Budgeting for a Dairy Modernization

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WI and NY Dairy Farms by Herd Size, 2007*

WI 11,400 herds or 80% of 14,200 herds
NY 4,250 herds or 75% of 5,700 herds

Average herd size NY 118 cows (2012)
Average herd size WI 111 cows (2012)

NY 5,150 dairy herds (2012)
WI 11,490 dairy herds (2012)

NY ??? (2014)
WI 10,500 dairy herds (2014)

*USDA/NASS
Common Goals

• What are your goals for the dairy farm business?
Common Goals

- **Improved Quality of Life**
  - Increase Family Time

- **Improved Health/Safety**

- **Transition In/Out**
  - Allow Senior Partner to Exit Operation
  - Allow New Partner to Enter Operation

- **Labor**
  - Milk in a Reasonable Amount of Time
  - Use Existing Labor Force
  - Improve Labor Efficiency

- **Economic**
  - Manage Debt Load
  - Low Capital Cost
  - Improve Profitability
Dairy Modernization

- Improved cow comfort
- Increased dry matter intake (DMI)
- Labor efficiency (2 x more cows)
- Improved operator health and safety
- Increased profit
- Improved quality of life
Farmstead Master Plan

- A farmstead master plan is a set of drawings and documents that describes the site plan with:
  - Physical boundaries
  - Natural boundaries
  - Existing facilities
  - Planned/Proposed improvements
- Define the benefits/limits of the site
Limitations to growth

What are the limitations of growing your family dairy farm business?
Limitations to growth

- Physical Resources
  - Site Conditions
    - Topography
      - Elevations/slopes
    - Drainage Patterns
    - Streams
    - Water Bodies
    - Water well
  - Current Facilities
    - Parlor Size/Capacity
    - Housing
    - Manure Storage
    - Feed Storage

- Physical Resources
  - Site Restrictions
    - Land Base (Acres)
    - Property Boundaries
    - Setbacks
    - Roads
    - Zoning
    - Utility Corridors
      - Electric
      - Gas
Limitations to growth

- Economic Resources
  - Equity
  - Debt Capacity
  - Risk Tolerance
    - Generational differences

- Personal Resources
  - Goals
    - Personal
    - Business
  - Labor
    - Availability
    - Management
  - Peer Pressure
  - Neighbors
    - Ag
    - Non-Ag
Strategies to Manage a Small Budget

“Build in Phases”

• Phase 1 Build new cow barn
  – with short term manure storage
• Phase 2 Retrofit a parlor in the stall barn
• Phase 3 Build feed storage
• Phase 4 Add more cow barn(s)
• Phase 5 Build new parlor
• Phase 6 Add more cow barn(s)
• Phase 7 Build new long term manure storage
How much for a new Freestall Barn Parlor, Feed Storage, Manure Storage on a new site for 150 cows?

- $300,000
- $600,000
- $900,000
- $1,200,000
Step 1
Build cow barn for cow comfort

- Housing System Design which:
  - Provides adequate space for resting, eating, drinking, and walking
  - Protects the cow from severe environmental conditions
  - Limits the likelihood of injury and/or disease
## Facility Costs in Wisconsin

- **Housing Cost**
  - $2,000-$3,000/cow

- **Milking Center Cost**
  - $20,000-$25,000/milking stall
  - Double 8 parlor cost - $320,000-$400,000

- **Feed Storage**
  - $500/cow

- **Manure Storage**
  - $700/cow

- **Total Capital Cost**
  - $8,000-$10,000/Cow

- **Calf Housing Cost**
  - $750/calf

- **Heifer Housing Cost**
  - $1,000-$1,500/animal

- **Bio Gas Generation**
  - Plug Flow - $1100/cow
  - Mixed Flow - $900/cow

- **Sand Separation** $750/cow

- **Solid Separation** $200/cow

- **Freestall Bedding Cost**
  - Sand @ $11/Mton
    - 23 kg/cow-day = $.25/cow-day
  - Wood Shavings @ $110/Mton
    - 7 kg/cow-day = $.75/cow-day
  - Biogas solids @ $33/Mton
    - 10kg/cow-day = $.33/cow-day
## Dairy Modernization Impacts

<table>
<thead>
<tr>
<th></th>
<th>Pre Modernization</th>
<th>Post Modernization</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Herd Size</td>
<td>82</td>
<td>203</td>
<td>+ 121</td>
</tr>
<tr>
<td>Average Production per Cow (lbs)</td>
<td>20,245</td>
<td>21,684</td>
<td>+ 1,439</td>
</tr>
<tr>
<td>Milk Production per Farm Annually (lbs.)</td>
<td>1,660,090</td>
<td>4,401,852</td>
<td>+ 2,741,762</td>
</tr>
<tr>
<td>Annual Hours of Labor per Cow</td>
<td>51.8</td>
<td>26.0</td>
<td>- 25.8</td>
</tr>
<tr>
<td>Milk Cows / F.T.E.</td>
<td>35</td>
<td>50</td>
<td>+ 15</td>
</tr>
</tbody>
</table>
Pre and Post Labor Requirements

Average Per Cow/Day

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pre Modernization</th>
<th>Post Modernization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding Milk Cows</td>
<td>1.59</td>
<td>0.65</td>
</tr>
<tr>
<td>Handling Cows</td>
<td>0.75</td>
<td>0.49</td>
</tr>
<tr>
<td>Handling Manure</td>
<td>0.79</td>
<td>0.40</td>
</tr>
</tbody>
</table>

**P = <.001    *P = <.01**
Pre and Post Labor Requirements
Average Per Cow/Day

**Milking**
- Pre Modernization: 4.07 minutes/cow-day
- Post Modernization: 2.09 minutes/cow-day
- Difference: 8.51 minutes/cow-day - 4.27 minutes/cow-day - 4.24 minutes/cow-day

**Maintaining Stalls**
- Pre Modernization: 0.8 minutes/cow-day
- Post Modernization: 0.32 minutes/cow-day

**Milking Setup/Cleanup**
- Pre Modernization: 0.51 minutes/cow-day
- Post Modernization: 0.32 minutes/cow-day

**P = .001      *P = .01**
## Economic Impacts from Reduced Hours Labor Per Cow

<table>
<thead>
<tr>
<th>Activity</th>
<th>Reduction/Cow/Year</th>
<th>Dollar Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milking Setup/Cleanup</td>
<td>1.16 hours @ $12/Hour</td>
<td>$13.92</td>
</tr>
<tr>
<td>Milking Time</td>
<td>12.05 hours @$12/Hour</td>
<td>$144.60</td>
</tr>
<tr>
<td>Feeding Time per Cow</td>
<td>5.72 hours @ $12/Hour</td>
<td>$68.64</td>
</tr>
<tr>
<td>Time Handling Cows</td>
<td>1.58 hours @ $12/Hour</td>
<td>$18.96</td>
</tr>
<tr>
<td>Maintaining Stalls</td>
<td>2.92 hours @ $12/Hour</td>
<td>$35.04</td>
</tr>
<tr>
<td>Handling Manure</td>
<td>2.37 hours @ $12/Hour</td>
<td>$28.44</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>25.80 Hours/Cow/Year</strong></td>
<td><strong>$309.60/Cow/Year</strong></td>
</tr>
</tbody>
</table>
Milking System Throughput

Change = 21.4 cows/person/hour
P = 0.001
Step 2
Build a Milking Facility
Options

1. Remodel Parlor into stall barn and use milk house
2. Add shell for parlor to stall barn and use stall barn for holding area and use milk house
3. Build new shell at new site with cow barn
Parlor Annual Capital and Labor Costs

- **Tie Stall**
  - $42,048/year labor

- **Low Cost Remodeled Parlor**
  - $25,000-capital ($4,250 annual)
  - $21,024/year labor

- **Medium Cost Remodeled Parlor**
  - $50,000-capital ($8,500 annual)
  - $21,024/year labor

- **High Cost Remodeled Parlor**
  - $100,000-capital ($17,000 annual)
  - $21,024/year labor

- **New Parlor**
  - $320,000 ($54,400 annual)
  - $21,024/year labor

- **AMS**
  - $500,000 ($85,000 annual)
  - $7,500/year labor

120 cows 25,000 lbs
@ $12/hr labor
7 year payback @ 5%
Annual Cost Payback Timeframe

120 cows 25,000 lbs
@ $12/hr labor
@ 5%

- Tie Stall
  - Labor Only
- Medium Cost Remodeled Parlor = $50,000
  - 7 year $17,000/year
  - 10 year $13,000/year
  - 20 year $4,000/year
Annual Parlor Throughput Cost

- **Tie Stall**
  - 25 cph = $42,048/year labor

- **Medium Cost Remodeled Parlor** = $50,000

- **New Parlor Cost** = $320,000
  - 50 cph = $21,024/year labor
  - 60 cph = $17,520/year labor
  - 80 cph = $13,140/year labor

120 cows 25,000 lbs @ $12/hr labor @ 5%

- Parlor Throughput
- Labor Cost
- Capital Cost

Cost $/cwt-yr

- 25 cph
- 50 cph
- 60 cph
- 80 cph
- NP

$0.00
$0.50
$1.00
$1.50
$2.00
$2.50

Parlor Throughput

$2.39
$.98
$.86
$.72
$1.42
Strategies to Manage a Small Budget for the Milking Center

1. Space
2. Parlor Stall Choice
3. Milking Equipment Choice
4. Parlor Interior Finish
   ✓ Receiver Group Location
   ✓ Milking Unit Storage and Cleaning Location
5. Sweat Equity
Strategies to Manage a Small Budget “Space”

- Use the existing milk house in a new way
- Use the existing stall barn space in a new way
- Minimize moving posts and structural changes
- Minimize new construction
  - Add new space if necessary
- Value of existing facilities
  - Structure
  - Electrical
  - Plumbing
  - Value can be $75,000 - $100,000
- New Parlor Space $30-$40/s.f.
Use the Existing Stall Barn in a new way
Use the Existing Milk House in a new way
Strategies to Manage a Small Budget

“Parlor Stall”

- Home built parlor stall < $3,000 for steel for double 8 (16 stalls)
- Dealer built parlor stall, $ Steel x 2 for $ Labor = $400-$500/stall
- Buy used parlor stall, $2,500-$5,000/stall
- Buy economical new parlor stall, $5,000-$10,000/stall
- New parlor stall, $10,000-$15,000/stall
## Parlor Equipment Costs*

<table>
<thead>
<tr>
<th>Parlor Type</th>
<th>Average Number of Stalls</th>
<th>Number of Parlors</th>
<th>Cost per Milking Stall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoflow</td>
<td>9</td>
<td>2</td>
<td>$14,800</td>
</tr>
<tr>
<td>Flat</td>
<td>11</td>
<td>5</td>
<td>$3,550</td>
</tr>
<tr>
<td>Herringbone, used</td>
<td>16</td>
<td>2</td>
<td>$3,925</td>
</tr>
<tr>
<td>Herringbone, new</td>
<td>16</td>
<td>7</td>
<td>$7,575</td>
</tr>
<tr>
<td>Parallel, used</td>
<td>24</td>
<td>2</td>
<td>$6,775</td>
</tr>
<tr>
<td>Parallel, new</td>
<td>22</td>
<td>26</td>
<td>$9,250</td>
</tr>
<tr>
<td>Rotary</td>
<td>28</td>
<td>2</td>
<td>$7,750</td>
</tr>
<tr>
<td>Swing</td>
<td>20</td>
<td>3</td>
<td>$2,650</td>
</tr>
</tbody>
</table>

* FCA Cost Data 2007
## Parlor Cost per Milking Stall
### 2008 Dollars

<table>
<thead>
<tr>
<th>Parlor Stall Type</th>
<th>Retrofit Construction (n=55)</th>
<th>New Construction n= 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat barn</td>
<td>$3,360 (n=6)</td>
<td>NA</td>
</tr>
<tr>
<td>Parabone</td>
<td>$3,845 (n=30)</td>
<td>$6,016 (+$2,171) (n= 10)</td>
</tr>
<tr>
<td>Herringbone</td>
<td>$9,657 (n=8)</td>
<td>$18,769 (+$9,112) (n=3)</td>
</tr>
<tr>
<td>Parallel</td>
<td>$7,478 (n=11)</td>
<td>$22,361 (+$14,883) (n=18)</td>
</tr>
</tbody>
</table>
* Note: Bond all steel and reinforcing to form equipotential plane and bond to grounding system.
Strategies to Manage a Small Budget
“Milking System”

- Recycle and use existing milking system in different configuration
  - Swing line milking system
  - Use existing milking units
  - Use existing automatic takeoffs
- Buy good used milking system
- Buy economical milking system
  - Upgrade at a later time when cash is available
- Add new technology at a later time
  - Low Line
  - Additional units
  - ATO
  - RFID
Table 2. Milk Line Size and Number of Milking Units Used for a Careful Operator. (Transient air admission of 3.5 ft^3/min. per milkline slope.)

<table>
<thead>
<tr>
<th>Nominal Line Size</th>
<th>Milk line Slope (%)</th>
<th>0.8 %</th>
<th>1.0 %</th>
<th>1.2 %</th>
<th>1.5 %</th>
<th>2.0 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inch</td>
<td>Maximum Number of Milking Units/Slope</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.5 inch</td>
<td>Maximum Number of Milking Units/Slope</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3 inch</td>
<td>Maximum Number of Milking Units/Slope</td>
<td>11</td>
<td>13</td>
<td>14</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>4 inch</td>
<td>Maximum Number of Milking Units/Slope</td>
<td>27</td>
<td>30</td>
<td>34</td>
<td>38</td>
<td>45</td>
</tr>
</tbody>
</table>

Note: A slope of 0.8 % is equivalent to 1" drop in 10'. A slope of 1.2 % is equivalent to 1½ drop in 10'. Milk line slopes greater than 1.6 % (2" per 10') are not recommended unless the cow platform is sloped in the same direction as the milk line. Table from ASAE S518.2 July 1996.
New vs. Used

**Milking Parlor Stalls**
- New: 53
- Used: 10
- Combination: 25
- Home Built: 1

- Total: n = 89

**Milking Equipment**
- New: 39
- Used: 28
- Combination: 24

- Total: n = 91
Use existing units and takeoffs
Strategies to Manage a Small Budget

“Receiver Group Location and Storage and Cleaning of Milking Units”

- No need to finish interior of parlor
  - Receiver group location in milk house space
  - Mini milk house in parlor
  - Store and Clean milking units in milk house space
  - Dry Parlor
Receiver Group in Milk House
Receiver Group in Milk House
Clean Units in Milk House
Mini milk house
Low Line Receiver Group In Parlor
Strategies to Manage a Small Budget

“Receiver Group Location and Storage and Cleaning of Milking Units”

- Milk house grade finishes in parlor space
  - Receiver group location in parlor space
    - High Line
    - Low Line
  - Store and clean milking units in parlor space
Receiver group in Parlor
Low Line
Clean Units in Parlor
Clean Units in Parlor
Clean Units in Parlor
Strategies to Manage a Small Budget

“Sweat Equity”

• Use the skills you have
  – Demolition
  – Carpentry
  – Welding
  – Concrete

• Neighbors and friends
  – (Parlor raising)
Low Cost Parlor

It can be done!
It has been done!
Think outside the box

- Calculate how many cows it will take to pay for a new parlor
- Calculate a parlor budget based on the number of cows you want
$1,000 Parlor

$1,000 Truck
$17,000 Parlor

$17,000 Truck
$25,000 Parlor

$25,000 Truck
$30,000 Parlor

$30,000 Truck
$50,000 Parlor

$50,000 Truck
$70,000 Parlor

$70,000 Truck
$100,000 Parlor

$100,000 Truck
$150,000 Parlor

$150,000 Truck?
$500,000 Parlor
$500,000 Truck?
Challenges to Keep Cost Low

- No plan or design work
- Know what you want (Meet your goals)
- You are in charge, (It won’t just happen)
- Visit and milk in a similarly designed parlor
- Find an equipment dealer that is willing to work with you
- Find contractors that are willing to work with you
Goodbye!