Using Simulators to Improve Profitability on Dairy Farms

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This 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 tools to help dairy farmers improve their economic performance along with environmental stewardship.

University of Wisconsin

University of Wisconsin - Madison
UW - Cooperative Extension
UW - Dairy Science
Dairy Cattle Reproduction
Dairy Cattle Nutrition
Milk Quality
UW Dairy Nutrient
Understanding Dairy Markets
UW Center for Dairy Profitability

Latest Projects
Improving Dairy Farm Sustainability
Genomic Selection and Herd Management
Dairy Reproduction Decision Support Tools
Strategies of Pasture Supplementation
Improving Dairy Cow Fertility

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Extension Specialist
in Dairy Management
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Madison, WI 53706
(608) 255-8506
vcabrera@wisc.edu

Victor E. Cabrera, Ph.D.

Helpful Link
Repro Money Program

Tweets
Drop everything, this time-lapse will make you want to shout from the mountaintops, "I love Madison!". https://t.co/3GpXAIhW
Retweeted by Victor E. Cabrera
Tools
A collection of the state-of-the-art and scientific-based dairy farm management decision support tools that are user-friendly, interactive, robust, visually attractive, and self-contained. These tools count with associated documentation and video demonstrations. Technical support on their application is also available upon request.

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
- Heifer Pregnancy Rate
- 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
- The Economic Value of a Dairy Cow
- Economic Value of Sexed Semen Programs for Dairy Heifers
- Exploring Timing of Pregnancy Impact on Income Over Feed Cost
- Dairy Reproductive Economic Analysis
- Heifer Pregnancy Rate
- Retention Pay-Off (RPO) Calculator

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
- Retention Pay-Off (RPO) Calculator

Health
- Economic Evaluation of Chol/PEARL

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
Decision support tools
Farm-specific assessments

Every farm is different

Farm conditions change
Decisions should adjust

Market conditions change permanently
Prices and cost impact decisions

Applications should be user-friendly
Direct application of results
Selected simulators: Illustrations

Demonstration of practical applications
FeedVal
Estimates the true value of dairy feeds

FeedVal 2012
V. E. Cabrera, L. Armentano, R. D. Shaver

Upload Data

Template Spreadsheet:
Download

Upload data as Excel file:
Choose File, no file selected
Upload

Select Nutrients and Date

Select nutrients:
4 selected

Price date:
2014-04-25

Perform Analysis

Analyze
Download Results
Convert all to kg

Remove nutrients with negative predicted unit costs.

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>As-Fed Basis</th>
<th>Calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredient</td>
<td>RUP %</td>
<td>RDP %</td>
</tr>
<tr>
<td>Shelled Corn</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Soybean Meal 48%</td>
<td>21</td>
<td>33</td>
</tr>
<tr>
<td>Soybean Meal 44%</td>
<td>17.3</td>
<td>32.5</td>
</tr>
<tr>
<td>Soybean Meal, expeller</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Soybeans, raw</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Soybeans, heated</td>
<td>22</td>
<td>21</td>
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<tr>
<td>Good Quality Hay</td>
<td>6</td>
<td>14</td>
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<tr>
<td>Poor Quality Hay</td>
<td>4.8</td>
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<tr>
<td>Corn Silage</td>
<td>2.8</td>
<td>4.2</td>
</tr>
<tr>
<td>Earlage/Snaplage</td>
<td>3.6</td>
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<tr>
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<td>0</td>
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<tr>
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<td>76</td>
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<td>0</td>
<td>287</td>
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<td>Straw</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Soy Hulls</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

Helps find best feed purchases
FeedVal

Information flow

User
Feed Market Prices

User
Feed nutrient contents

User
Referee feeds and nutrients

Simulator
Finds best and worst feed purchases

Simulator
Predicts feed prices ($)

Simulator
Predicts nutrient values ($)
Anatomy of FeedVal

Upload Data

Template Spreadsheet:
Download

Upload data as Excel file:
Choose File  no file selected
Upload

Select Nutrients and Date

Select nutrients:
4 selected

Price date:
2014-04-25

Perform Analysis

Analyze  Download Results  Convert all to kg

Remove nutrients with negative predicted unit costs.

<table>
<thead>
<tr>
<th></th>
<th>Ingredient</th>
<th>Nutrients</th>
<th>As-Fed Basis</th>
<th>Calculated</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>RUP %</td>
<td>RDP %</td>
<td>NEI3x Mcal/lb</td>
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<tr>
<td>1</td>
<td>Shelled Corn</td>
<td>4.5</td>
<td>4.5</td>
<td>0.91</td>
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<tr>
<td>2</td>
<td>Soybean Meal 48%</td>
<td>21</td>
<td>33</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Soybean Meal 44%</td>
<td>17.5</td>
<td>32.5</td>
<td>0.97</td>
</tr>
<tr>
<td>4</td>
<td>Soybean Meal, expeller</td>
<td>30</td>
<td>16</td>
<td>1.09</td>
</tr>
<tr>
<td>5</td>
<td>Soybeans, raw</td>
<td>12</td>
<td>28</td>
<td>1.35</td>
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</table>
Anatomy of FeedVal

Upload Data
Template Spreadsheet:
Download

Upload data as Excel file:
Choose File no file selected
Upload

Enter file data

Select referee nutrients
Select nutrients:
4 selected

Price date:
2014-04-25

Referential price date

Commands/Controls

Perform Analysis
Analyze Download Results Convert all to kg

Remove nutrients with negative predicted unit costs.

Feeds | Composition | Price | Prediction
--- | --- | --- | ---
| Ingredient | RUP % | RDP % | NEIX Mcal/lb | peNDF % | DM % | Price $/Unit | Unit | Predicted Value $/Unit | Actual Price as % of Predicted Value |
1 | ✅ Shelled Corn | 4.5 | 4.5 | 0.91 | 0 | 86 | 5.04 | bu | |
2 | ✅ Soybean Meal 48% | 21 | 33 | 1 | 0 | 89 | 516 | ton | |
3 | ✅ Soybean Meal 44% | 17.5 | 32.5 | 0.97 | 0 | 89 | 504 | ton | |
4 | | | | | | | | | |
5 | | | | | | | | | |
Referee nutrients

2 Nutrients
Minimum

13 Nutrients
Maximum

Less or qual to
Number of referee feeds

Depends on
Type of analysis wanted
Referee feeds

Denoted by a check mark
As many as 40

More or equal to
Number of referee nutrients

Unchecked feeds
Still predicts their price

Depends on
Type of analysis wanted and feed prices available
## Nutrient composition and prices

<table>
<thead>
<tr>
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<th>Nutrients</th>
<th>As-Fed Basis</th>
</tr>
</thead>
<tbody>
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<td>RDP %</td>
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<td>-----------------------------------</td>
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<td>4.5</td>
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<tr>
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<td>32.5</td>
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<tr>
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<td>14</td>
</tr>
<tr>
<td>Poor Quality Hay</td>
<td>4.8</td>
<td>11.2</td>
</tr>
</tbody>
</table>

### Changes:
- Through input file
- Directly online

**Everything is “editable”**
- Name of feed
- Nutrient composition
- Market prices
- Units
### April 25, 2004 - Midwest prices

#### 4 referee nutrients
- RUP
- RDP
- NEL
- peNDF

#### 26 referee feeds
Prices available

#### 13 good purchase feeds
Green cells
April 25, 2004 - Midwest prices

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>RUP %</th>
<th>RDP %</th>
<th>NEi3x Mcal/lb</th>
<th>peNDF %</th>
<th>DM %</th>
<th>Price* $/Unit</th>
<th>Unit</th>
<th>Predicted Value $/Unit</th>
<th>Actual Price as % of Predicted Value</th>
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<tr>
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<td>15</td>
<td>15</td>
<td>0.9</td>
<td>0</td>
<td>89</td>
<td>0.26</td>
<td>kg</td>
<td>0.426/kg</td>
<td>61</td>
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<tr>
<td>Whole Cottonseed</td>
<td>6</td>
<td>18</td>
<td>0.88</td>
<td>22</td>
<td>89</td>
<td>0.50</td>
<td>kg</td>
<td>0.316/kg</td>
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<td>28</td>
<td>1.25</td>
<td>0</td>
<td>87</td>
<td>0.49</td>
<td>kg</td>
<td>0.488/kg</td>
<td>100</td>
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</table>

Distiller Dried Grains: A BARGAIN

Whole Cottonseed: A RIP-OFF

Soybeans, raw: OK PURCHASE
# Monthly market watch (Midwest)

[FeedVal 2012 predicted dairy feed prices and rankings for March 2014](#)

V.E. Cabrera, P. Hoffman, and R. Shaver

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>DM %</th>
<th>Unit</th>
<th>Market</th>
<th>Predicted</th>
<th>Actual Price as % of Predicted</th>
<th>Best-buy Ranking</th>
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<td>Wet Distillers</td>
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<td>ton</td>
<td>76.0</td>
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<td>41</td>
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<td>ton</td>
<td>75.0</td>
<td>145.5</td>
<td>52</td>
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<tr>
<td>Hominy</td>
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<td>ton</td>
<td>141.0</td>
<td>232.5</td>
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<td>ton</td>
<td>255.0</td>
<td>402.0</td>
<td>63</td>
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<td>ton</td>
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<td>bu</td>
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<td>73</td>
<td>6</td>
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<td>ton</td>
<td>48.0</td>
<td>61.3</td>
<td>78</td>
<td>7</td>
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<td>ton</td>
<td>185.0</td>
<td>228.6</td>
<td>81</td>
<td>8</td>
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<td>Soy Hulls</td>
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<td>ton</td>
<td>200.0</td>
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<td>90</td>
<td>9</td>
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<td>ton</td>
<td>375.8</td>
<td>418.9</td>
<td>90</td>
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<td>ton</td>
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<td>94</td>
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<td>ton</td>
<td>780.0</td>
<td>820.8</td>
<td>95</td>
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<td>89</td>
<td>bu</td>
<td>6.9</td>
<td>6.9</td>
<td>99</td>
<td>14</td>
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<tr>
<td>Soybean Meal 44%</td>
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<td>ton</td>
<td>487.0</td>
<td>474.9</td>
<td>103</td>
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<td>Sunflower Meal</td>
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<td>ton</td>
<td>270.0</td>
<td>261.8</td>
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<td>Urea</td>
<td>99</td>
<td>ton</td>
<td>472.0</td>
<td>454.1</td>
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<tr>
<td>Blood Meal</td>
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<td>ton</td>
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<td>ton</td>
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<td>ton</td>
<td>216.4</td>
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<td>12.9</td>
<td>11.2</td>
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<td>bu</td>
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<td>12.2</td>
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<td>Oats</td>
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<td>ton</td>
<td>290.0</td>
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<td>cwt</td>
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<td>ton</td>
<td>270.0</td>
<td>205.4</td>
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<td>26</td>
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<td>ton</td>
<td>438.0</td>
<td>265.1</td>
<td>165</td>
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</table>
Pricing drought stressed corn silage

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Nutrients</th>
<th>As-Fed Basis</th>
<th>Calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TDN %</td>
<td>CP %</td>
<td>DM %</td>
</tr>
<tr>
<td>1 Shelled Corn</td>
<td>89</td>
<td>9.4</td>
<td>84.5</td>
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<tr>
<td>2 Soybean Meal 48%</td>
<td>81</td>
<td>53.8</td>
<td>89</td>
</tr>
<tr>
<td>3 Drought Stress Corn Silage</td>
<td>65</td>
<td>10</td>
<td>35</td>
</tr>
</tbody>
</table>

- Pricing Drought Stressed Corn Silage
- Based only on fertilizer prices
- Not available in the selection list
The Economic Value of Dairy Cow
Calculates the projected net return of a cow

Assists decision-making for replacement, reproduction, treatment...
Value of a cow

Concept and principle

Discounted future net return
Always compared to an immediate replacement

General interpretation

+ value = KEEP
- value = REPLACE
Value of a cow
Calculation: Aggregated future net returns
Markov-chain model

Cabrera, 2012
Critical decision-making
Practical application

Optimal replacement
Keep or replace

Optimal treatment
Treat or not treat

Optimal breeding
Breed or no to breeding

Critical information
Value of a pregnancy
Cost of pregnancy loss
Cost of day open

Individual cow management
Most important factors
For decision-making

Cow expected productivity
Related to herd

Replacement genetic make-up
Compared to herd
### Anatomy Simulator Value of a Cow

#### ENTRADAS - Editar Valores en este Bloque

**Parametros de Vaca Evaluada**
- Lactancia Actual: $3$
- Meses después del parto: $5$
- Meses de gestación: $1$
- Prod. de Leche esperada durante resto de lactancia, %: $100$
- Prod. de Leche esperada durante sig. lactancias, %: $100$

**Parametro de Vaca de Reemplazo**
- Mejora genética esperada, % de leche adicional: $0$

**Produccion del Hato y Variables de Reproduccion**
- Índice de descarte del hato, %/año: $35$
- Promedio de producción, kg/vaca por año: $10890$
- Tasa de Preñez a 21 días, %: $18$
- Costos de Reproducción, $/vaca por mes: $20.00$
- Último Mes Después del Parto Para Inseminar la Vaca: $10$
- Leche Minima para Descartar Vaca no Prelada, kg/día: $22.5$
- Pérdida de preñezes > 35 días de gestación, %: $22.5$
- Peso Promedio de una Vaca, kg: $652.39$

**Parametros Economicos del Hato**
- Costo de Reemplazo, $/vaca: $1300.00$
- Costo de Recuperacion al Descarte, $/kg peso animal vivo: $0.84$
- Valor Ternero/Ternera, $/tornera: $100.00$
- Precio Leche, $/Kg: $0.35$
- Contenido de Grasa en Leche, %: $3.5$
- Costo de Alimentación de Vacas Lactantes, $/kg materia seca: $0.22$
- Costo de Alimentación de Vacas Secas, $/kg materia seca: $0.18$
- Tasa de Interes, %/año: $6$

#### SAIDAS - Resultados Interactivos

**Valor de la Vaca, $$**: 627
**Comparacion Respecto a un Reemplazo, $$**: 147
**Ventas de Leche, $$**: -157
**Costos de Alimentacion, $$**: 25
**Costo de Mortalidad, $$**: -43
**Seleccin Reproductiva, $$**: 12
**Costos Reproductiva, $$**: 45
**Transaccion de Reemplazo, $$**: 704

**Estructura del Hato en Equilibrio**
- Días en Leche: 224
- Días a la Conceptión: 122
- Porcentaje de Vacas Prenadas: 52
- Descarte Reproductivo, %: 8
- Mortalidad, %: 3
- 1ra Lactancia, %: 43
- 2da Lactancia, %: 27
- >= 3ra Lactancia, %: 30

**Economia de una vaca promedio, $/año**
- Retorno Neto, $$: 1989
- Ventas de Leche, $$: 3806
- Costos de Alimentacion, $$: -1522
- Ventas Terneros, $$: 60
- Costo de Descarte No-reproductivo, $$: -198
- Costo de Mortalidad, $$: -38
- Costo de Desecho Reproductivo, $$: -59
- Costo de Reproducción, $$: -80
## Anatomy Simulator Value of a Cow

### Language and units
- Options: English, Spanish
- Units: EEUU, Métrico, Inglaterra

### Cow info
- **Lactancia Actual**: 3 months
- **Meses después del parto**: 5 months
- **Meses de gestación**: 1 month
- **Prod. de Leche esperada durante resto de lactancia, %**: 100
- **Prod. de Leche esperada durante sig. lactancias, %**: 100

### Replacement
- **Promedio de producción, kg/vaca por año**: 10800
- **Tasa de Preñez a 21 días, %**: 18
- **Costos de Reproducción, $/vaca por mes**: 20.00
- **Ultimo Mes Después del Parto Para Inseminar la Vaca**: 10 months
- **Pérdida de preñezes > 35 días de gestación, %**: 22.6%
- **Peso Promedio de una Vaca, kg**: 592.39

### Herd data
- **Costo de Reemplazo, $/vaca**: 1300.00
- **Costo de Recuperacion al Descarte, $/kg peso animal vivo**: 0.84
- **Valor Ternero/Ternera, $/térnero**: 100.00
- **Precio Leche, $/kg**: 0.35
- **Contenido de Grasa en Leche, %**: 3.5
- **Costo de Alimentacion de Vacas Lactantes, $/kg materia seca**: 0.22
- **Costo de Alimentacion de Vacas Secas, $/kg materia seca**: 0.18
- **Tasa de Interés, %/año**: 6
- **Valor de la Vaca, $**: 627
- **Comparacion Respecto a un Reemplazo, $**: 147
- **Ventas de Leche, $**: -167
- **Costos de Alimentacion, $**: 26
- **Desecho No-reproductivo, $**: -126
- **Costo de Mortalidad, $**: -24
- **Selección Reproductiva, $**: 12
- **Costos de Reproducción, $**: 45
- **Transacción de Reemplazo, $**: 704

### Herd structure
- **Dias en Leche**: 224
- **Dias a la Concepticion**: 122
- **Porcentaje de Vacas Prenadas**: 52%
- **Descarte Reproductivo, %**: 8
- **Mortalidad, %**: 3
- **1ra Lactancia, %**: 43
- **2da Lactancia, %**: 27
- **>= 3ra Lactancia, %**: 30
- **Economía de una vaca promedio, $/año**: 1989
- **Retorno Neto, $**: 3806
- **Ventas de Leche, $**: -1522
- **Costos de Alimentacion, $**: 60
- **Ventas Terneros, $**: -198
- **Costo de Descarte No-reproductivo, $**: -38
- **Costo de Mortalidad, $**: -59
- **Costo de Desecho Reproductivo, $**: -80

---

### Cow or Herd Selection
- Options: Cow, Herd
- Value of a Cow: $627
- Value of a Herd: $704
Value of a cow illustration

Average (=100%) cow and replacement

- $225
- $450
- $675
- $900

- Open
- Pregnant 3 MIM
- Pregnant 5 MIM
- Pregnant 7 MIM

Cow value, $

Months after second calving
Value of a non-pregnant cow
Impact of milk productivity in future lactations

- $500
- $40
- $420
- $880
- $1,340
- $1,800

Base
+20%
-20%

Months after second calving
Pregnant cow (MIM=8, MIP=2)
Impact of milk productivity in future lactations

- $1,000
- $420
- $160
- $740
- $1,320
- $1,900

Lactation

Base
+20%
-20%
Expected genetic gain replacement
Genetic gain summarized in milk productivity

Replacement genetic gain

• Cow value is $211 lower for every 1% expected improved milk productivity of a replacement
Herd Selection Guide

Available DHI Report

>3,500 herds

Records Monthly

Production Health Statistics

Optional Herd Selection

Ranked Cow Values of Herd

Individual cow productivity

Economic Value of a Cow, Herd Analysis
Wisconsin-Cornell Dairy Repro$ Evaluates reproductive programs

Aids decision-making for reproductive management programs
Reproduction Benefits vs. Costs

Very delicate balance

- Milk
- Calves
- Culling
- Hormones
- Semen
- Labor
- Equipment
Reproduction Efficiency vs. Net Return

Very involved calculation

Net Return, $/cow per d

Percent Pregnant, %

Days After Calving

Pregnant
Net Return

50 72 94 114 136 156 178 198 220 240 262 282 304 324 346

5.50 5.85 6.20 6.55 6.90 7.25

6.55 6.90 7.25

5.50 5.85 6.20

0 10 20 30 40 50 60 70 80 90 100

50 72 94 114 136 156 178 198 220 240 262 282 304 324 346
# Anatomy of UW-CU_Repro

## Herd Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herd Size (#)</td>
<td>100</td>
</tr>
<tr>
<td>Average Body Weight (lb)</td>
<td>1,400</td>
</tr>
<tr>
<td>Involuntary Culling (%/yr)</td>
<td>35.0</td>
</tr>
<tr>
<td>Mortality Rate(%/yr)</td>
<td>4.0</td>
</tr>
<tr>
<td>Stillbirth(%)</td>
<td>4.9</td>
</tr>
</tbody>
</table>

## Economic Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk Price ($/cwt)</td>
<td>16.00</td>
</tr>
<tr>
<td>Cost Feed Lactating ($/lb DM)</td>
<td>0.08</td>
</tr>
<tr>
<td>Dry Period Fixed Cost ($/lb DM)</td>
<td>0.06</td>
</tr>
<tr>
<td>Female Calf value($)</td>
<td>136</td>
</tr>
<tr>
<td>Male Calf value ($)</td>
<td>50</td>
</tr>
<tr>
<td>Heifer Replacement Value($)</td>
<td>1,302</td>
</tr>
<tr>
<td>Salvage Value ($/lb)</td>
<td>0.526</td>
</tr>
</tbody>
</table>
Anatomy of UW-CU_Repro$

Important to define herd OWN lactation curves
Anatomy of UW-CU_Repro$

Always compares the "alternative"

<table>
<thead>
<tr>
<th>Reproductive Programs</th>
<th>Current</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>First AI postpartum</td>
<td>Presynch-Ovsynch-14</td>
<td>Double-Ovsynch (hCG)</td>
</tr>
<tr>
<td>Second and sub. AI</td>
<td>Ovsynch</td>
<td>Ovsynch</td>
</tr>
<tr>
<td>Resynch before preg check</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>
Anatomy of UW-CU_Repro$ allows for the most detailed description of reproductive programs.

<table>
<thead>
<tr>
<th>Programs Description</th>
<th>Current</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>VWP (d)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Estrous Cycle Duration (d)</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Maximum DIM for Breeding</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Do-not-Breed Minimum Milk (lb/d)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>DIM first injection for first AI sync program (d)</td>
<td>36</td>
<td>29</td>
</tr>
<tr>
<td>Weekday first injection</td>
<td>Tuesday</td>
<td>Tuesday</td>
</tr>
<tr>
<td>Intercycling interval for TAI services (d)</td>
<td>42</td>
<td>35</td>
</tr>
<tr>
<td>Heat bred before first TAI service (%)</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>CR heat bred before first TAI service (%)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>CR first TAI service (%)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Heat bred after first TAI service (%)</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>CR heat bred after first TAI service (%)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>CR second and subsequent TAI services (%)</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pregnancy Diagnosis</th>
<th>Current</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day in gestation first preg check (d)</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>Day in gestation second preg check (d)</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>Day in gestation third preg check (d)</td>
<td>221</td>
<td>221</td>
</tr>
</tbody>
</table>
Anatomy of UW-CU_Repro

## Cost of Reproductive Programs

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Current</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semen ($/cow)</strong></td>
<td>41.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Labor ($/cow)</strong></td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Preg check</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palpation ($/hr)</td>
<td>105.0</td>
<td>105.0</td>
</tr>
<tr>
<td>Ultrasound ($/hr)</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Blood Test ($/cow)</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

## Detection of Estrus

**Visual Observation**
- Laborers (#): 0 / 0
- hr/d: 0.0 / 0.0
- Labor ($/h): 0.0 / 0.0

**Activity monitors for Heat Detection**
- System cost ($): 0 / 0
- Monitors (#): 0 / 0
- Cost per monitor ($): 0.0 / 0.0
- Maintenance ($/yr): 0.0 / 0.0
- Life expectancy (yr): 0.0 / 0.0
- Salvage value (%): 0 / 0

## Synchronization

- Labor for injection: 15.0 / 15.0

## Hormones

- GnRH ($/dose): 2.6 / 2.6
- PGF ($/dose): 2.3 / 2.3
- CIDR ($/Unit): 10.0 / 10.0
- hCG ($/dose): 3.5 / 3.5

Level of detail and precision is determined by the user.
Day to day labor required can be described.

### Labor Required for Injections and Pregnancy Diagnosis

**Current**

<table>
<thead>
<tr>
<th>Desc</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Injections</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Hours/d</td>
<td>0.0</td>
<td>0.6</td>
<td>0.0</td>
<td>0.9</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td># Cows</td>
<td>0.0</td>
<td>36.0</td>
<td>0.0</td>
<td>52.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<td><strong>Pregnancy Diagnosis</strong></td>
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**Alternative**

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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laborers</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0</td>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Pregnancy Diagnosis</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>0.0</td>
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<td>0.0</td>
<td>52.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Results

Economic advantage of ALTERNATIVE program

Economic Results

Net Value ($/cow/y)

Current: $3,026
Alternative: $3,090

$/cow/year

$64.2
**Results**

Disaggregated economic factors that contribute to the DIFFERENCE

<table>
<thead>
<tr>
<th>Item</th>
<th>Current</th>
<th>Alternative</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Net Value ($/cow/y)</td>
<td>3,026.1</td>
<td>3,090.3</td>
<td>64.2</td>
</tr>
<tr>
<td>IOFC ($/cow/y)</td>
<td>3,274.9</td>
<td>3,269.3</td>
<td>-5.6</td>
</tr>
<tr>
<td>Replacement Cost ($/cow/y)</td>
<td>-193.3</td>
<td>-187.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Reproductive Cost ($/cow/y)</td>
<td>-93.1</td>
<td>-30.7</td>
<td>62.4</td>
</tr>
<tr>
<td>Calf Value ($/cow/y)</td>
<td>37.6</td>
<td>39.0</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Results

REPRODUCTIVE performance

Expected change by switching to the Alternative program

- Pregnancy rate (PR, %)
- Days open (DO, d)
- Calving interval (PCI, mo)
- Cows Pregnant (%) over DIM

Survival curves
Results

Herd STRUCTURE

By condition, lactation, production
Results

Replacement BALANCE

<table>
<thead>
<tr>
<th>Cows Leaving the Herd</th>
<th>Current</th>
<th>Alternative</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Culling (%)</td>
<td>42.3</td>
<td>40</td>
<td>-2.3</td>
</tr>
<tr>
<td>Non-Reproductive Culling (%)</td>
<td>26.6</td>
<td>25.7</td>
<td>-0.9</td>
</tr>
<tr>
<td>Mortality (%)</td>
<td>4.2</td>
<td>4</td>
<td>-0.2</td>
</tr>
<tr>
<td>Reproductive Culling (%)</td>
<td>11.6</td>
<td>10.3</td>
<td>-1.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heifer Supply and Demand</th>
<th>Current</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heifer Supply (% of herd/year)</td>
<td>41.2</td>
<td>40.9</td>
</tr>
<tr>
<td>Heifer Demand (% of herd/year)</td>
<td>42.4</td>
<td>40.1</td>
</tr>
<tr>
<td>Heifer Balance</td>
<td>-1.2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Is the herd CAPABLE to maintain its size?
Thanks