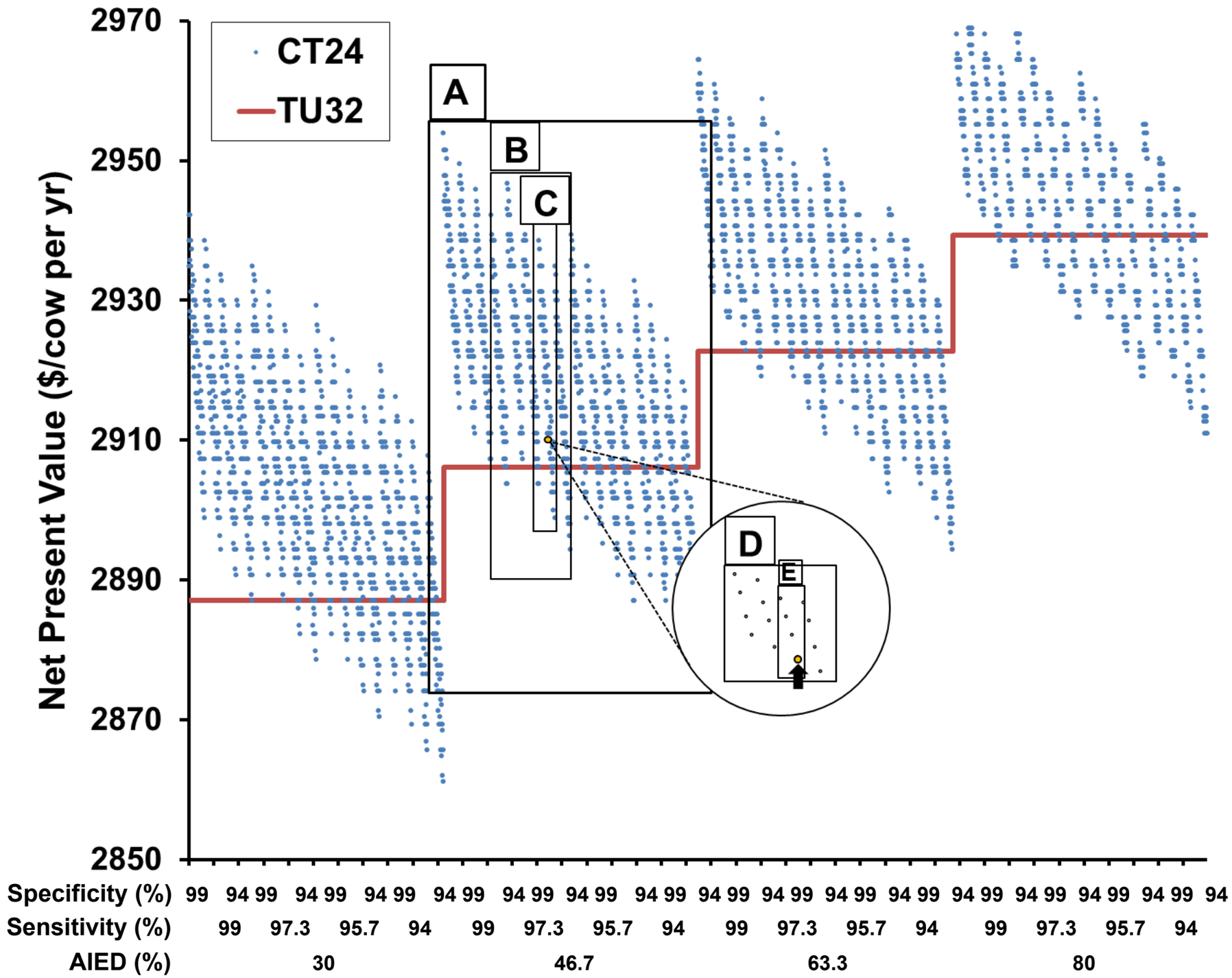
Reproductive performance



Giordano et al., 2013

Repro$ Plus application 2

Economic performance



Giordano et al., 2013

Repro$ Plus application 2

Economic performance

			$ per 1% or $0.1	
	Base	**Range**	**CT31 vs RP39**	**CT24 vs TU32**
% Sensitivity	98/97	94-99	**+5.3**	**+4.5**
% Specificity	98/97	94-99	**+3.1**	**+2.5**
% Pregnancy loss	6/6.6	0-10	**-3.1**	**-2.5**
% Questionable	3.3/8.5	0-10	**-0.4**	**-0.3**
% Estrous detection	50	30-80	**0.097**	**-0.220**
$ CT cost	2.4	0.5-5	**-0.0175**	**-0.0192**

Giordano et al., 2013

Repro$ Plus application 2

Economic performance

	Break even	
	CT31 vs RP39	**CT24 vs TU32**
% Sensitivity	**96.4**	**94.9**
% Specificity	**95.1**	**93.2**
% Pregnancy loss	**8.9**	**10.5**

Early chemical pregnancy test

Profitable when Sensitivity >95%, Specificity >93%, Early pregnancy loss <11%

Giordano et al., 2013

Economic Value of a Dairy Cow

Economic value of a dairy cow

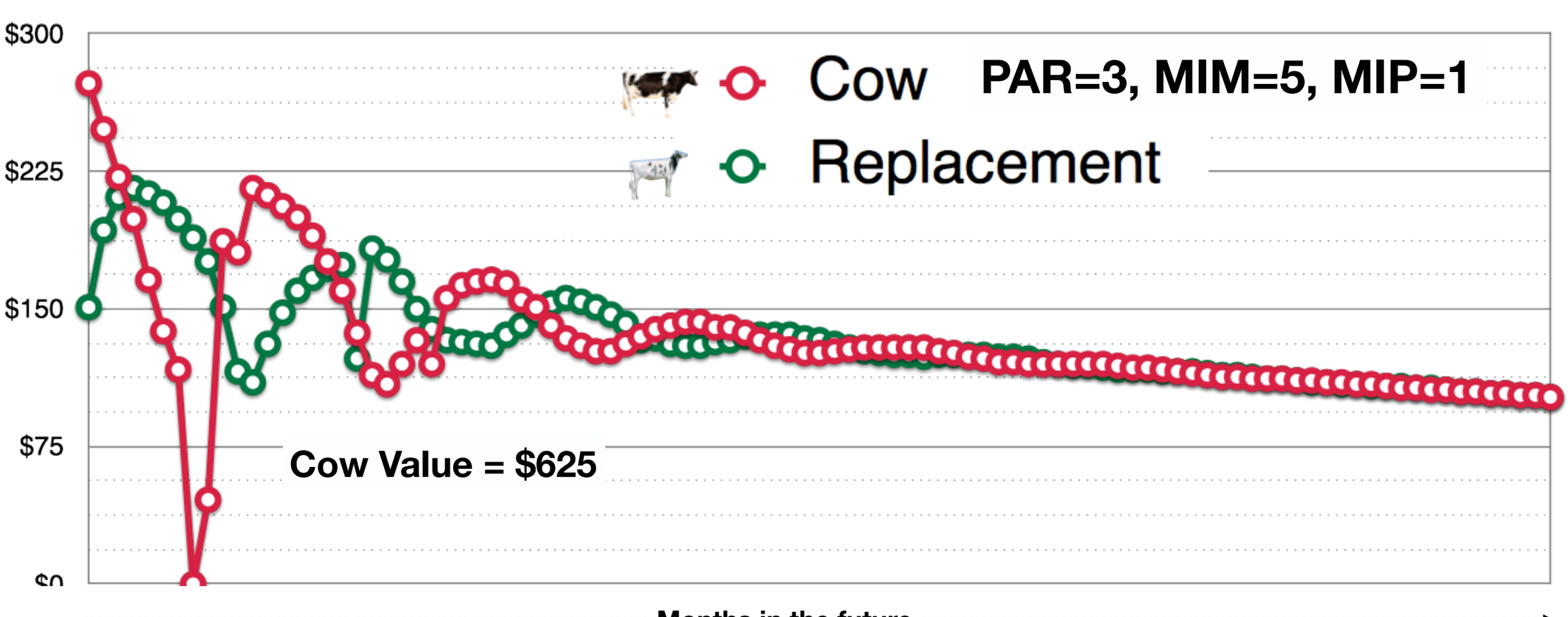
Projected net return

Discounted future net return

Always compared to a replacement

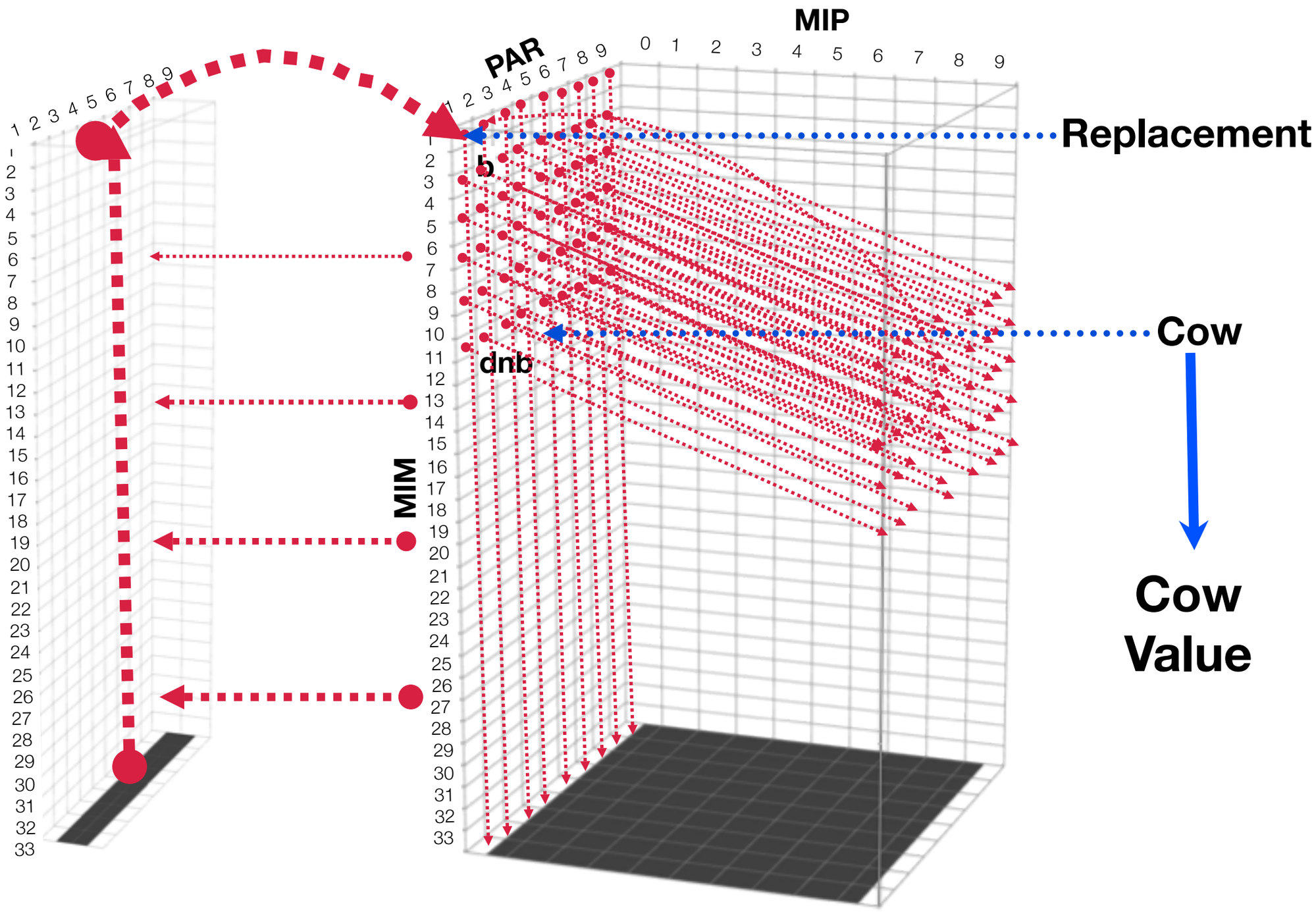
Includes transaction replacement cost

Salvage value - Springer cost



Basic principals of calculation

Markov-chains



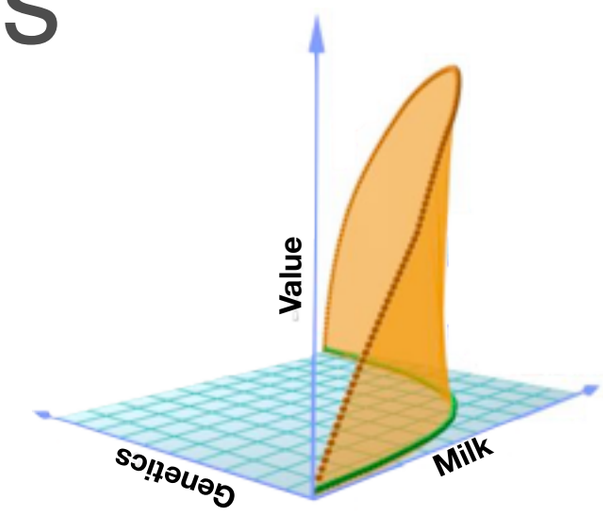
Cabrera, 2012

Importance of the cow value

Critical economic implications

Optimal management of herd

Keep or Replace



Crucial decisions

Treat or not treat

Breed or not breed

Important information

Value of a pregnancy

Cost of a pregnancy loss

Cost of a day open

The economic value of a dairy cow

Online decision support tool

The Economic Value of a Dairy Cow

Victor E. Cabrera, Department of Dairy Science

Overview | Single Cow Analysis | Herd Analysis | Units: US English | US Metric | UK | Español

INPUTS - Edit Values in This Block

Evaluated Cow Variables	
Current Lactation	2
Current Months after Calving	1
Current Months in Pregnancy	0
Expected Milk Production Rest of Lactation, %	100
Expected Milk Production Next Lactations, %	100
Replacement Cow Variable	
Expected genetic improvement, % additional milk	0
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	15.88
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

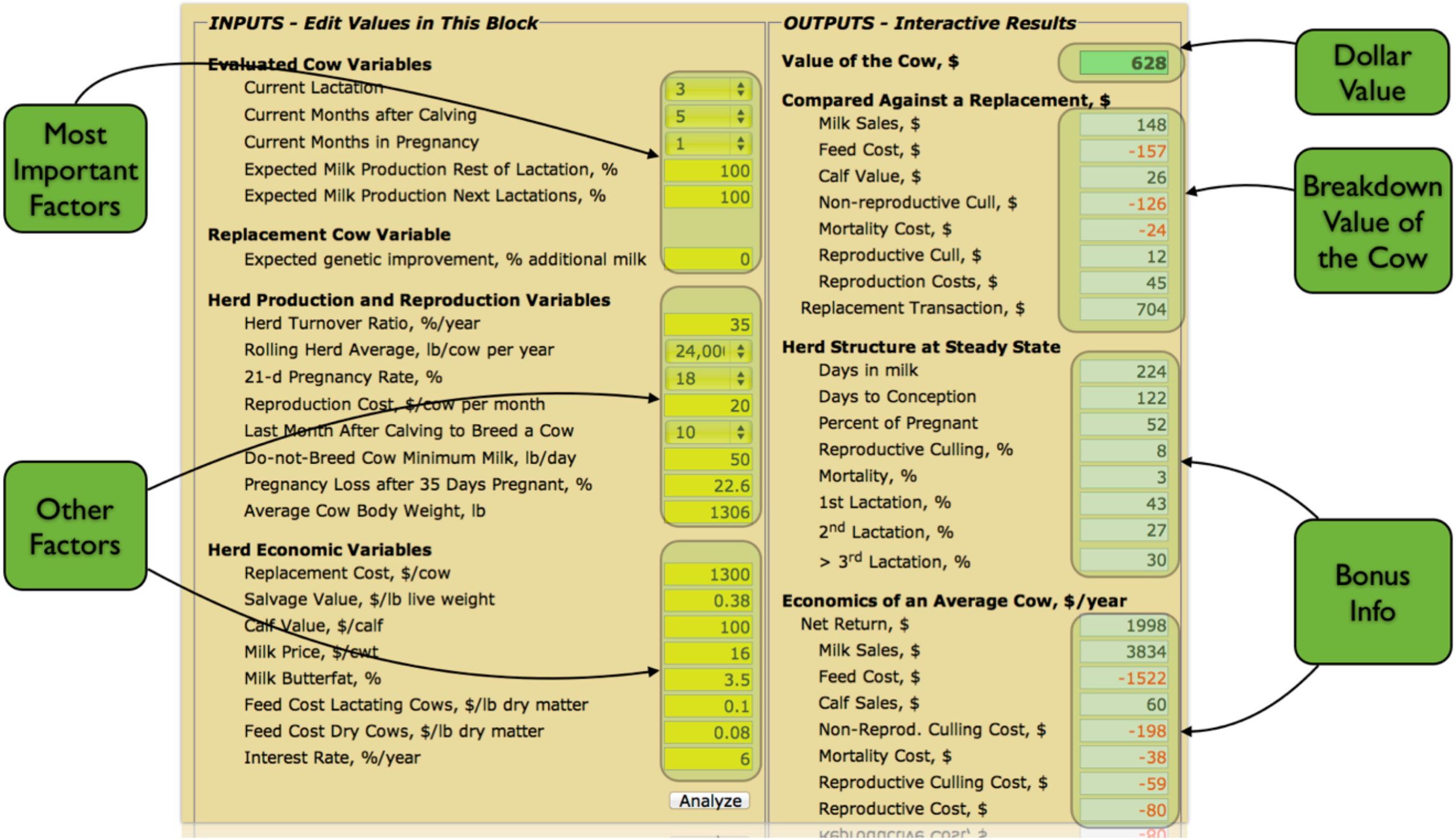
Value of the Cow, $	**897**
Compared Against a Replacement, $	
Milk Sales, $	535
Feed Cost, $	-238
Calf Value, $	-2
Non-reproductive Cull, $	-85
Mortality Cost, $	-16
Reproductive Cull, $	4
Reproduction Costs, $	-5
Replacement Transaction, $	704
Herd Structure at Steady State	
Days in milk	224
Days to Conception	122
Percent of Pregnant	52
Reproductive Culling, %	8
Mortality, %	3
1st Lactation, %	43
2nd Lactation, %	27
>= 3rd Lactation, %	30
Economics of an Average Cow, $/year	
Net Return, $	1969
Milk Sales, $	3806
Feed Cost, $	-1522
Calf Sales, $	60
Non-Reprod. Culling Cost, $	-198
Mortality Cost, $	-38
Reproductive Culling Cost, $	-59
Reproductive Cost, $	-80

Example:

Value of this 2nd lactation, 1 MIM, open cow is **$897**

Single cow analysis

Decision for specific cow



Herd analysis

Decisions at the herd level

List of all cows in a herd

Same factors as individual cow

Count of cows

Results snapshot

Analyze results

INPUTS - Edit Values in This Block

Download Parameter Excel File

Download Parameters File

Upload Parameters as Excel File

Select the Excel File:

Choose File HerdValued

Replacement Cow Variable	
Expected genetic improvement, % additional milk	0
Herd Production and Reproduction Variables	
Herd Turnover Ratio, %/year	35
Rolling Herd Average, lb/cow per year	24,00
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

Number of Cows: **1595**

Creating Excel Spreadsheet ...

Progress bar

CowID	Cow Value,$	CowID	Cow Value,$
3747	-5685	4846	-2687
6752	-5086	4540	-2649
4370	-4686	3838	-2614
6141	-4119	6402	-2602
5666	-4094	6050	-2579
5331	-3999	6736	-2579
6963	-3941	4174	-2572
6552	-3651	4236	-2550
4763	-3517	6918	-2525
6362	-3488	6472	-2505
4799	-3440	5508	-2488
4104	-3297	5681	-2484
5208	-3233	5940	-2440
6867	-3180	6721	-2436
4906	-3090	6633	-2430
6122	-3064	5790	-2423
6224	-3041	6801	-2420
6928	-3028	6857	-2420
6748	-2973	6820	-2388
6666	-2908	4586	-2333
3892	-2899	4264	-2323
4192	-2776	5766	-2282
3727	-2724	6303	-2282
4639	-2700	6975	-2282
4876	-2693	...	...

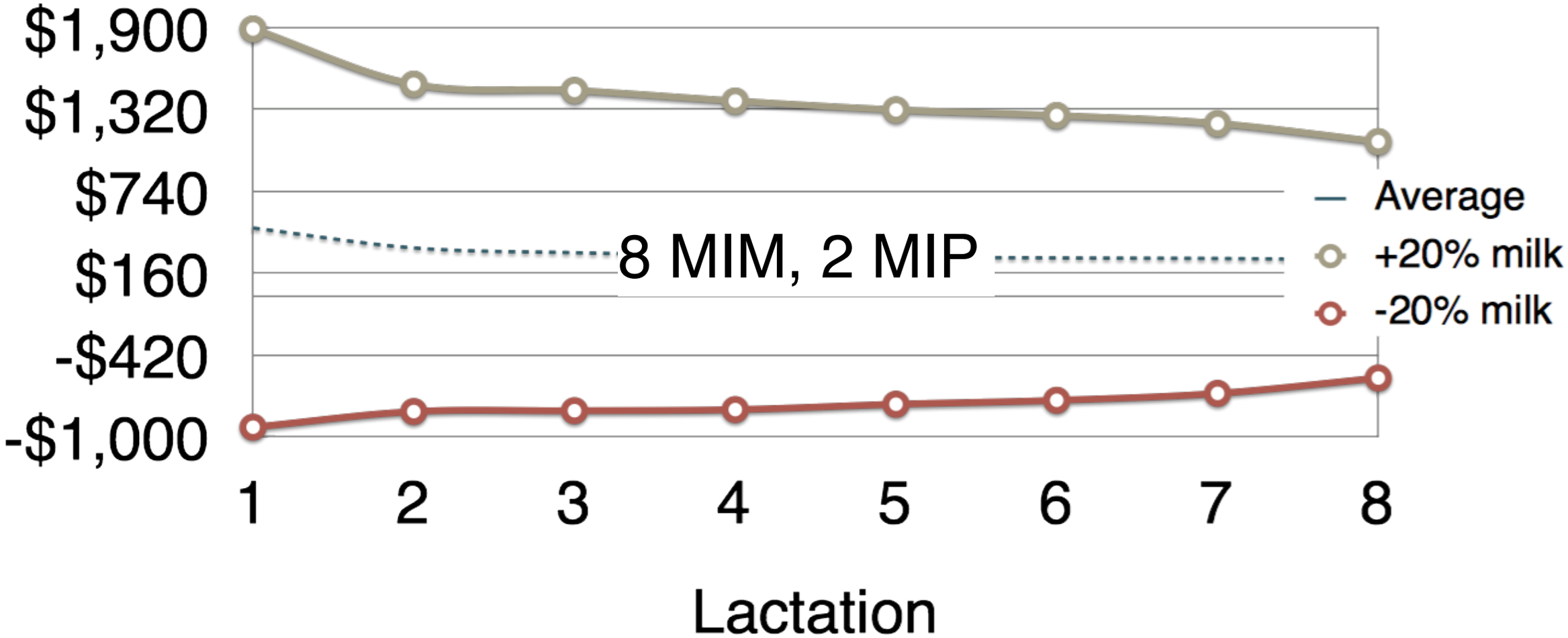
Download Results as Excel Spreadsheet

Economic value of a dairy cow

Practical decision-making

Cull or not cull

Positive cow value indicates cow brings more value than replacement

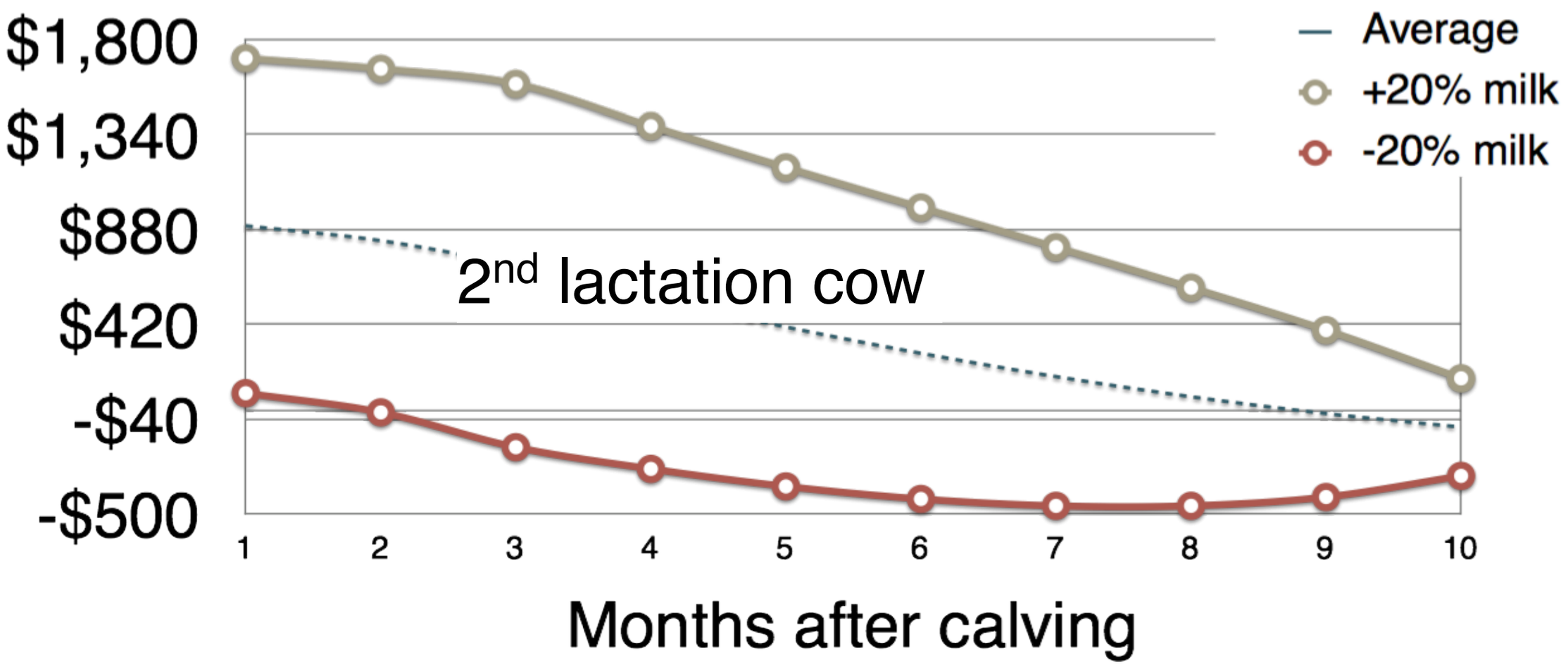


Economic value of a dairy cow

Practical decision-making

Breed or not breed

Better chance for higher value cows

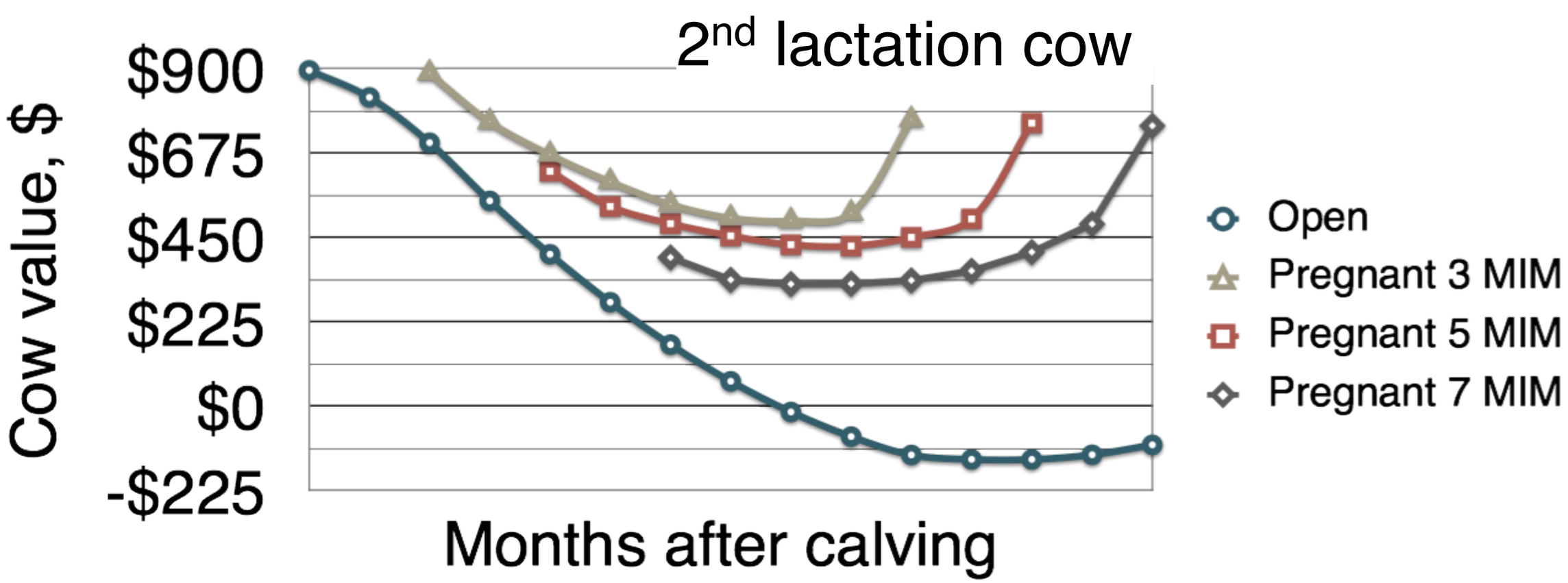


Economic value of a dairy cow

Practical decision-making

Treat or not treat

More investment allowed in higher value cows

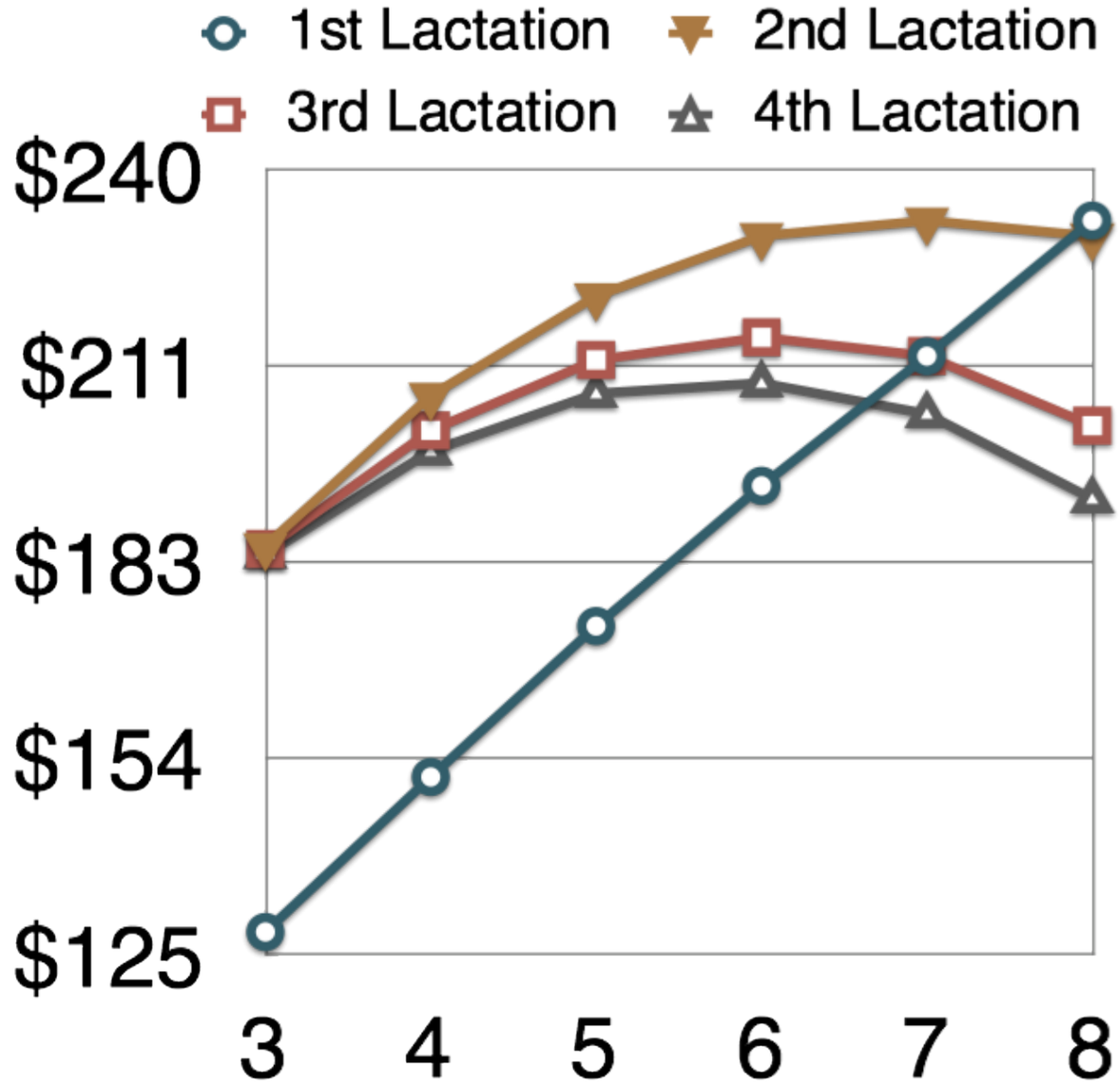


Economic value of a dairy cow

Practical decision-making

Calculate the value of a pregnancy

Difference between pregnant and non-pregnant

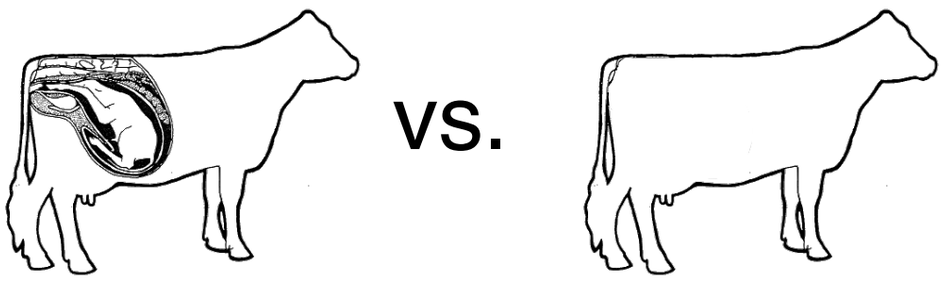


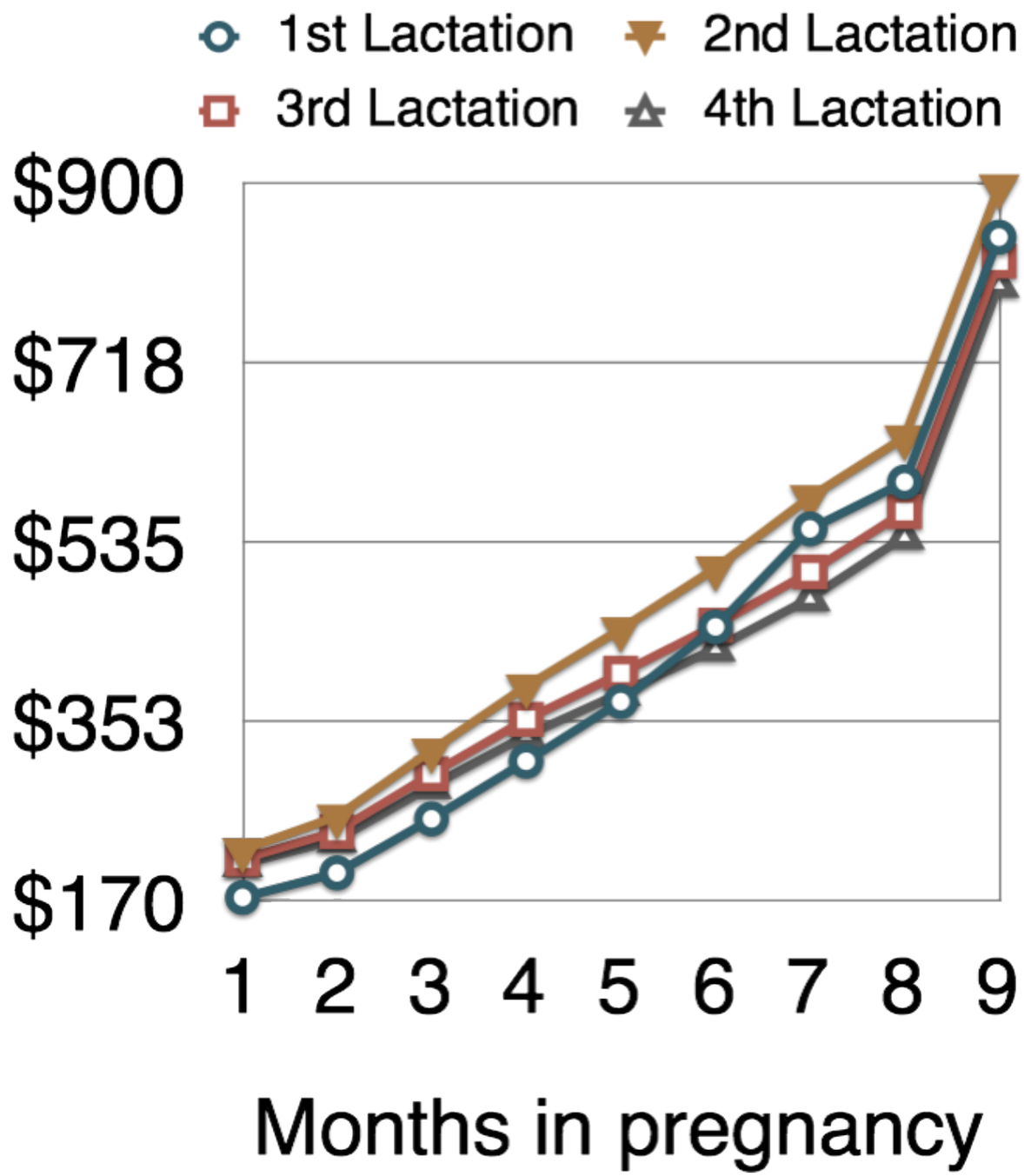
Economic value of a dairy cow

Practical decision-making

Calculate the cost of a pregnancy loss

Difference between non-pregnant and pregnant



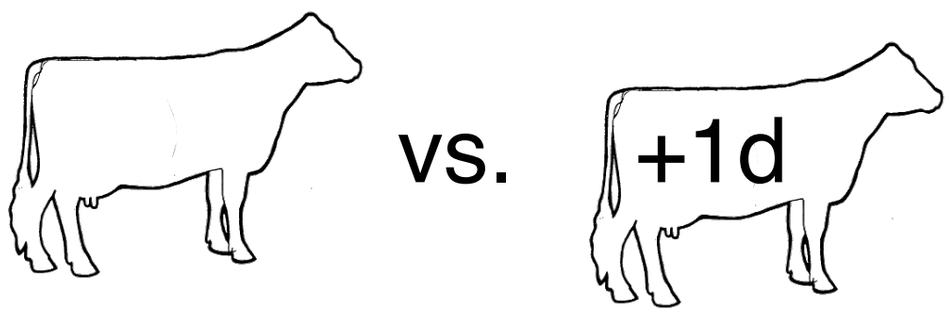


Economic value of a dairy cow

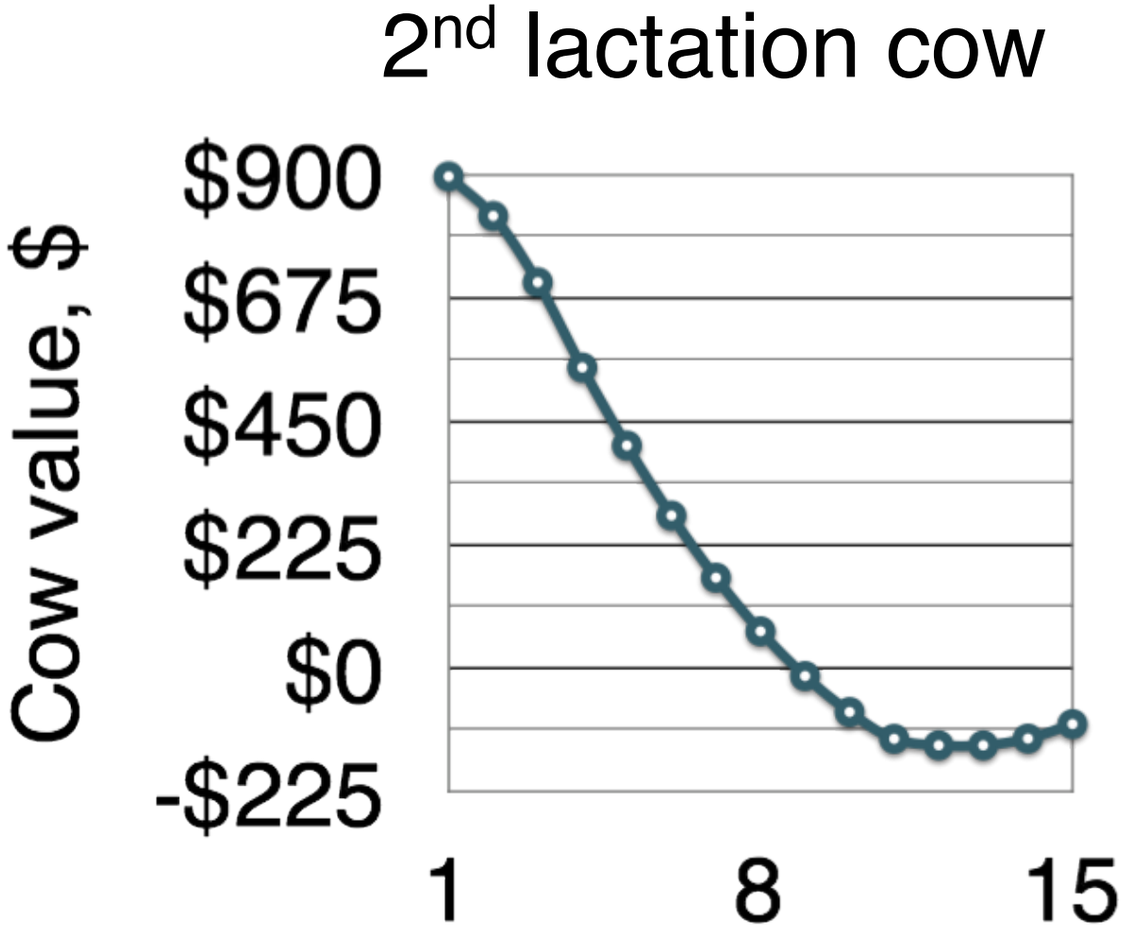
Practical decision-making

Calculate the cost of a day open

Difference between value of non-pregnant cow in 2 successive days



E.g., $5.16 (month 2-3) and $4.26 (month 5-6)



Herd Selection Guide

Breeding and replacement decisions

AgSource Cooperative Services

Current Lactation			Lifetime Average			Genetics		Test Day		
ME Milk	LS SCC	TCI	ME Milk	LS SCC	TCI	NM$	Gen Ind.	Milk	LS SCC	Exp. Rel. $
46513	1.1		46513	1.1		99				$4,576
43440	0.8		43440			142		78	0.9	$3,684
42577	1.9		42577			146		131	1.3	$3,571
42690	1.4		42690			567		109	0.9	$3,468
41259	1.6		41259			340		112	1.5	$3,156
42777	2.4		42777			20		125	2.2	$3,130
39417	5.4	2404	39616	0.5	2404	318		128	3.9	$278
33255	0.9	428	35944	4.6	428	71		131	1.2	$276
33183	1	-913	34185	1.7	-76	344				$273
31578	1.4	3517	34188	3.8	3517	285		119	1.4	$273
34011	3.8		34011	3.8						$270
33609	1.6		33609			185		59	1.9	$269
27406	0.8	612	36670	1.9	226	194		115	1	$265
33556	0.9		33556			124		100	0.8	$256
17783	1.2	-6148	26926	3.3	-6148			47	1.1	($3,473)
23564	2.1		23564					53	2.1	($3,654)
19546	1.7		19546					34	1.7	($5,128)
19173	1.6		19173					41	0.8	($5,151)
18936	1.6		18936					41	1.6	($5,384)
17321	1.3		17321					34	1.3	($5,958)

New report being offered to ≥ 3,500 dairy farmers in Wisconsin

Economic values of cows calculated with tool

Thanks

Cow nutrient requirement

Energy

Total net energy (NE_{total})

Energy required for maintenance + energy required for milk production

NE_{total} (Mcal) = $NE_{maintenance}$ + NE_{milk}

$NE_{maintenance}$

Function of animal body weight

$NE_{maintenance} = 0.079 \times BW^{0.75}$

NE_{milk}

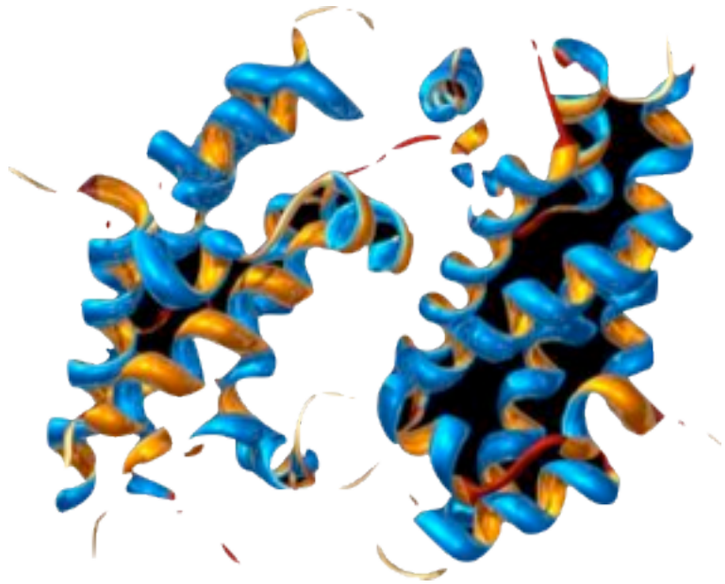
Function of milk and fat production

$NE_{milk} = Milk \times (0.36 + 0.0969 \times Fat\%)$

NRC, 2001

Cow nutrient requirement

Protein



Total crude protein (CP_{total})

Protein required for maintenance + protein required for milk production

$$CP_{total}\ (g) = CP_{maintenance} + CP_{milk}$$

$CP_{maintenance}$

Function of animal body weight

$$CP_{maintenance} = 104.78 + 0.73 \times BW - 0.00015432 \times BW^2$$

CP_{milk}

Function of milk and fat production

$$CP_{milk} = Milk \times (4586 + 1036 \times Fat\%)$$

McGilliard et al., 1983

Cow feed requirement

Dry matter intake

Total dry matter intake (DMI)

Function of DIM, BW, and 4% fat corrected milk (4% FCM)

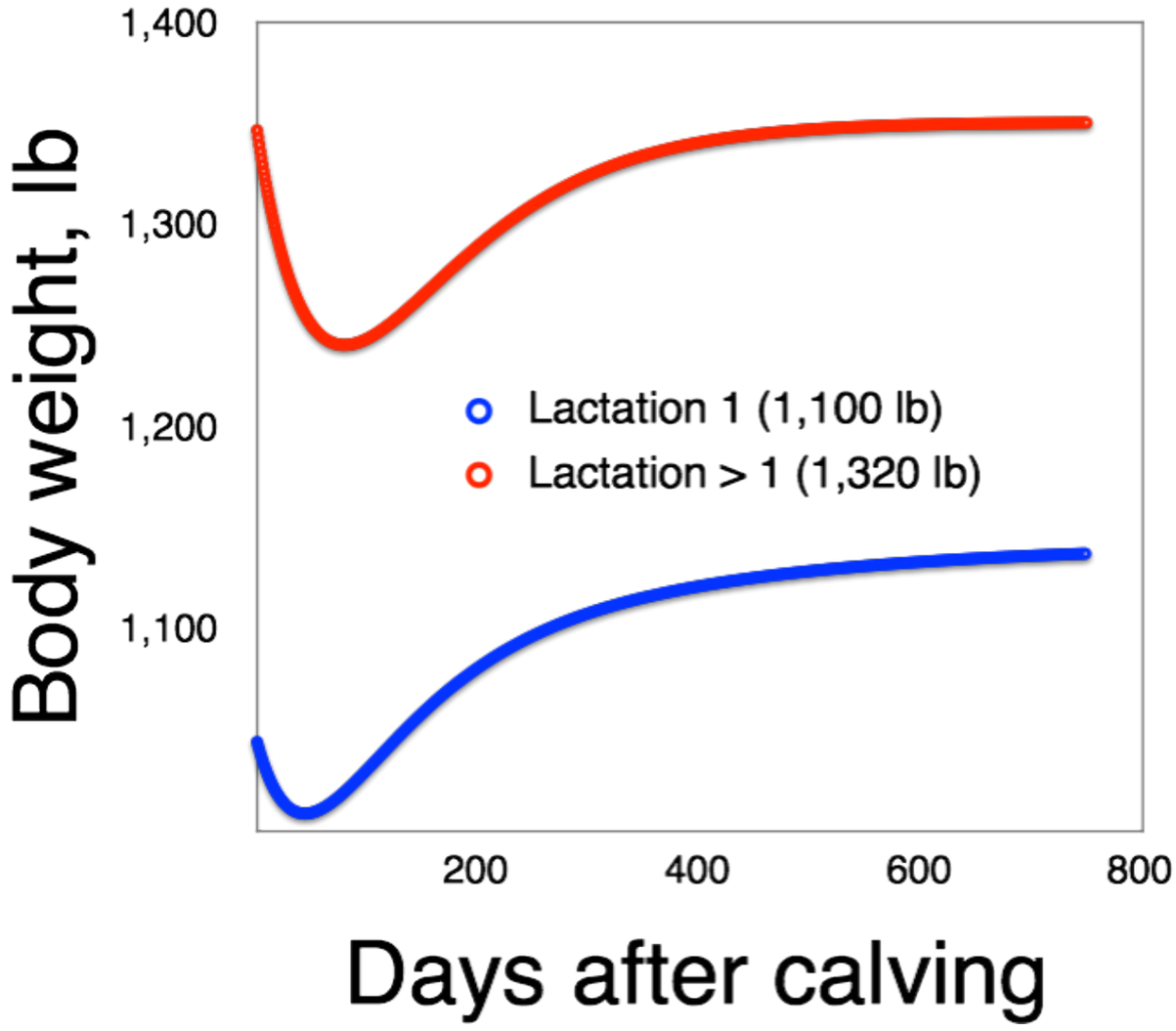
$$DMI\ (kg) = (0.372 \times 4\%\ FCM + 0.0968 \times BW^{0.75}) \times (1 - e^{(-0.192 \times ((DIM/7) + 3.67))})$$

$$4\%\ FCM = 0.4 \times Milk + 15 \times (Fat\%/100) \times Milk$$

NRC, 2001

Cow body weight

Measurements not always available



Estimation based on

- Lactation
- DIM
- Cohorts' average BW

Korver et al., 1985 function
fitted to NRC, 2001

Additional costs and benefits

Impacts grouping feeding strategies

Management cost

- Additional labor
- Extra management

Avoid costs

- Additives savings

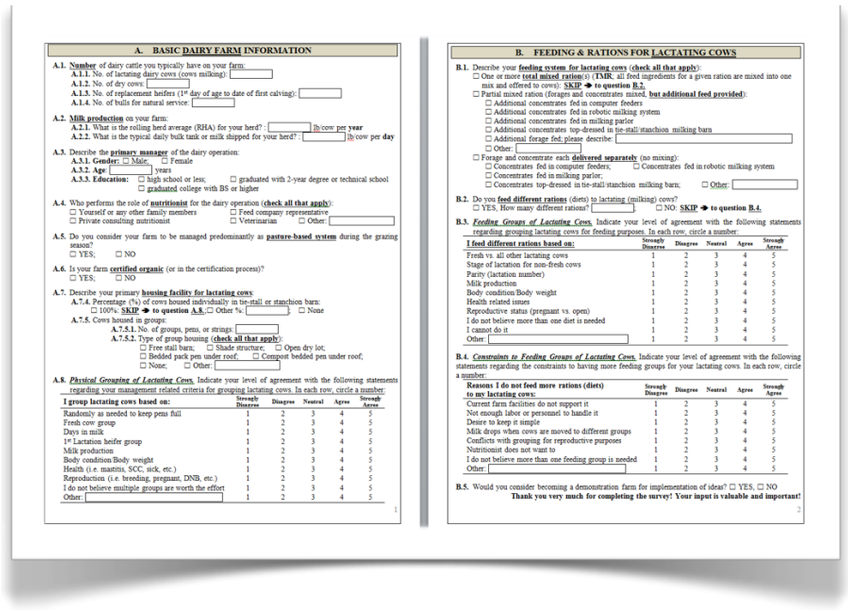
Milk depression

- Cow social interactions
- Diet changes

Why farmers do not group more?

Trying to find most important constraints

2-page mailed survey



A. BASIC DAIRY FARM INFORMATION

A.1. Number of dairy cattle you typically have on your farm:
- **A.1.1.** No. of lactating dairy cows (cows milking): ☐
- **A.1.2.** No. of dry cows: ☐
- **A.1.3.** No. of replacement heifers (1st day of age to date of first calving): ☐
- **A.1.4.** No. of bulls for natural service: ☐

A.2. Milk production on your farm:
- **A.2.1.** What is the rolling herd average (RHA) for your herd? : ☐ lb/cow **per year**
- **A.2.2.** What is the typical daily bulk tank or milk shipped for your herd? : ☐ lb/cow per **day**

A.3. Describe the **primary manager** of the dairy operation:
- **A.3.1. Gender:** ☐ Male; ☐ Female
- **A.3.2. Age:** ☐ years
- **A.3.3. Education:** ☐ high school or less; ☐ graduated with 2-year degree or technical school ☐ graduated college with BS or higher

A.4. Who performs the role of **nutritionist** for the dairy operation (**check all that apply**):
☐ Yourself or any other family members ☐ Feed company representative
☐ Private consulting nutritionist ☐ Veterinarian ☐ Other: ☐

A.5. Do you consider your farm to be managed predominantly as **pasture-based system** during the grazing season?
☐ YES; ☐ NO

A.6. Is your farm **certified organic** (or in the certification process)?
☐ YES; ☐ NO

A.7. Describe your primary **housing facility for lactating cows**:
- **A.7.4.** Percentage (%) of cows housed individually in tie-stall or stanchion barn:
  ☐ 100%: **SKIP ➔ to question A.8.** ☐ Other %: ☐ ☐ None
- **A.7.5.** Cows housed in groups:
  - **A.7.5.1.** No. of groups, pens, or strings: ☐
  - **A.7.5.2.** Type of group housing (**check all that apply**):
    ☐ Free stall barn; ☐ Shade structure; ☐ Open dry lot;
    ☐ Bedded pack pen under roof; ☐ Compost bedded pen under roof;
    ☐ None; ☐ Other: ☐

A.8. *Physical Grouping of Lactating Cows.* Indicate your level of agreement with the following statements regarding your management related criteria for grouping lactating cows. In each row, circle a number:

I group lactating cows based on:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Randomly as needed to keep pens full	1	2	3	4	5
Fresh cow group	1	2	3	4	5
Days in milk	1	2	3	4	5
1st Lactation heifer group	1	2	3	4	5
Milk production	1	2	3	4	5
Body condition/Body weight	1	2	3	4	5
Health (i.e. mastitis, SCC, sick, etc.)	1	2	3	4	5
Reproduction (i.e. breeding, pregnant, DNB, etc.)	1	2	3	4	5
I do not believe multiple groups are worth the effort	1	2	3	4	5
Other: ☐	1	2	3	4	5

1

B. FEEDING & RATIONS FOR LACTATING COWS

B.1. Describe your **feeding system for lactating cows** (**check all that apply**):
- ☐ One or more **total mixed ration**(s) (**TMR**; all feed ingredients for a given ration are mixed into one mix and offered to cows): **SKIP ➔ to question B.2.**
- ☐ Partial mixed ration (forages and concentrates mixed, **but additional feed provided**):
  - ☐ Additional concentrates fed in computer feeders
  - ☐ Additional concentrates fed in robotic milking system
  - ☐ Additional concentrates fed in milking parlor
  - ☐ Additional concentrates top-dressed in tie-stall/stanchion milking barn
  - ☐ Additional forage fed; please describe: ☐
  - ☐ Other: ☐
- ☐ Forage and concentrate each **delivered separately** (no mixing):
  - ☐ Concentrates fed in computer feeders; ☐ Concentrates fed in robotic milking system
  - ☐ Concentrates fed in milking parlor;
  - ☐ Concentrates top-dressed in tie-stall/stanchion milking barn; ☐ Other: ☐

B.2. Do you **feed different rations** (diets) to lactating (milking) cows?
☐ YES, How many different rations? ☐ ; ☐ NO: **SKIP ➔ to question B.4.**

B.3. *Feeding Groups of Lactating Cows.* Indicate your level of agreement with the following statements regarding grouping lactating cows for feeding purposes. In each row, circle a number:

I feed different rations based on:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Fresh vs. all other lactating cows	1	2	3	4	5
Stage of lactation for non-fresh cows	1	2	3	4	5
Parity (lactation number)	1	2	3	4	5
Milk production	1	2	3	4	5
Body condition/Body weight	1	2	3	4	5
Health related issues	1	2	3	4	5
Reproductive status (pregnant vs. open)	1	2	3	4	5
I do not believe more than one diet is needed	1	2	3	4	5
I cannot do it	1	2	3	4	5
Other: ☐	1	2	3	4	5

B.4. *Constraints to Feeding Groups of Lactating Cows.* Indicate your level of agreement with the following statements regarding the constraints to having more feeding groups for your lactating cows. In each row, circle a number:

Reasons I do not feed more rations (diets) to my lactating cows:	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Current farm facilities do not support it	1	2	3	4	5
Not enough labor or personnel to handle it	1	2	3	4	5
Desire to keep it simple	1	2	3	4	5
Milk drops when cows are moved to different groups	1	2	3	4	5
Conflicts with grouping for reproductive purposes	1	2	3	4	5
Nutritionist does not want to	1	2	3	4	5
I do not believe more than one feeding group is needed	1	2	3	4	5
Other: ☐	1	2	3	4	5

B.5. Would you consider becoming a demonstration farm for implementation of ideas? ☐ YES, ☐ NO

Thank you very much for completing the survey! Your input is valuable and important!

2

30 to 35% feeding same ration to all lactating

1	Perception of milk drops
2	Keep mgt. simple
3	Conflicts w/repro group
4	Facilities do not allow
5	Don't believe are needed
6	Nutritionist don't want
7	Labor or personnel

Results (responses)

~200 WI

~59 MI

Cotreras-Govea et al., 2013

Economic value all cows in herd

Ranked values for better decision-making

Herd's individual cow values

Candidates for replacement

Best performing animals

Treatment decisions

5892	-1,123
6344	-243
435	-10
221	269
5543	2,213