Cornell University
Cooperative Extension
North Country Regional Ag Team

Cow Comfort Conference 2017

"Working with What You Have and Looking Toward the Future"

March 20-21, 2017
Holiday Inn
Liverpool, NY

Conference Speakers:

Dr. Gordie Jones, D.V.M., Central Sands Dairy
Dan MacFarland, M.S., Agricultural Engineering Educator, Penn State Extension
Emily Yeiser Stepp, M.S., Director, FARM Animal Care Program, National Milk Producers Federation
Dr. Robert Lynch, D.V.M., Dairy Herd Health and Management Specialist, PRO-DAIRY
Dr. Heather Dann, Research Scientist, Miner Institute
Dr. Albert De Vries, Associate Professor, Department of Animal Science, University of Florida

Producer Panelist:

Lisa Ford, M.P.S. - Cayuga Marketing
Corwin Holtz, M.S - Holtz Nelson Dairy Consulting
Daryl Martin - Glenview Dairy

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Conference Sponsors

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Holtz Nelson Dairy Consultants

PROCEEDINGS

COW COMFORT CONFERENCE
2017

"Working with What You Have and Looking Towards the Future"

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Holiday Inn

Liverpool, NY

Presented by:

North Country Regional Ag Team
Cornell University Cooperative Extension
In conjunction with Cornell University/PRO-DAIRY

Cornell University
Cooperative Extension
North Country Regional Ag Team

2017 Cow Comfort Conference
Monday March 20, 2017

10:00 AM	Vendor set up and registration opens
12:00 PM	Light lunch available and visit with vendors
1:00 PM	***Welcome*** – Dr. Kimberley Morrill and Lindsay Ferlito, M.S., Cornell Cooperative Extension, North Country Regional Ag Team
1:10 PM	***Cow Comfort Issues Facing the Dairy Industry Today and Tomorrow*** - Dr. Gordie Jones, D.V.M., Central Sands Dairy
2:10 PM	***Should you Retrofit or Rebuild?*** - Dan McFarland, M.S., Agricultural Engineering Educator, Penn State Extension
3:10 PM	Break and visit with vendors
3:45 PM	***National FARM Program Update and Emerging Issues*** - Emily Yeiser Stepp, M.S., Director, FARM Animal Care Program, National Milk Producers Federation
4:20 PM	***Producer Panel: Dealing with Cow Comfort Issues*** - Lisa Ford, M.P.S., Cayuga Marketing; Corwin Holtz, M.S., Holtz Nelson Dairy Consulting; Daryl Martin, Glenview Dairy
5:05 PM	Questions for Emily Yeiser Stepp and panelists
5:25 PM	***First day wrap up*** – Dr. Kimberley Morrill and Lindsay Ferlito, M.S.
5:30 PM	Social hour and visit with vendors
6:00 PM	Dinner
7:00 PM	Casino night

2017 Cow Comfort Conference
Monday March 20, 2017

7:00 AM	Breakfast available and visit with vendors
8:00 AM	***Welcome back*** – Dr. Kimberley Morrill and Lindsay Ferlito, M.S.
8:05 AM	***Using On-Farm Automation and Technology to Improve Cow Comfort*** - Dr. Robert Lynch, D.V.M., Dairy Herd Health and Management Specialist, PRO-DAIRY
9:00 AM	***Managing the Environment to Maximize Cow Comfort*** - Dr. Heather Dann, Research Scientist, Miner Institute
9:55 AM	Break and visit with vendors
10:25 AM	***The Economics of Cow Comfort: Why it pays to Make Improvements*** - Dr. Albert De Vries, Associate Professor, Department of Animal Sciences, University of Florida
11:20 AM	***Successfully Designing Facilities to Maximize Cow Comfort*** - Dr. Gordie Jones, D.V.M., Central Sands Dairy
12:10 PM	***Wrap up*** – Dr. Kimberley Morrill and Lindsay Ferlito, M.S.
12:15 PM	Adjourn – Lunch available

Table of Contents

From Our Co-operative Of Farm Families Since 1919

CABOT®

Achieving Excellence
Dr. Gordon Jones

If you want cows that product more than 100 pounds (45L) of milk a day “fill them up and lay them down.”

Many factors determine milk yield besides just rations. Non-dietary factors such as feed push-ups, feeding for a refusal rate of five percent, stall design and management and age at first calving are have a major influence.

There are three things a cow should be doing: She should stand to be milked, stand to eat and drink, and lay down. If she’s doing one of these things she’s making you money.

The Three Circles of Excellence

A simple thought to help dairy operations to be as efficient and profitable as possible, is to break them down into “circles.” Understanding the cycles and circles of dairy farming on any size operation can find the bottlenecks in the operation. A bottleneck is a point of congestion, the limit of constraints or blockage which keeps an operation from its highest potential.

There are three circles on every dairy farm that need to be understood for bottlenecks to become apparent.

The Daily Circle

The first cycle is the 24 hour circle, or what does a cow does during the course of a day. When planning facilities the designer should consider a cow’s daily life. (Figure 1.)

- When and how often is she milked?
- How long does she spend in the holding pen and parlor?
- How long is she locked up for breeding?
- When is she fed? When does her feed arrive and how long is the manger empty?

All of these questions are easy to answer when we know the 24 hour circle of a herd or pen of cows. Also, take a close look at what 24 hours look like in the life the dry cows and heifers.

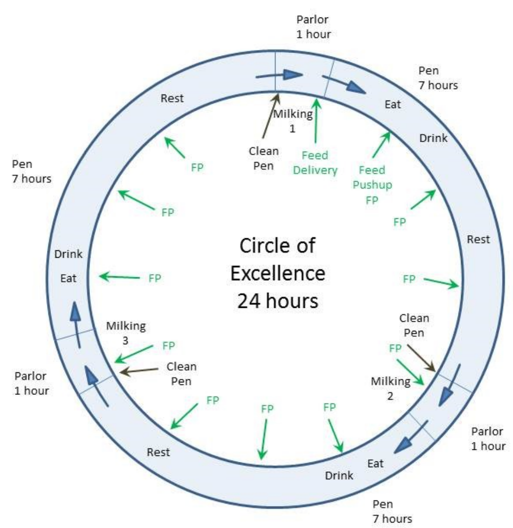


Figure 1. Circle of Excellence 24 hour Time Budget of a Milking Cow, FP = feed push-up

The Annual Circle

In addition to looking at the cows' typical day, consider what her year looks like. (Figure 2.) This second circle starts at the maternity pen. Another way to ask about the circle is how does the recently freshened cow get back to the fresh pen a year later? The questions about the annual circle might look like these:

- Where does she freshen, when is she moved into the fresh pen, how long is she in the fresh pen, when is she moved into the breeding pens, when does breeding start, when does breeding stop, how many rations does she get fed?
- When is she dried off, how long is she dry, how many dry cow rations is she fed, what are the rations?
- How is the beginning of labor detected, when is she moved to be by herself to calve?
- How often does she experience pen/ group changes? Cows lose up to six pounds of milk a day for two to three days every time they change social groups. (Shaver & Zwald, 2012)
- How often is her milk cow ration changed?
- When is she bred?
- How long is she dry?

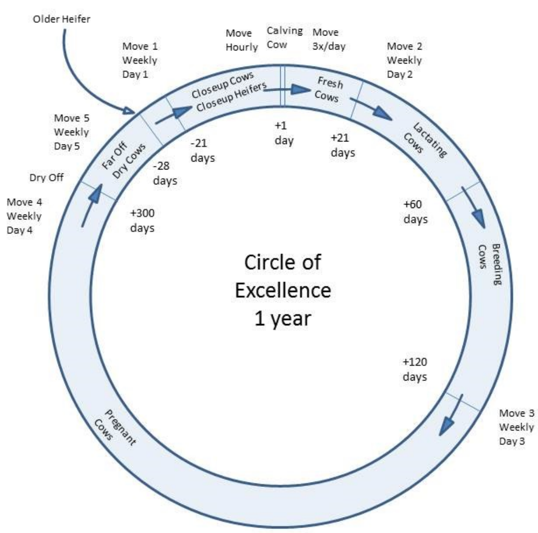


Figure 2. Circle of Excellence Annual Cycle of a Cow's Life (LDHM 2017).

Calf to Fresh Cycle

The third circle also starts at the maternity pen and belongs to the calf. (Figure 3) Instead of looking at a year, this circle looks at the first two years of life, beginning at calving.

Questions include:

- When is she fed colostrum, how much colostrum is she fed, where is she housed and fed until weaning, how many calves are together in the weaning pens?
- What is she fed, when is grain introduced, how many heifer rations is she fed, where is he housed until breeding age? When are water, forages and fermented forages introduced?
- When is she bred, is she bred by size or age or both?
- When does she move into the close up pens, how is she handled at calving for the first time?

Think about those three circles on all sizes of dairy farms. If the circles are fully understood, bottlenecks blocking the operation's potential can be identified and corrected. Any size dairy farm can be more easily understood when analyzing the circles of excellence, and large operations may not seem as overwhelming.

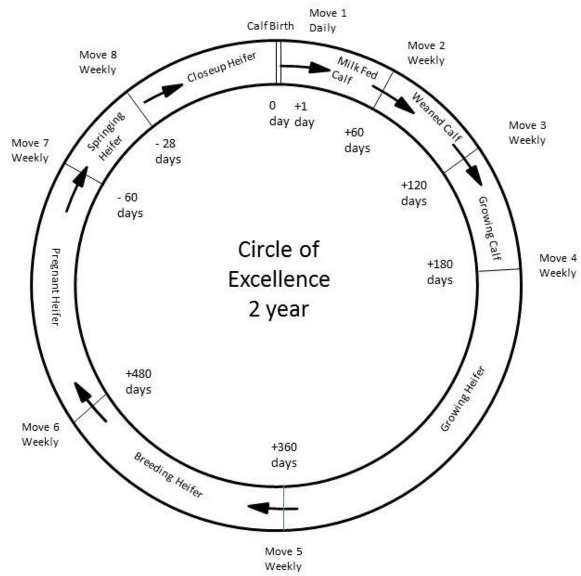


Figure 3. Circle of Excellence 24 month Cycle of the Replacement Calf (LDHM, 2017).

<u>Common problems</u>

She should not be spending more than four hours a day away from food. The producer gets four hours a day; the cows get the other 20. The four hours away from feed also needs to include such things as sorting pens, holding pens, breeding time, hoof care, palpation rail time and other herd health.

One of the most common failures on farms, is not making sure that cows have at least half of their dry matter intake when they exit from morning milking. And it is very important to feed the best feed to your best cows. Silage loses quality when exposed to the air, so the first feed mixed in the morning should go to the low production pen, then, the fresh cows can have the freshest feed that morning.

The ancestors of the modern cow were prey. Cows are designed to eat as much as they can first thing in the morning, and then moved to a safe location to lie down and chew her cud.

Another common mistake is not having enough waterers in freestalls; many freestall designs have three waterers when there really should be four. If there are more than 100 cows in a barn they typically divide into two social groups and each social group should have two waterers.

Freestall design is crucial. The main four reasons for "freestall fails" are lack of cushion, neck rail placement, lunge and bob space limitations, and lack of fresh air/ vision.

Freestall design include 48” (122cm) wide stalls, neck rail 48” (122cm) above the height of the back curb, neck rail that is 68” (172cm) from back curb to contact of neck rail, 16’ (5m) from curb to curb “nose to nose,” 68” (172cm) to brisket board, and two inches (5cm) above back curb for brisket board.

Wider stalls are often not better because cows lie diagonally in the stalls. They then defecate on the stall instead of the alley and lie in their own waste.

If the cows are lying diagonally, the set up can sometimes by corrected by putting 2x4s on the side rails to prevent the cow from putting her head through.

If a 30” (76cm) loop is used with forward lunge, width is not as important, but a 39” (100cm) loop from top to bottom, lets the cow lay diagonally and may need some modification.

Bedding must be maintained level with the curb for the curb width to be “useable.” Once the bedding drops below the curb and useable bed length becomes 8 to 10” (25cm) shorter, which is unacceptable to the cow.

A person should be able to fall to their knees in the area where the cows lie down and not experience pain. If it hurts to do that then the cow needs more padding and/or bedding.

Lack of fresh air can also be an issue. Something as simple as weeds being allowed to grow tall alongside of a building can disrupt air flow.

Do not underestimate the value of standard operating procedures (SOP). Everyone should know and understand their job, and everyone should be required to pass an exam (oral or written) about their job and how to do it. When people know their jobs they will be happier at their jobs.

Refitting Existing Buildings

"Increasing the 'shelf-life' of dairy facilities"

PennState Extension

Dan F. McFarland, M.S.
Agricultural Engineer
Penn State Extension
dfm6@psu.edu
extension.psu.edu

Other Desirable Features

- Good observation & access
- Simple sorting, isolation & restraint
- Convenient feed delivery
- Efficient manure collection
- Expedient 'housekeeping'
- Worker Safety

Allows caregivers to be more productive

Cow Comfort

- What's the problem?
  - Production
  - Feed intake
  - Lameness
  - Health
  - Injury
  - Reproduction

"Wendell ... I'm not content."

Is it a facility problem?

Dairy Housing Basics

- Excellent air quality
- Dry, comfortable resting area
- Good access to feed
- Good access to water
- Confident footing

Allows animals to be more productive

Factors Affecting Health & Performance

- Feed not available to cows
- Cows not available to feed
- Poor (or variable) feed quality
- Undesirable feeding area
- Feed out or reach

Management

Factors Affecting Health & Performance

- Illness
- Injury
- Lameness
- Poor air quality
- Heat stress
- Overcrowding
- Filth
- Submissive behavior

Management & Facilities

Troubleshooting Cow Comfort Issues

- Air quality
- Resting time & stall use
- Feed & water access
- Lameness
- Injury
- Cleanliness
- Time away from pen
- Stocking density
- Heat stress

Factors Affecting Health & Performance

- Feed area hard to get to
- Cows associate feed with pain
- Not enough feed space

Facilities

Benefits of Improving Cow Comfort

- Improved milk production
- Improved milk quality
- Improved health
- Reduced lameness
- Improved reproduction
- Improved longevity

Productive cows are most affected by comfort

Factors Affecting Health & Performance

- Poor air quality
- Uncomfortable resting area
- Slippery floors
- Limited water access

Facilities

Improved Milk Production

- Lactation 305 days @ $17.00/cwt.

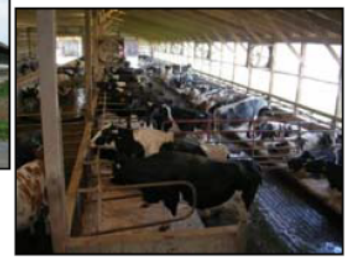
Additional milk per cow per day (lb)	Additional milk income per cow per lactation
1	$51.85
5	$295.25
10	$518.50

Additional Feed Cost??

Estimating the Cost of Cow Comfort

- Reduced milk output
  - Due to heat stress
  - Loss of good genetics due to forced culling
- Longer calving interval
  - Poorer conception; More tail-enders
- Increased involuntary culls
  - Fewer cows merchandised

Some Facilities Only Need Minor Adjustments



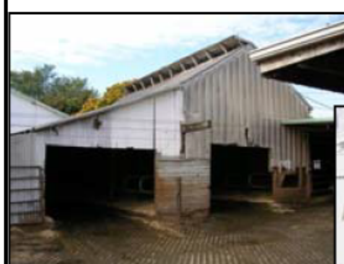
Estimating the Impact of Cow Comfort

100 cows (milking & dry); $17.00/cwt; Feed cost $7.60/cwt

1. Reduced milk output (heat stress)	$2,397.00
2. Reduced milk output (loss of good genetics)	$4,700.00
3. Longer calving interval (more tail enders)	$1,579.20
4. More cows culled (fewer cows merchandised)	$6,500.00

Cumulative Impact $15,176.20

Some Facilities Need A Little More Work



Why Renovate Dairy Buildings?

- Current Facility Worn Out
  - Inadequate cow comfort
  - Spend too much time fixing things
- Facility isn't allowing the business to move forward

Factors to Evaluate

- Location, location, location
  - Distance & wind direction
    - Ventilation, noise, odors
  - Ease of access
    - Feeding, manure handling, pastures
  - Distance & direction
    - Roads, other buildings, feed storage

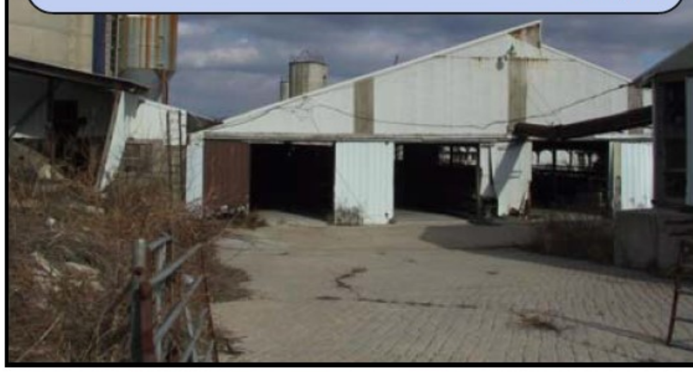
Factors to Evaluate

- Will it provide a productive environment for the cows?
  - Excellent air quality
  - Clean, dry, comfortable resting area?
  - Good access to feed
  - Good access to water
  - Confident footing
  - Protection from weather extremes

Factors to Evaluate

- Consider the caregiver
  - Feed delivery
  - Manure collection & removal
  - Bedding & stall grooming
  - Cow handling & care
    - Movement
    - Isolation & restraint
    - Loading & unloading
    - 24 hour access

Tasks performed:
✓ *properly*
✓ *completely*
✓ *consistently*
✓ *safely*



Factors to Evaluate

- Structural soundness
  - Alignment & general condition
    - Columns, beams, footings & foundation walls
  - Alignment, strength & condition
    - Support walls & columns
  - Condition of roof frame & cover
    - Trusses, connections, sheathing

Good Ventilation

- Maintain excellent air quality
  - Control moisture, gas & pollutant levels
- Protection from weather extremes
  - Protection from cold wind & precipitation
- Proper air exchange
  - Seasonal adjustment

Natural Ventilation Design Features

- Orientation
- Separation distance
- Sidewall height
- Sidewall opening
- Ridge opening
- Eave overhang

Improve Air Exchange in Existing Naturally Ventilated Buildings

Natural Ventilation Factor (NVF)

Risk Factor	Best (1)	Medium (2)	Poor (3)
Ventilation Openings	A_c > 11 ft^2/cow & R_w > 3 in per 10ft B_w	A_c > 7 to 11 ft^2/cow & R_w > 2 to 3 in per 10 ft B_w	A_c < 7 ft^2/cow & R_w < 2 in per 10 ft B_w
Orientation to Prevailing Winds	Shelter perpendicular to prevailing winds	Shelter diagonal to prevailing winds	Shelter parallel to prevailing winds
Exposure to Winds	Smooth terrain such as smooth open ag fields	Scattered trees and small buildings upwind	Rough terrain with tall trees, buildings and/or embankments

NVF < 4: Good natural ventilation.
NVF = 5 to 7: Natural ventilation compromised.
NVF = 8 or more: Natural ventilation greatly compromised.

Adapted from Tyson, 2008

Allow the Building to Breathe!

Open side & end walls as much as possible

Natural Ventilation Factor (NVF)

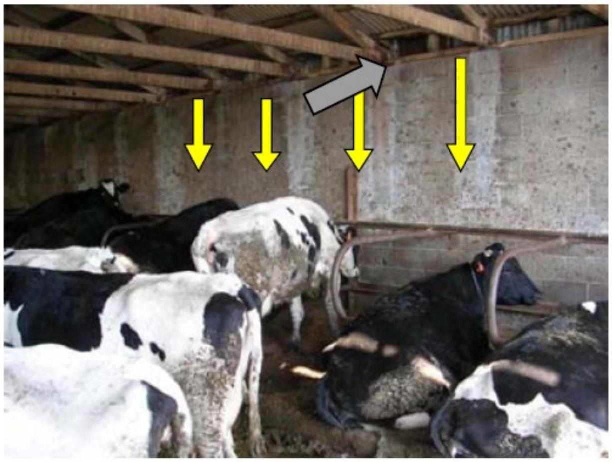
Risk Factor	Best (1)	Medium (2)	Poor (3)
Ventilation Openings	[redacted]	A_c > 7 to 11 ft^2/cow & R_w > 2 to 3 in per 10 ft B_w	[redacted]
Orientation to Prevailing Winds	[redacted]	[redacted]	Shelter parallel to prevailing winds
Exposure to Winds	[redacted]	Scattered trees and small buildings upwind	[redacted]

NVF = 7, therefore, Natural ventilation compromised.

Adapted from Tyson, 2008

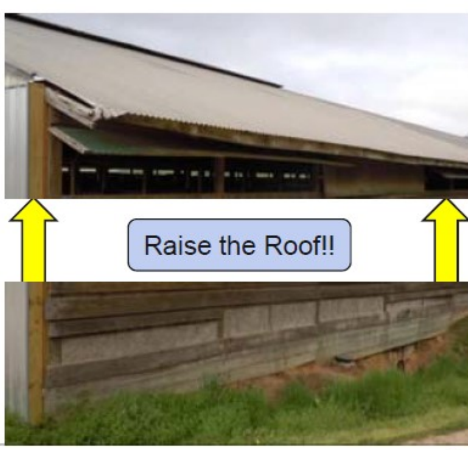
Allow the Building to Breathe!

Improved ventilation & natural lighting



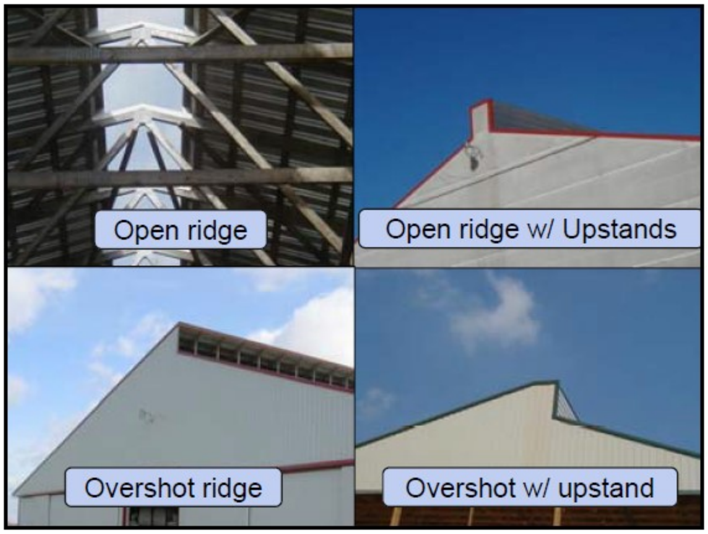
Allow the Building to Breathe!

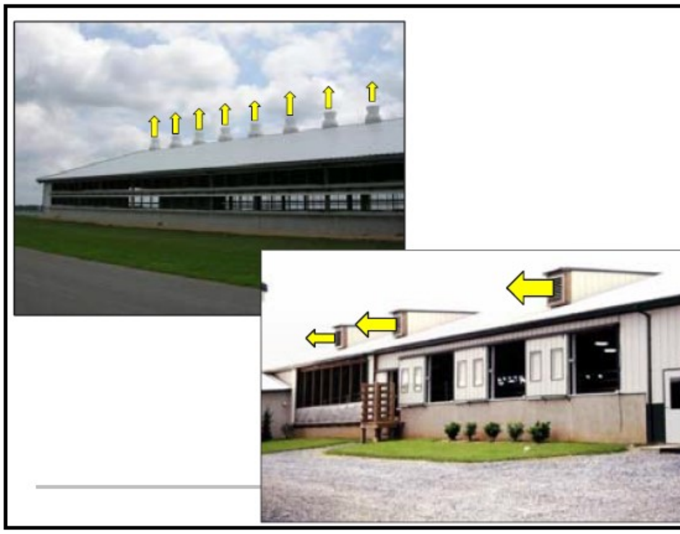
Provide adequate ridge opening
2” to 3” per 10’ of building width
(12” minimum)



Allow the Building to Breathe!

Add an overshot ridge opening





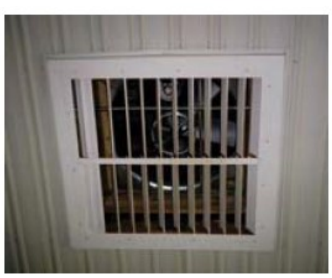
Allow the Building to Breathe!


Ventilation stacks

Loose Housing Mechanical Ventilation

- Typical air exchange rates (air changes per hour):
  - Cold ~ 4 to 6 ACH
  - Mild ~ 10 to 15 ACH
  - Warm ~ 30 ACH
  - Hot ~50 to 60 ACH

Allow the Building to Breathe!

Ventilation stacks with exhaust fans

Natural Ventilation in Tie Stall Barns

Tie Stall Mechanical Ventilation

- Exhaust Fans

- Fresh air inlets

- Controls

Air Inlet Alternatives

Mechanical Ventilation

- Typical air exchange rates:
  - Cold ~ 50 cfm /cow
  - Mild ~ 200 cfm / cow
  - Warm ~ 500 cfm / cow
  - Hot ~1,000 -1,500 cfm /cow

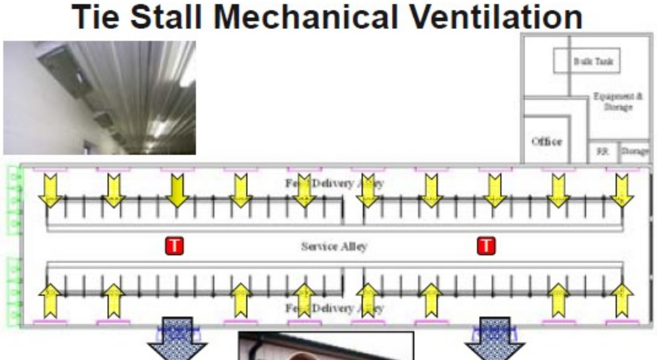
JAMES BARN MAGAZINE

How Much Air Does A Cow Need

Does She Get Enough of This Vital Element in Your Barn ?

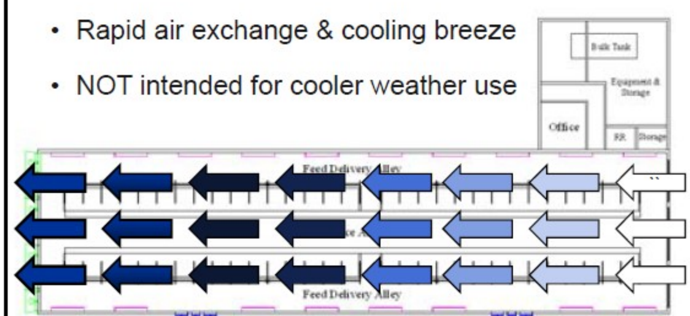
Tie Stall Mechanical Ventilation

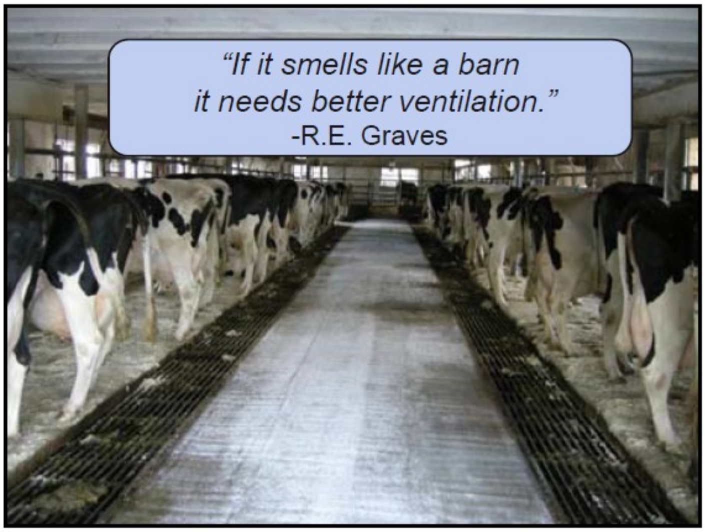
Tie Stall Mechanical Ventilation



Tie Stall Tunnel Ventilation

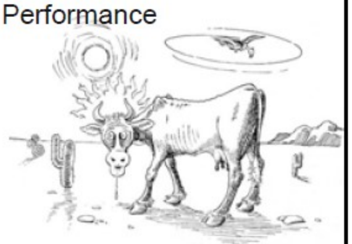
- Rapid air exchange & cooling breeze
- NOT intended for cooler weather use





Heat Stress Affects Performance & Health

- Reduced DMI
- Reduced Milk Production
- Reduced Reproductive Performance
- Increased Lameness
  - excessive standing
  - 'slug' feeding



Reducing Heat Stress

- Shade
- Air
  - exchange
  - movement
- Water
  - drinking
  - cooling

Cooling Cows with Water

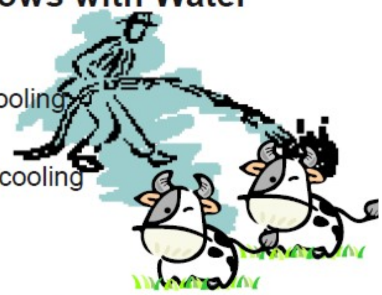
- Indirect Evaporative Cooling

Axial Circulation Fans

- "In-line" fan spacing
  - Over feeding area 10 X diameter apart
  - Over single stall row 10 X diameter apart
  - Over double stall row 8 X diameter apart
- Mounting height
  - Guarded: Fan bottom 6 to 8 ft above surface
  - Unguarded: Fan bottom 8 ft minimum
- Tilt to 10° to 20° from vertical
  - Air movement at resting level

Cooling Cows with Water

- Direct evaporative cooling
- Indirect evaporative cooling



Moisture & heat are added to the animal space
- Good air exchange & forced convention are essential

Cooling Cows with Water

- Direct Evaporative Cooling

Clean, Dry, Comfortable Resting Area

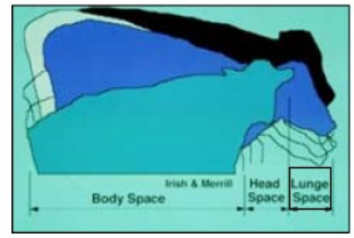
- Easy access
  - Enter, recline, rest, rise and exit the stall freely
- Provide comfort
  - Cushion, comfort, traction
- Promote cleanliness
- Prevent injury

How Can Resting Area Performance Be Improved?

- Modify stall structure to allow more ‘freedom’ of use
- Improve resting surface comfort
- Increase bedding volume & frequency
- More frequent stall bed grooming
- Don’t overcrowd

Freestall Length

- Provide space for forward lunge



Minimum 8.5’ from post to curb

Successful Designs Become the Model

Freestall Length

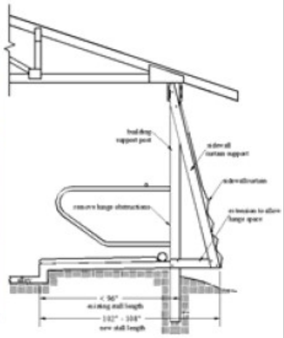
Freestall Dimensions

- Essential to creating a successful resting area
- Affect acceptance & resting position
- Must accommodate the cows using stalls

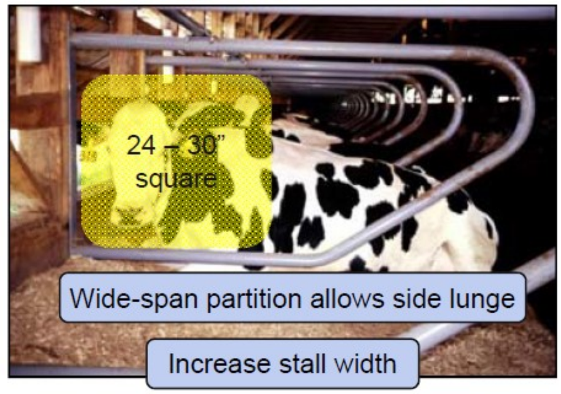
*Select dimensions for the **largest** cows in the group*

Freestall Length

Improving Closed Front Stalls



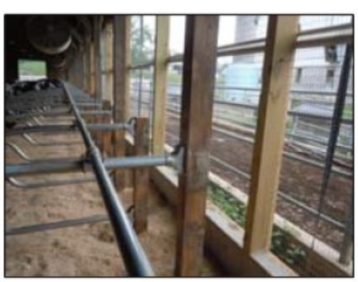
Improving Closed Front Stalls

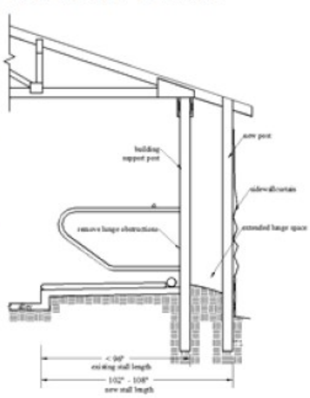


Improving Closed Front Stalls

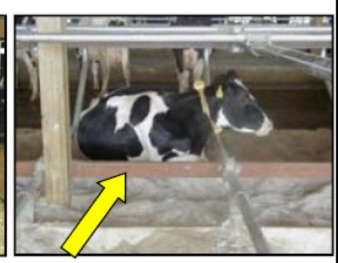
Remove Lunge Barriers

Improving Closed Front Stalls





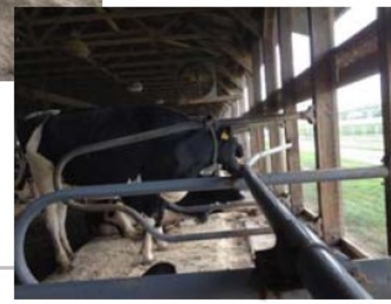
Remove Lunge Barriers



Remove Lunge Barriers

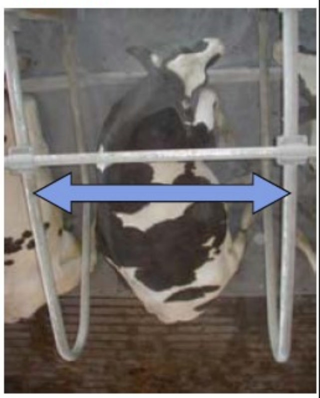
Individual support posts

'Beam' divider support

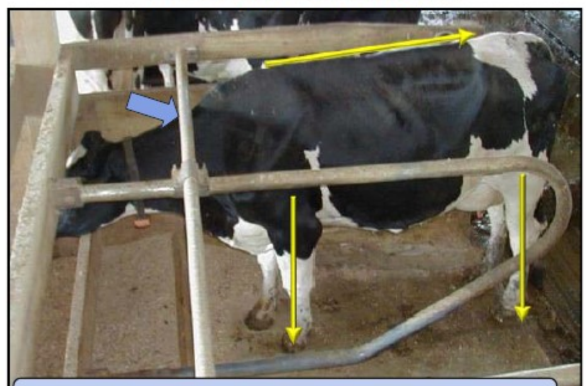


Freestall Width

- Determined by cow size
  - 46" – 54" on center
- Stall size may eventually determine cow size



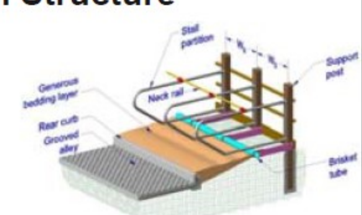
Freestall Structure

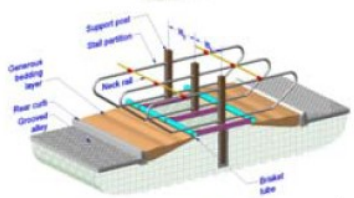


Should suit the largest cows in the group

Freestall Structure

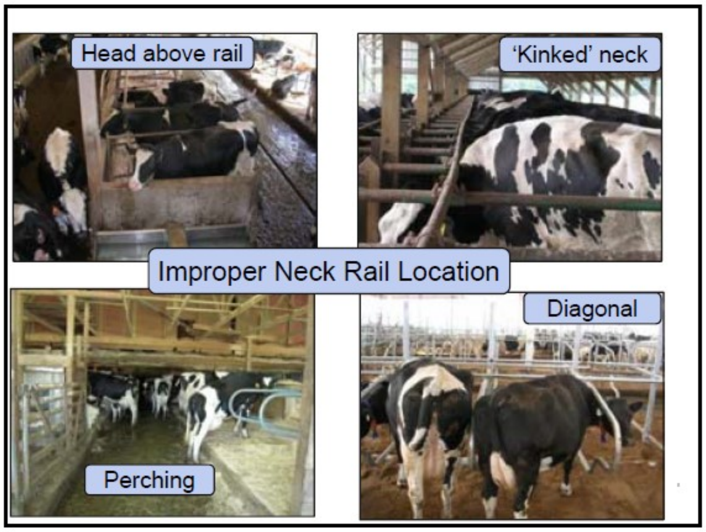
- Stall partition
- Neck rail
- Brisket locator
- Support structure

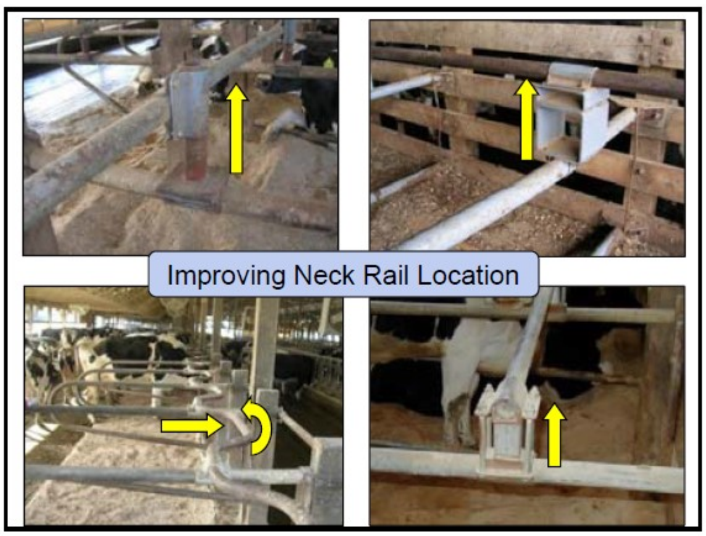


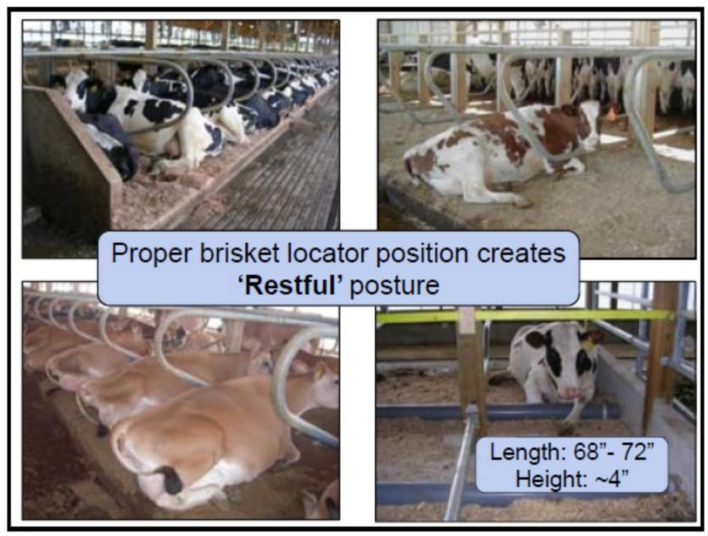


Freestall Structure

- Stall partition



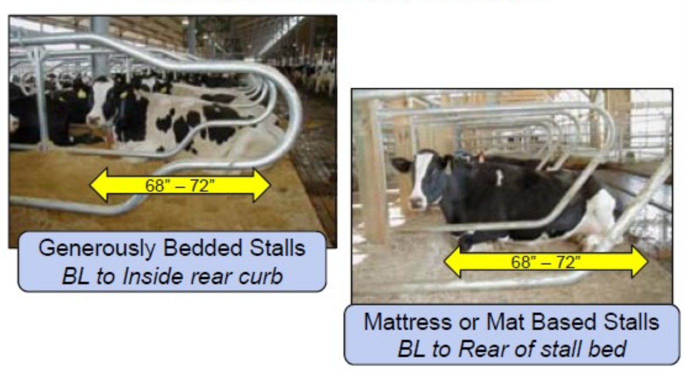




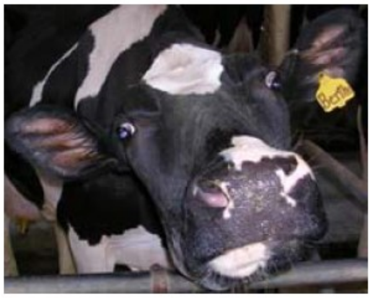
Brisket Locator Position

- Discourages forward movement when resting
- Allow adequate space for comfortable resting

Brisket Locator Position



Can you tell the difference between a ‘freestall’ and a “tie stall” cow

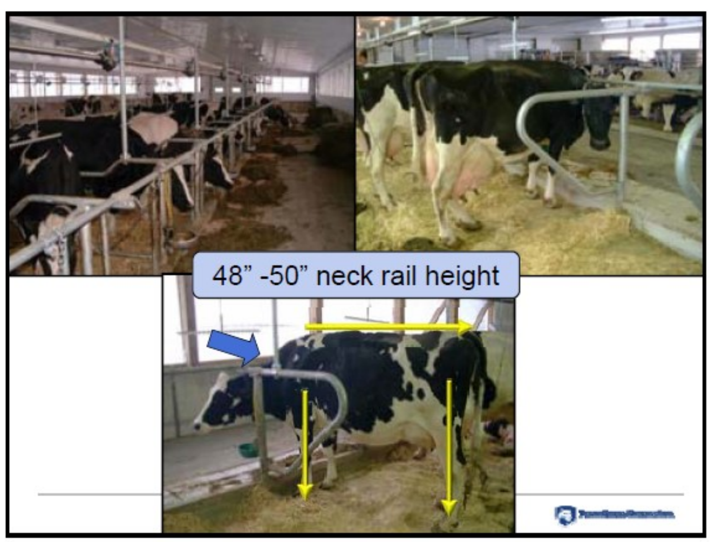


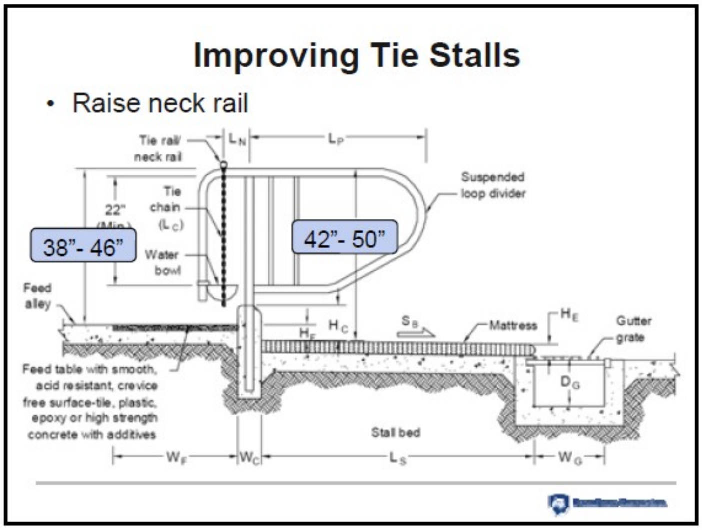
Improving Tie Stalls

- Increase Length
  - Move curb forward
  - Move gutter back
- Increase Width
  - Suspended dividers
  - Reduce stalls per row
- Improve stall structure
  - Raise neck rail
  - Increase tie chain length
  - Suspended divider

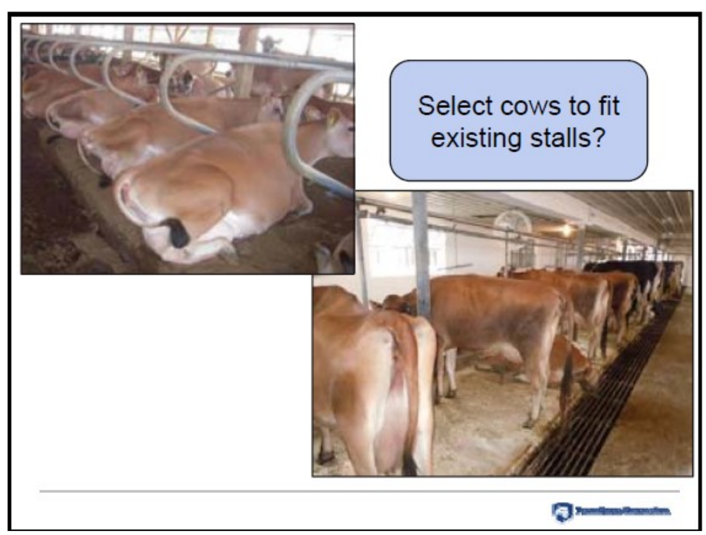
Improving Tie Stalls

- Increase Length
  - Remove gutter




Improving Tie Stalls
• Raise neck rail
Tie rail/ neck rail
Tie chain (L_C)
22" (Min.)
38"- 46"
42"- 50"
Water bowl
Suspended loop divider
Feed alley
Mattress
Gutter grate
Feed table with smooth, acid resistant, crevice free surface-tile, plastic, epoxy or high strength concrete with additives
Stall bed
L_N
L_P
H_E
H_C
H_F
S_B
D_G
W_F
W_C
L_S
W_G


Increase tie chain length to improve freedom of movement


Select cows to fit existing stalls?

Resting Surface

- Generously Bedded
  - Organic
  - Inorganic

Bedding depth: 4”– 8”

Bed More Frequently

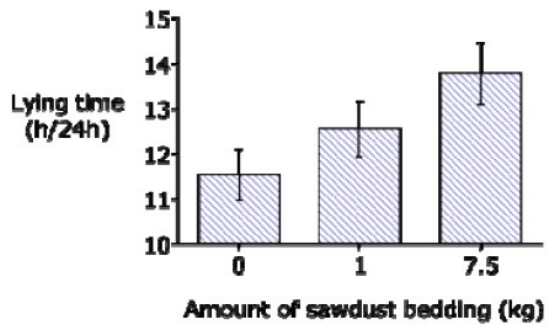
- Cows prefer to rest on mattress with most bedding

Resting Surface

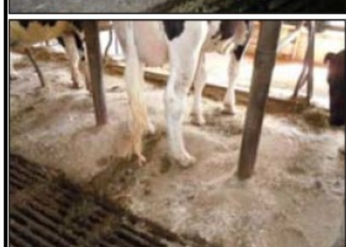
- Mattress & Mats
  - Replace some % of what cows require

Stall Bed Studies

- Cows prefer to rest on mattress with most bedding



Source: *Tucker & Weary, 2004, J. Dairy Sci. 87: 2889-2895*



Mats & mattresses have a ‘useful’ life (don’t extend it)

Bedding Retainers

- Establish a layer of bedding between the stall bed and cow
  - Reduce hock injury
  - Improve cushion
  - Improve cleanliness

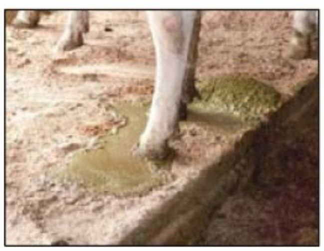
Retains bedding where it is needed

Feeding Area Design

- Adequate feeding space
- 'Head-down' feeding position

Bedding Retainers

- Retain more than bedding
- Can create a lump at the rear of the stall
- May reduce available body space
- Can be a mess!



Feeding Space

- Lactating cows
  - All-at-once
    - 27 to 30" per cow
  - TMR, good access & time
    - 18" per cow

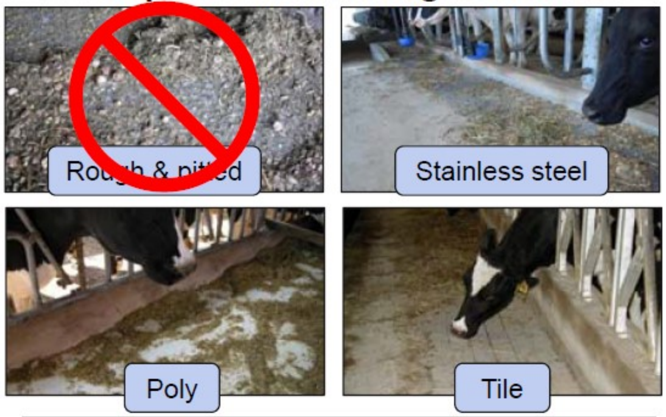
Good Access to Feed

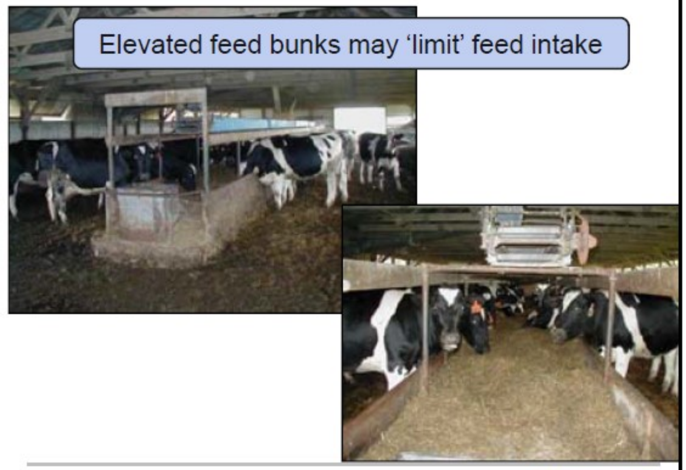
- Encourage & allow proper DMI for each cow
- Comfortable feeding experience
- 24-hr availability of feed
- Easy to clean & keep clean

Feeding Area Design

- Feed table
  - 2" to 6" above cow alley
  - Smooth
  - Durable
  - Easy to clean

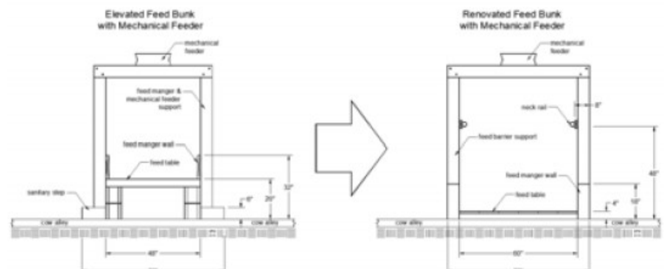
Improve the Feeding Surface





Feed Barrier

- Post & Rail
  - 48” high
  - 8” to 14” forward

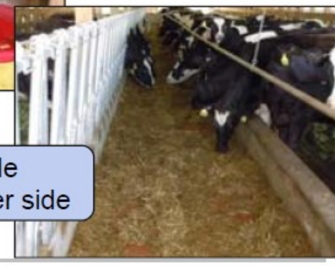


Modify elevated bunks to improve feed intake

Feed Barrier

- Headlocks


Lower, wider feed bunk

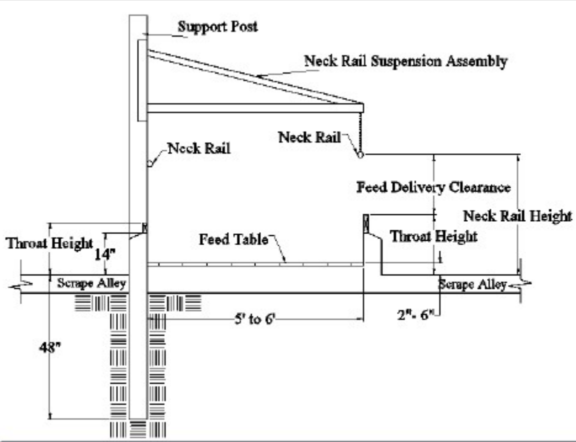
Headlocks on one side
'Floating' neck rail on other side

Convenient Feed Delivery


Feed Access & Availability

- Feed available 21 hours/day
- TMR delivered 2 times/day
- Target for 3% refusal
- Bunk density < 100%
- ½ hour push ups for 2 hours post-feeding
  - *Focus on when, not how often*

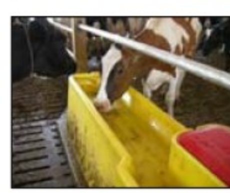

Source: Grant, 2014



Modifications to allow drive-by feed delivery

Water Station Considerations

- Convenient location
  - Cows should be within 50' of water
- Allows cows to draw water easily
  - Free access; open surface
- Good quality water
- Keep up with peak demand
  - 6 – 10 gallons per minute
- Be easy to clean & keep clean

Group Housing Water Access

- Provide at least two drinking water units per group
- Allow one watering space or 3' per 10 to 15 cows
- Provide space for multiple cows to drink at same time
- Supply 6 to 10 gpm to each watering unit

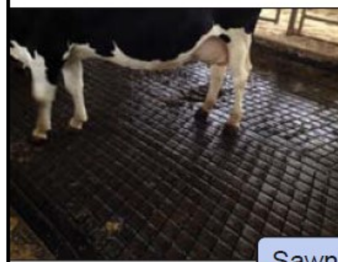

Tie Stall Water Access


Structure should not impede water access

Tie Stall Water Access

- One water bowl per stall
  - Better access
  - Reduce water bowl dominance

Improving Existing Floor Surfaces

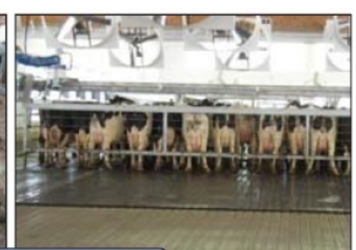



Sawn Grooves

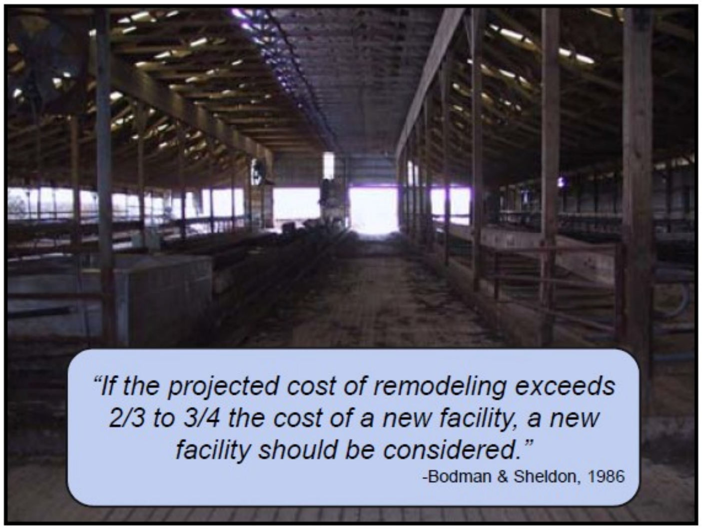
Improving Existing Floor Surfaces


Texturing

Improving Existing Floor Surfaces

Resilient flooring materials



"If the projected cost of remodeling exceeds 2/3 to 3/4 the cost of a new facility, a new facility should be considered."

-Bodman & Sheldon, 1986

Questions?

Dan F. McFarland
Agricultural Engineer
Penn State Extension
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Benefits of Improving Cow Comfort

- Improved milk production
- Improved milk quality
- Improved health
- Reduced lameness
- Improved reproduction
- Improved longevity

Productive cows are most affected by comfort

Create a management & facility plan with the primary goal of animal health & well-being in mind

Estimating the Impact of Cow Comfort – 100 Total Cows (Milking & Dry)

Poor cow comfort affects dairy cattle and herd profits in several ways:

1. Reduced milk production per cow and less income over feed costs.
2. Poorer conception rates, longer calving intervals and more tail-end producers.
3. More involuntary culls, higher replacement costs and loss of valuable genetics.
4. Higher vet and medical costs.

The following worksheet can help you estimate the economic impact of cow comfort.

1. **Reduced milk output** (heat stress reduces DMI):				
Milk price per cwt.	17.00		______	
Feed cost per cwt. milk	- 7.60		- ______	
Milk Margin - per cwt. of milk	9.40		______	
	÷ 100		÷ 100	
- per lb. of milk	0.094		______	
Milk loss per cow per day (lb.)	x 10		x ______	
Change in milk margin per cow per day	0.94		______	
No. of days milk production is down	x 30		x ______	
Total loss of milk margin per cow	28.20		______	
No. of cows in milk	x 85		x ______	
Total impact	$	2,397.00		$ ______
2. **Reduced milk output** (due to forced culling of good genetic cows):				
Drop in DHIA RHA or milk per cow per year	500		______	
Milk margin (see part 1.)	x 0.094		x ______	
Total loss in milk margin per cow per yr.	47.00		______	
Average herd size (milking plus dry)	x 100		x ______	
Total impact	$	4,700.00		$ ______
3. **Longer calving interval** (more tail-end producers):				
Herd average (305 day actual)	21,000		______	
First 305 days in milk	÷ 305		÷ 305	
Average milk per cow per day:				
For the first 305 days	68		______	
For the days milked beyond 305	- 40		- ______	
Difference in daily milk	28		______	
Increased days open	x 30		x ______	
Total production lost per cow (lb.)	840		______	
Milk margin per lb milk (see part 1.)	x 0.094		x ______	
Milk margin lost per cow	78.96		______	
No. cows with increased days open	x 20		x ______	
Total impact	$	$ 1,579.20		$ ______
4. **More cows culled, fewer cows merchandised**:				
Total cost of a replacement (cash plus non-cash)	2,000		______	
Average price of a cull (dead or alive)	- 700		- ______	
Net cost of filling a stall with a replacement	1,300		______	
No. of extra cows culled	x 5		x ______	
Extra replacement costs	$	6,500.00		$ ______
5. **Increased vet and health costs**	$	500.00		$ ______
6. **Cumulative impact**	$	15,676.20		$ ______

Worksheet developed by Glenn Shirk, 2000; Revised by Tim Beck 2012

PENNSTATE

Cooperative Extension

College of Agricultural Sciences

extension.psu.edu

An OUTREACH program of the College of Agricultural Sciences

Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

Notes:

The National Dairy FARM Program

DEMONSTRATING FARMERS COMMITMENT TO BEST PRACTICES

EMILY YEISER STEPP
NMPF, DIRECTOR FARM ANIMAL CARE PROGRAM

FARM PROGRAM HAS GROWN

PROGRAM BACKGROUND

WHY DOES THE FARM PROGRAM MATTER?

- We know that the dairy industry has a great story to tell.
- The FARM Program helps provide the data and proof points to back up these positive stories on America's dairies.
- The FARM Program also helps provide one, consistent, unified program for the entire dairy industry to follow.

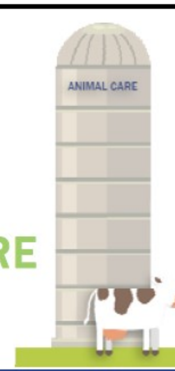
http://www.nationaldairyfarm.com/

WHAT IS FARM?

- The dairy industry, through National Milk Producers Federation (NMPF) with support from Dairy Management, Inc. initiated a voluntary program named FARM: Farmers Assuring Responsible Management in 2009
  - Began with animal care and has since expanded
- Program Goal:
  - Assure to CONSUMERS & CUSTOMERS that dairy farmers raise and care for their animals and land in a humane and ethical manner.

http://www.nationaldairyfarm.com/

FARM ANIMAL CARE



NATIONAL DAIRY FARM ANIMAL CARE BACKGROUND

- FARM offers a *continuous improvement* process to ensure a high level of on-farm animal care.
- FARM sets the highest standards that encourages dairy farmers to *continually improve*.

http://www.nationaldairyfarm.com/

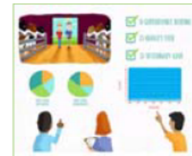
FARM ANIMAL CARE PROGRAM COMPONENTS

Best Management Practices

Second-Party Evaluations

- Pre-Interview
- Interview Questions
- Animal Observations
- Closing Interview
- Follow-up; Action Plans

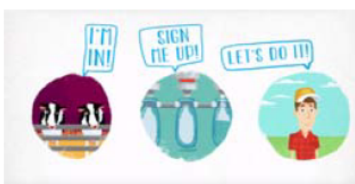
Third-Party Verification



#FARMPROUD

FARM AC PROGRAM BY THE NUMBERS

- **105** Participating Co-ops and/or Proprietary Processors
- Covers **98%** of the domestic milk supply in **48** states
- > **45,000** 2nd party evaluations completed to date
- > **370** trained FARM Evaluators



http://www.nationaldairyfarm.com/

FARM CONTINUES TO BUILD CUSTOMER SUPPORT

WHO MAKES DECISIONS ABOUT FARM ANIMAL CARE?

- The FARM Program is updated **every 3 years** by a group of:
  - Farmers
  - Academics
  - Veterinarians
  - Cooperative staff
- These individuals comprise the FARM Technical Writing Group.

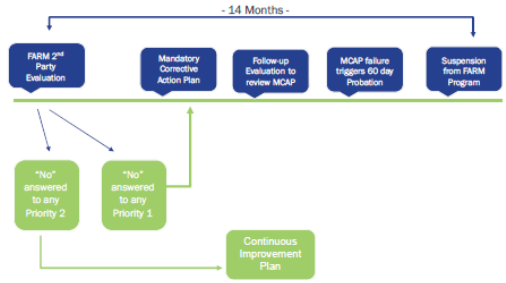
http://www.nationaldairyfarm.com/

FOOD CHAIN ENDORSERS OF FARM ANIMAL CARE

Sysco, Domino's Pizza, Harris Teeter, Great Lakes Cheese, Target, Nestlé, Leprino Foods, Costco Wholesale, Wawa, Kroger, Hershey's, Taco Bell, Yum!, Safeway, Starbucks Coffee, H-E-B, SuperValu, Chobani, McDonald's, Walmart, ingles, Kraft, Oscar Mayer

FARM ANIMAL CARE VERSION 3.0

FARM 3.0 ACCOUNTABILITY MEASURES



VERSION 3.0 PRIORITY AREAS

Phase One Priority Areas

- ❑ Veterinary Client Patient Relationship
  - Official form signed by Veterinarian of Record
- ❑ Dairy Cattle Care Ethics & Training Form
  - Signed by all employees with animal care responsibilities
  - Signed annually
  - Indicates:
    - Received training in stockmanship AND area of responsibility;
    - Will not abuse animals/Will report any mistreatment that occurs
- ❑ No Tail Docking

HOW TO PREPARE FOR YOUR FARM EVALUATION

VERSION 3.0 PRIORITY AREAS

Phase Two Priority Areas

- ❑ Herd Health Plan
  - Protocols for newborn and milk-fed dairy calves.
  - Protocols for pain management.
  - Protocols and training for non-ambulatory animal management.
  - Protocols for euthanasia.
- ❑ Animal Observations
  - Lameness
  - Body Condition
  - Hock/Knee

PRIMARY AREAS OF EVALUATION

- Management SOPs and Records
- Newborn and Milk-Fed Calves
- Animal Nutrition
- Animal Health
- Environment and Facilities
- Handling, Movement and Transportation

http://www.nationaldairyfarm.com/

WHAT DOES THE EVALUATION ENTAIL?

1. Pre-Evaluation
   - Self-Assessment
   - Pre-Evaluation Checklist
2. Interview Questions
3. Animal/Facility Observations
4. Closing Meeting & Follow-up

http://www.nationaldairyfarm.com/

RESOURCES

RESOURCES TO HELP MEET EVALUATION AREAS

- Animal Care Reference Manual
- FARM Self Assessment Tool
- Sample VCPR
- Sample Dairy Cattle Care Ethics Agreement
- Training Log
- Emergency Contacts Poster
- Culling Poster
- Fillable Herd Health Plan Protocols
- Example Herd Health Plan
- Training Resources

Can use FARM templates or your own versions of all documents, records and training

EMERGING ISSUES

FARM TRAINING OPPORTUNITIES

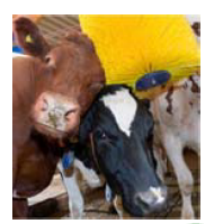
- Stockmanship
- Calf Care
- Euthanasia
- Non-Ambulatory Animals
- Pain Management
- Crisis Preparedness
- Emerging Issues
- Culling Decisions
- Antibiotic Stewardship Webinars

MERCK Animal Health

Beef Quality Assurance

WHAT IS AN EMERGING ANIMAL CARE ISSUE?

The roster of standard operating procedures and recommended practices on dairy farms is evolving, shaped by new technology, new science, and practical experience. What is new is that this evolution is increasingly driven by both measurable animal welfare outcomes and by societal pressures about what is acceptable, as expressed by the clear and unequivocal expectations of our customers.



HOW DOES FARM ADDRESS EMERGING ANIMAL CARE ISSUES?

Defend the defensible
- Through sound science, practical experience, and best management practice development

Educate customers and consumers
- Through coordinated industry messaging for customer meetings, corporate responsible sourcing guidelines, and social media interactions

Prepare for changes
- Through expert task forces and when necessary responsible transition timelines

CONNECT WITH THE FARM PROGRAM #FARMPROUD

@farmprogram National Dairy FARM Program @farmprogram

#FARMPROUD

TODAY'S EMERGING ANIMAL CARE ISSUES

- Disbudding vs. Polled Genetics
- Biotechnology
- Antibiotic Stewardship
- Animal Housing
- Calf Care

Thank you!

http://www.nationaldairyfarm.com/

HELP BUILD SUPPORT FOR FARM

Notes:

Berg & Bennett

Quality Dairy Equipment

Castorland, NY

Cornell University
College of Agriculture and Life Sciences

PRO-DAIRY

Using On-Farm Automation and Technology to Improve Cow Comfort

Robert Lynch, DVM
Dairy Herd Health & Management Specialist
Cornell University PRO-DAIRY
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607.882.5378

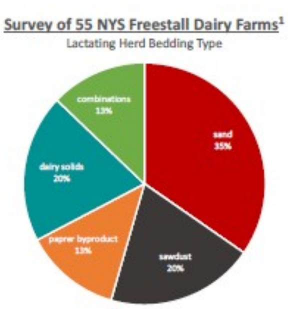
Mar 21, 2017

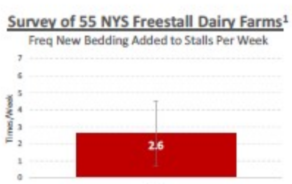
Outline

- Stall comfort
- Maximizing resting time
- Finding cows that might need help
- Access to feed
- Heat abatement
- Calf Comfort

PRO-DAIRY 2

Bedding Management





[1] Ben Scott, Masters Thesis, 2016

PRO-DAIRY 3

PRO-DAIRY 4

Grooming Sand

- Level by redistributing the sand from beneath the divider loops[1]
- Aerate the top 3-4 inches of the bed[1]
- Sandman: ~$7,000-$9,000[2]

[1] Cook, NMC Proceedings, 2017
[2] Benson, Ag Equipment Solutions, Personal Communication

PRO-DAIRY 5

Removing Sand

- 10 inch deep trench[1]
- 24 inch width trench[1]
- Skid steer mounted equipment
- Bedding Extractor: ~$9,300[2]

[1] Cook, NMC Proceedings, 2017
[2] Benson, Ag Equipment Solutions, Personal Communication

PRO-DAIRY 6

Dairy Manure Solids (DMS)

www.menschmfg.com

7

DMS

- Screw press separators, composters, feed pumps, agitators, controllers, buildings/concrete pads, installation
- ~45-60% Moisture
- Current bedding expense?

DMS Cost[1]	
Total Annual Cost	**Annual Cost /Cow**
$37,700 - $66,700	$61 - $196

[1]Tim Shepherd, PRO-DAIRY, Eastern Dairy Business, 2010

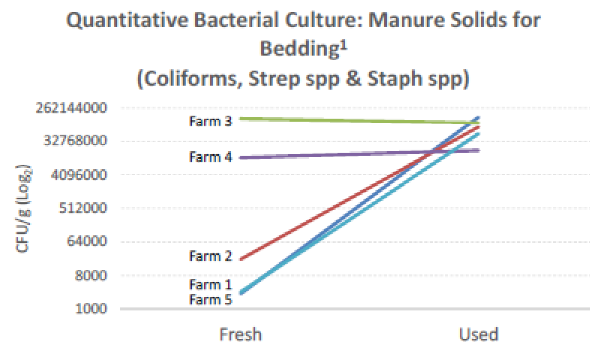
8

DMS

- Add new bedding frequently (1-2 days) to keep bedding deep
  - Deep Bed: 6-8"
  - On Mattress: 1-2"
- Remove soiled areas
- ↑ Risk of environmental mastitis?
  - Other management factors optimal?

9

DMS Bedding Bacteria Counts



[1]Analyzing the Use of Separated Dairy Manure Solids for Stall Bedding, Preliminary Results, 2016

10

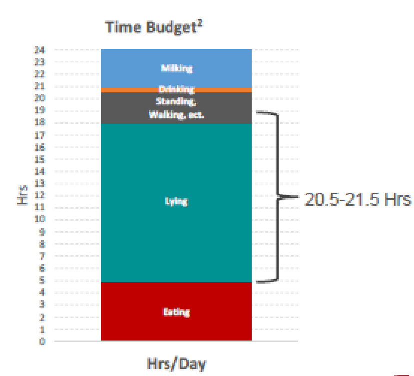
Dairy Cow Sensors

- Rumination
- Temperature
- Activity
  - Estrus
  - Health
  - Lying Time?

11

Dairy Cow Time Budget

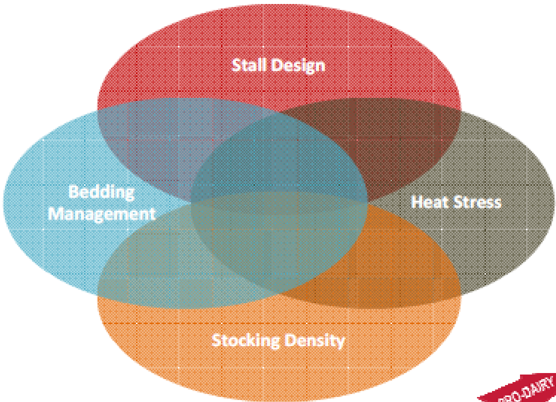
- Evaluating stall use
  - Observation methods affected by env temp, non-stall related pen constraints, time of management practices, crowding[1]
- 12-14Hrs Lying time ideal[2]



[1] M Overton, International Dairy Housing Proceedings, 2003
[2] Grant, 2004

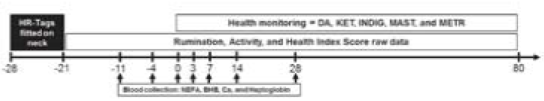
12

Lying Time



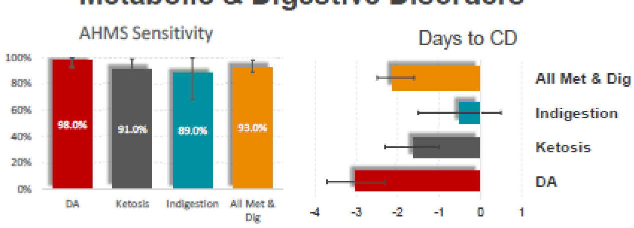
Activity / Rumination Meters

- Objectives:
  - Evaluate performance of AHMS to identify cows with metabolic and digestive disorders based on a Health Index Score (HIS)
  - Evaluate the number of days between the 1st HIS and clinical diagnosis by farm personnel
  - Evaluate daily rumination time, physical activity, and HIS patterns around clinical disease (CD)
- 1,121 Holstein cattle with neck-mounted electronic rumination and activity monitoring tag
- HIS calculated daily for individual cows
  - +HIS = <86 during at least 1d from -5 to 2 d after CD
  - Subgroup (n=459): NEFA, BHBA, Total Cal, Haptoglobin



Stangaferro et al, J Dairy Sci., 2016

Activity & Rumination Meters and Metabolic & Digestive Disorders



- Overall sensitivity and timing of the AHMS alerts for cows with metabolic and digestive disorders indicated that AHMS that combine rumination and activity could be a useful tool for identifying cows with metabolic and digestive disorders.

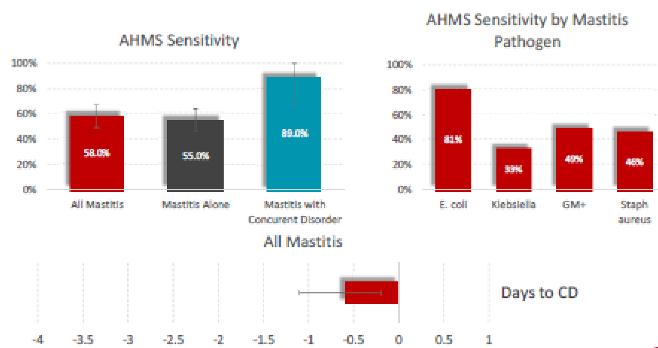
Stangaferro et al, J Dairy Sci., 2016

Activity & Rumination Monitors and Mastitis

- Objectives:
  - Evaluate performance of AHMS to identify cows with mastitis based on a Health Index Score (HIS)
  - Evaluate the number of days between the 1st HIS and mastitis by farm personnel
  - Evaluate daily rumination time, physical activity, and HIS patterns around clinical disease (CD)

Stangaferro et al, J Dairy Sci., 2016

Activity & Rumination Monitors and Mastitis



Stangaferro et al, J Dairy Sci., 2016

Activity & Rumination Monitors and Mastitis

- AHMS effective for identifying cows with clinical mastitis caused by E. coli and cases of mastitis concurrent with another health disorder.
- AHMS should be used in combination with or to complement traditional methods of mastitis detection.

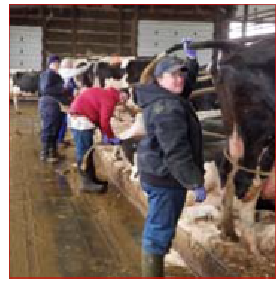
Stangaferro et al, J Dairy Sci., 2016

Activity & Rumination Monitors and Metritis

- Objectives:
  - Evaluate performance of AHMS to identify cows with metritis based on a Health Index Score (HIS)
  - Evaluate the number of days between the 1st HIS and metritis by farm personnel
  - Evaluate daily rumination time, physical activity, and HIS patterns around clinical disease (CD)

Stangaferro et al, J Dairy Sci., 2016

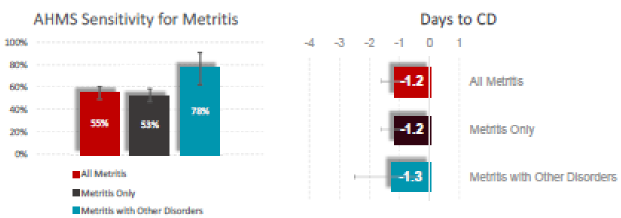
Blood NEFA can be Predicted from Milk During the Fresh Period



- Provides information about the severity and duration of the negative energy balance (fat mobilization)
- Early warning of problems ahead

Barbano et al., 2015 ADSA

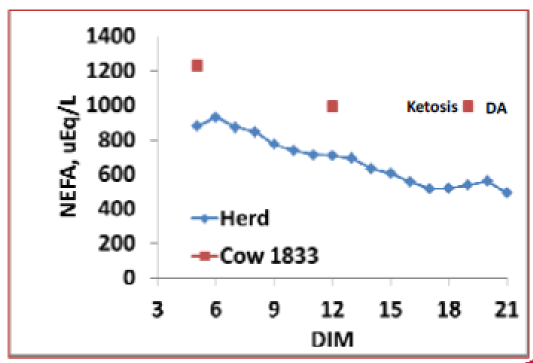
Activity & Rumination Monitors and Metritis



- AHMS was effective for identifying cows with severe cases of metritis or cows with metritis and another health disorder and identified cows earlier than by farm personnel.

Stangaferro et al, J Dairy Sci., 2016

Cow Identified as Outlier Based on Milk Predicted "Blood" NEFA Before Health Problem was Observed



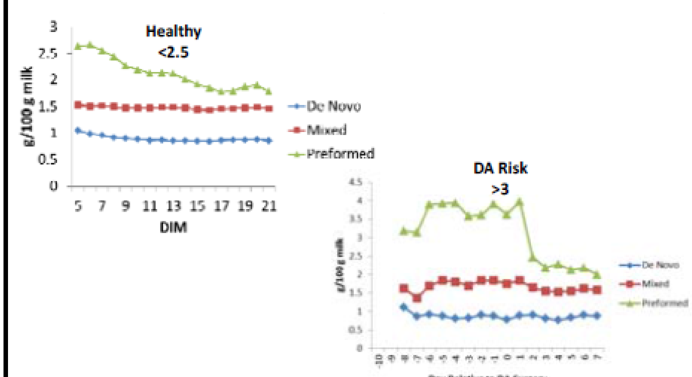
Barbano et al., 2015 ADSA

Use of Mid-IR Milk Analysis for Individual Cow Milk Samples

- Understanding how the milk "fingerprint" can be used for individual cows
- Milk can tell us more than the traditional fat and protein for individual cows
  - Diet/feeding management
  - Metabolism
  - Health
  - Reproduction

Dann, Miner Institute

Milk Fatty Acids Are Different in Healthy Transition Cows vs. Cows that Have DA



Dann, Miner Institute

Current Research

- Use of mid-IR milk analysis to…
  - predict blood BHB (ketones)
  - detect estrus
  - determine the likelihood of pregnancy following insemination
  - predict blood acute phase protein (immune markers)
  - predict rumen pH and SARA

Dann, Miner Institute

RFID / Wand

- Hand held RFID Reader
- Speed up cow-side chores
- Improve protocol compliance
- Minimize lock down time


Photo Credit: Thomas, DHMS, Curtimade Dairy


Photo Credit: Thomas, DHMS, Curtimade Dairy

26

RFID / Wand

- **Pocket Cowcard Scan Software**
  - $1750 one-time licensing
  - $360 annual subscription
- **Hardware**
  - Psion: ~$4500
  - Allflex (w/Android tablet): ~$1900


Photo Credit: Thomas, DHMS, Curtimade Dairy

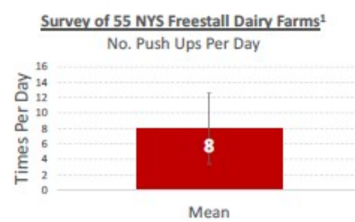
27

Video Credit: Thomas, DHMS, Curtimade Dairy

28

Feed Push-Ups

Improve feed access	Promote consistent nutrient intake	Encourage feeding behavior



[1] Ben Scott, Masters Thesis, 2016

29

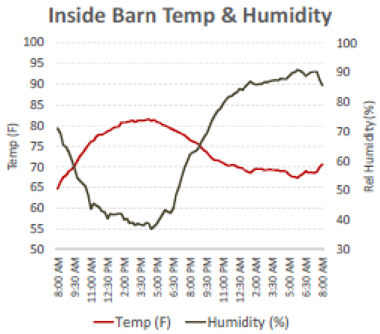
Automatic Feed Pushers

- Rail/Cable Driven or Robotic
  - Up to $25,000
- Not trouble free
- Saves on labor
  - Hourly wage x Hours spent pushing feed / yr

30

Effective Heat Abatement

- Heat abatement strategies proven to improve cattle welfare and performance
- Manual control not ideal

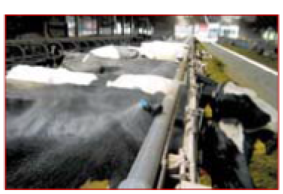


31

Automatic Curtains

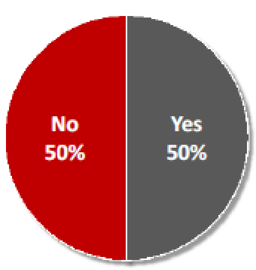
32

Automated Cooling Systems



Survey of 55 NYS Freestall Dairy Farms

Soakers in Barn[1]

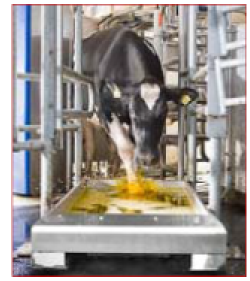


[1] Ben Scott, Masters Thesis, 2016

33

Lameness & Foot Bath Systems

- Infectious Hoof Diseases common
- Significant welfare & economic concern
- Use of foot baths common on US dairies
  - Prone to under-management
- Automatic Foot Bath Systems can be programed to fill, dose, flush and replenish
  - Less Labor
  - Improved foot bath efficacy
  - ~$7,500/system

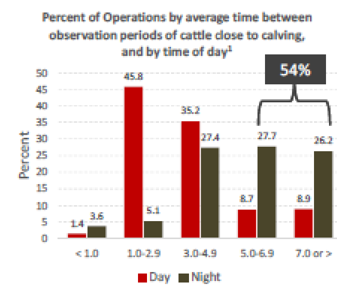


DeLaval Footbath AFB 1000

34

Prediction of Calving

- Situation:
  - Onset of Stage 2 Labor difficult to predict
  - Prolonged dystocia leads to increased risk to cow & calf
  - Labor constraints can make 24hr surveillance difficult
- Sensors based on activity, tail activity, or change in temp
  - MooCall:
    - $300/sensor includes 1yr license, $136/yr/sensor after



[1] NAHMS, 2007

35

Natural Ventilation

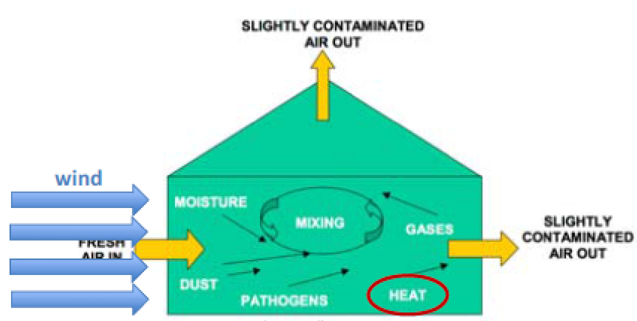
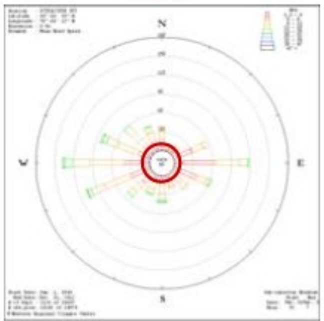


Diagram: Gooch, Cornell PRO-DAIRY

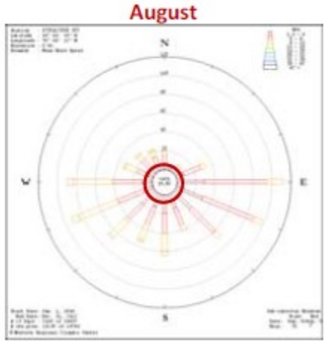
36

Syracuse Evening

March



August



http://www.wrcc.dri.edu

37

Benefits of Calf Pre-Weaned Nutrition

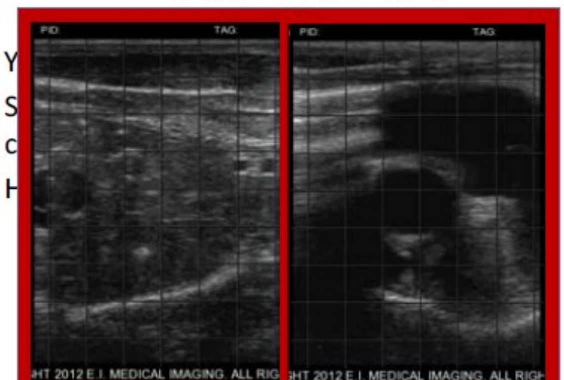
- Improved calf health
- Improved future 1st lact milk yield[1]
  - 1kg ADG increased 1st lact milk yield by 1550kg
  - Calves fed for greater ADG were 2x more likely to have greater milk yield in the 1st lact. (P=0.001)
- Challenge to achieve using traditional feeding strategies

[1] Soberon and Van Amburgh, J Anim Sci, 2013

40

Calf Pneumonia

- Y
- S
  c
- H



Ollivett, 2012

38

Ad Lib Feeding

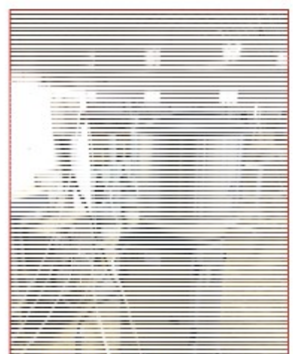


Photo Credit: Tabor, Manager, Seneca Valley Farm

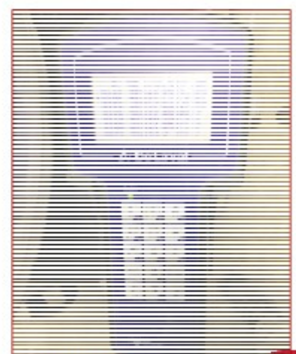


Photo Credit: Tabor, Manager, Seneca Valley Farm

41

Calf Comfort

Photo Credit: Tabor, Manager, Seneca Valley Farm

39

Daily Milk Consumption & Drinking Speed

KalbManagerWIN, Tabor, Manager, Seneca Valley Farm

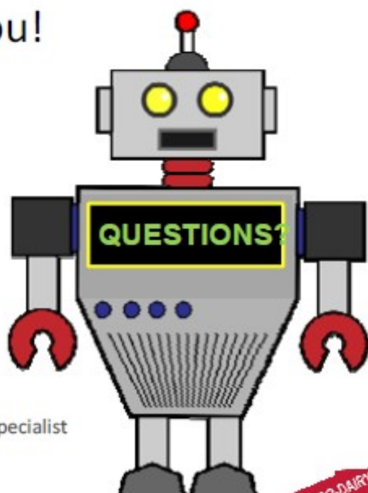
42

Real Time Feeding Progress Reports

KalbManagerWIN, Tabor, Manager, Seneca Valley Farm

43

Thank you!



Robert Lynch, DVM
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607.882.5378

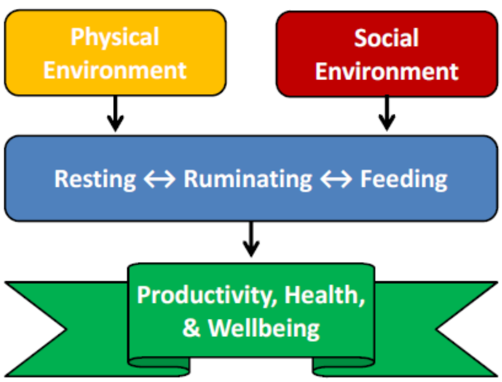
44

Notes:

Common Ways to Disturb the Time Budget

- Excessive time outside pen
- Uncomfortable stalls
- Inadequate feed availability
- Overcrowding, excessive competition
- Inadequate heat stress abatement
- Mixing of primi- and multiparous cows
- Short pen stays during transition – social turmoil
- >1 h/d in headlocks (fresh cows)

Cow Comfort is a Function of the Cow's Management Environment



Resting is the Cow's Most Valued Behavior

- Motivated to lie for ~12 h/d
- Lying behavior takes precedence over eating and social behaviors when opportunities to perform these behaviors are restricted
  - For every 3.5 min of lost rest (chronic), cows sacrifice 1 min of eating

Metz, 1985; Hopster et al., 2002; Munsgaard et al., 2005; Cooper et al., 2007

Management Environment Influences Time Budget Behaviors

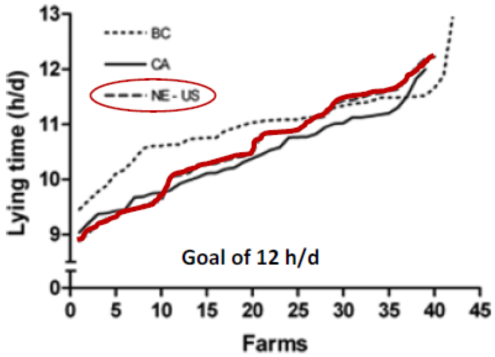
Activity	Hours per Day
Resting (lying)	10 to 14
Eating	3 to 5
Drinking	0.5
Ruminating (standing or lying)	7 to 10
Interactions, grooming, standing	2 to 3
Milking (outside of pen)	2.5 to 3.5

Adequate Rest (Lying Time) Has Benefits

- Increased milk production (3.7 lb/h), feeding time, and rumination
- Decreased standing that minimizes risk of sole hemorrhages and lameness
- Physiological changes
  - Decreased cortisol response
  - Increased growth hormone
  - More blood flow to mammary gland and gravid uterine horn
- Increased longevity

Bécotte et al., 2013; Munksgaard and Simonsen, 1996

Lying Time is an Opportunity for Many Farms



von Keyserlingk et al., 2012

Measured Time Outside of Pen

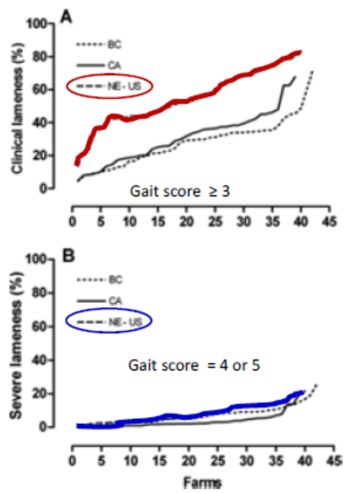
Time away from the pen in 40 Northeastern dairy herds

- Average: 4.8 h/d
- Range: 3.0 to 7.7 h/d

von Keyserlingk et al., 2012

Lameness is a Major Concern on Northeast Farms

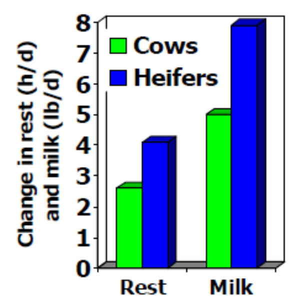
Gait Score	Category	Description
1 (Sound)	Not lame	Walks with a smooth and fluid locomotion, a flat back and even steps.
2 (Imperfect gait)		Walks with a slightly uneven gait and slight joint stiffness but with no limp.
3 (Mildly lame)	Mildly lame	Walks with shortened strides, a slight limp, and possibly an arched back.
4 (Moderately lame)	Severely lame	Walks with an obvious limp, an arched back and a jerky head bob.
5 (Severely lame)		Unwilling to bear weight on one limb and/or must be vigorously encouraged to stand or move.



von Keyserlingk et al., 2012

Less Time Outside the Pen is Beneficial

- 3 vs 6 h/d outside pen
  - Adjusted pen size versus parlor capacity
  - Mixed primi- and multiparous cows
  - 100% stocking density
  - 14-d periods



Economic benefit of 5 to 8 lb/d more milk

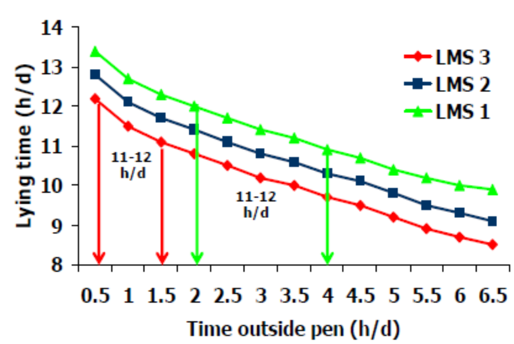
Matzke, 2003

Lameness and Time Outside of Pen

- 53 high-production pens on 50 dairy farms
- Greater lameness prevalence most highly associated with greater time outside the pen
  - Impacts time budget

Espejo and Endres, 2007

Lameness, Resting Requirement, and Time Outside the Pen



Gomez and Cook, 2010

Time Budget Behaviors

Primiparous Cows vs. Multiparous Cows

- Take smaller bites, eat more slowly, spend more time feeding
- Ruminate less
- Are less dominant, more easily displaced from manger, stalls, and water
- Avoid stalls previously occupied by dominant cows

Importance of the Management Environment

- 47 herds with similar genetics were fed same TMR and averaged 65 lb milk/d with a range of 45 to 74 lb milk/d
- Non-dietary factors accounted for 56% of variation in milk yield
  - Feeding for refusals
  - Feed push-ups
  - Stalls per cow

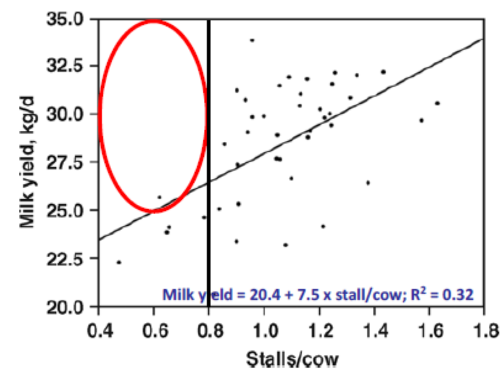
Bach et al., 2008

Comingled Parity Pens Cause Competition: 1st Lactation Cows Lose

- Less resting (20%)
- Less DMI (10%), drinking, and rumination
- Less milk (9%) and milk fat %
- Reduced FCM/DMI by 30 DIM
- More body weight loss by 30 DIM
- Avoid preferred stalls
- Fresh pen helps minimize negative impact
  - ~500 lb more milk during 305 d lactation
  - Less ketosis

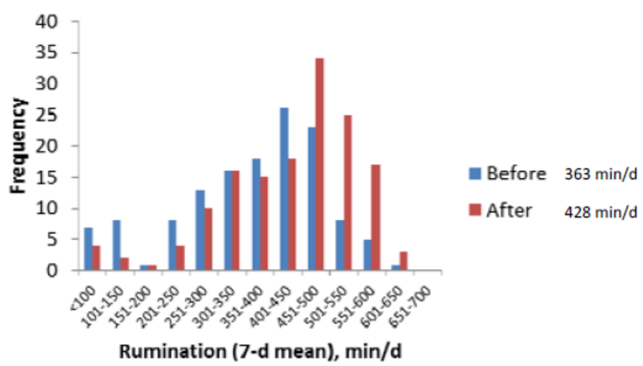
Kongaard and Krohn, 1980; Bach et al., 2006; Bach et al., 2007; Ostergaard et al., 2010

Stalls per Cow and Milk Production



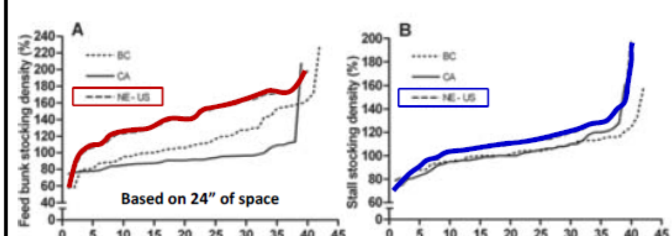
Bach et al., 2008

1st Lactation Cows Ruminated More When Moved to a Separate Pen



Data courtesy of St. Cyr (2014)

Northeast Farmers Overcrowd Cows!



von Keyserlingk et al., 2012

Cost of Overcrowding: Summary of Cow Responses

Changes in these behaviors…

- Greater aggression & displacements at bunk
- Greater feeding rate
- Reduced resting time
- Increased idle standing in alleys
- Decreased rumination
- Subordinate cows most affected

May result in these economic losses…

- Less milk yield
- Lower milk fat
- Greater SCC
- More health disorders
  - DA, SARA, milk fever
- Increased lameness
- Fewer cows pregnant

Stocking Density and Feeding Environment: Implications

- Don't feed marginal fiber on overstocked farms or when feeding for low refusals
  - Less lying, less buffer production at high stocking density
  - Possibility to adjust fiber content with two separate feedings?
  - Think about late night feeding management…is feed available?
- Location of rumination may be important
  - Stall comfort…are all stalls equally comfortable?
- 1st lactation animals will likely exhibit greater effects
  - Grouping strategies
  - Alter feeding environment to promote subdominant animals

Campbell and Grant, 2016 CNC

What is Optimal Stocking Density?

Close-up and fresh cows:
- ≤80% of bunk space (30 in/cow)
- Also a function of stall availability

Lactating cows
- 4-row barn: don't exceed 115-120% of stalls
  - Mixed heifer & older cows: 100%
- 6-row barn: 100% of stalls?

Ensure access to feed, water, stalls

Resting in Freestalls

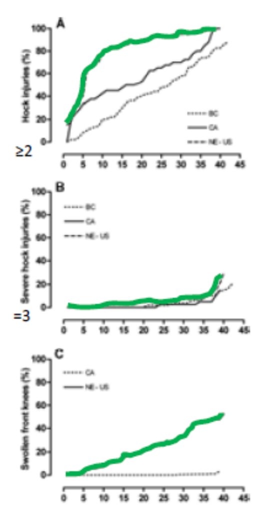
Clean, Dry, Comfortable, & Available

Multiple Stressors…Stocking Density and Feeding Environment

- Higher stocking density and marginal fiber negatively affect ruminal pH; greater contribution from stocking density.
- Increasing dietary peNDF/uNDF helps to maintain ruminal pH, especially when overcrowded.
- Reduced feed access exacerbates the negative effects of high stocking density.
- With high stocking density, pH is low throughout day, but effect is greatest at night
  - Management implications?

Campbell and Grant, 2016 CNC

Hock and Knee Injuries are Common on Northeast Farms



von Keyserlingk et al., 2012

Stall Base and Preference:
Cows Prefer More Compressible Surface

Stall base type	% Lying (Ranking)	CCI (Ranking)
Sand	69%(1)	87%(1)
Foam mattress	65%(2)	84%(2)
Rubber crumb mattress	57%(3)	68%(4)
Waterbed	45%(4)	74%(3)
Solid rubber mat	33%(5)	51%(6)
Concrete & sawdust	23%(6)	59%(5)

Wagner-Storch et al., 2003

Deep-bedded Stalls Benefit Cows

- Lameness is higher for mattresses vs deep-bedded stalls: 24-33% versus 11-22% (3 studies)
- Greater lying time for deep-bedded vs mattress: 15.0 versus 13.3 h/d (Tucker et al., 2003)
- Lame cows spend more time standing on mattresses vs deep-bedded stalls: 3.3 h/d more
- Hock lesions higher on mattresses vs deep-bedded stalls: 72-91 versus 24-25 (2 studies)

Use as Much Bedding as Possible for Cow Comfort

- Comfortable stall encourages resting
- More natural rising/lying down motions
- Minimizes injury
- Reduces hock and knee abrasions and swelling
- Reduces lameness

Deep-bedded Stalls are Best for Comfort…but How Deep is "Deep"?

- Can't see the stall/mat surface?
- 4-8 inches preferred by cow
  - Bed provides some of this depth
- 2-4 inches of sand on mattress provides benefits of deep-bedded sand (Cook et al., 2008)

Predictable Response to Bedding

+3 min/d lying time for each additional 2 lb of sawdust shavings

- 6 to 50 lb/stall: +1.1 h/d lying

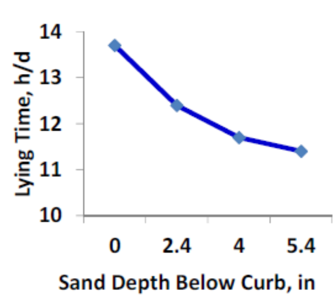
+12 min/d lying time for each additional 2 lb of straw

- 2 to 15 lb/stall: +1.2 h/d lying

+12 min/d lying time for each additional 1/2 inch of sand

Tucker et al., 2009

Don't Let the Sand Get Hollowed Out



Drissler et al., 2005

Cows Do Not Use Wet Stalls!

≥16 lb of sawdust on platform results in greatest lying time ~ deep bedded

- 4 inches of sawdust: 86 or 26% dry matter
- Allowed free-choice access to stalls:
  - 12.5 versus 0.9 h/d lying time
- Keep bedding >60-65% DM

Fregonesi et al., 2007

Create the Perfect Dining Experience

- Management that enhances rest and rumination
- Feed available on demand
- Consistent feed quality/quantity along the bunk
- Bunk stocking density ≤100%
  - ≥24 in/lactating cow and ≥30 in/dry cow
- TMR fed 2x/day
- Push-ups focused on 2 hours post-feeding
- ~3% feed refusal target
- Bunk empty no more than 3 h/d (ideally never)

UW Recommendations for Free Stalls

Dimension (in)	1st Lac 1400 lb	Mature 1600 lb	Prefresh 1800 lb
Total stall length facing wall	108	120	120
Head to head platform	204	216	216
Stall length (rear curb to brisket locator	68-70	70-72	72
Stall width	48	50	54
Height of brisket locator	4	4	4
Neck rail height	48	50	50
Rear curb height	8	8	8

Cook et al., 2004

Don't Forget about the Drinking Experience

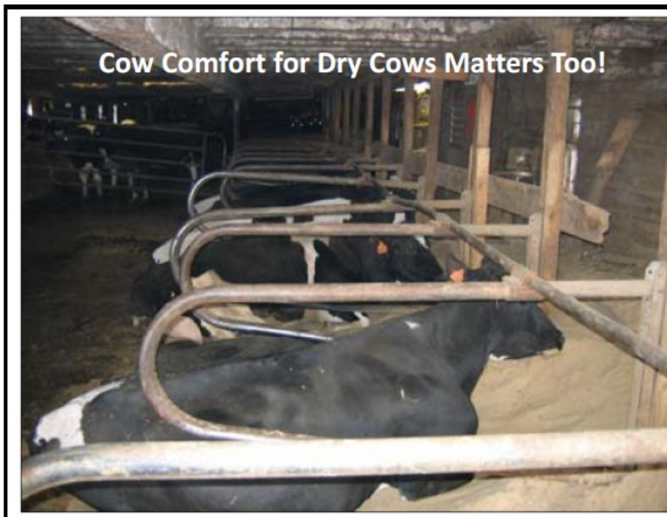
Economics of Stall Renovation: Five Case Studies

Softer beds, larger stalls
- 48 to 54 in wide
- 70 in long
- 50 in neck rail height

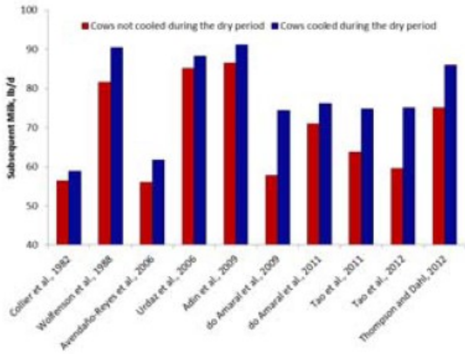
Payback on investment
- 0.5 to 3 years (average 1.9 years)

Economic benefits
- Greater milk (3 to 14 lb/d)
- Lower turnover rates (-6 to -13%)
- Lower SCC (-37,000 to -102,000)
- Less lameness (-15 to -20%)

Cummins et al., 2005; Cook, 2006



Cooling Cows During the Dry Period Improves Milk Production



Bedded Pack with Calving Blind vs. Individual Maternity Pen

Item	Pack with Blind	Individual Pen
Calvings, #	30	24
Calvings in blind, #	12	6 (in blind at move)
Blind occupied by other, #	4	4
Calving difficulty	1.6	1.8
Assisted calvings, #	7 (23%)	11 (46%)
Time from 1st lateral contraction to birth, min	98	124
Rumination, min/d (1st 21 DIM)	367	324

Morrison et al., 2013

Cooling Cows During the Dry Period

- Improves immune function (do Amaral et al., 2009)
- Increases colostrum yield and IgG content (Adin et al., 2009)
- Increases apparent efficiency of absorption of IgG (Tao et al., 2012)
- Increases birth weight and weaning weight of offspring (Tao et al., 2012)

Calving Pen Management Had Effects on the Dam and Newborn Calf

- Moving and isolating heifers during calving interrupted the process and increased labor duration

- Calf response
  - Increased prenatal hypoxia
  - Increased indicators of metabolic acidosis
  - Delayed 1st attempt to stand
  - Reduced appetite at 12 h of birth

Ji et al., 2013

The Calving Pen is an Important Facility Since it Affects the Well-being of the Cow and Newborn Calf

Goals: 1) low stress environment, 2) low health risk for cow and calf, 3) convenience for people, & 4) opportunity for seclusion

Individual maternity pen, bedded pack, or enhanced calving pen

Commercial Dairy with Calving Blind

"We're finding that cows are enjoying the privacy too, perhaps more than the heifers in our springer group"

Photos Courtesy of Meghan Hauser

Use of blinds to promote calving seclusion and minimize stress associated with overcrowding

Take Home Messages

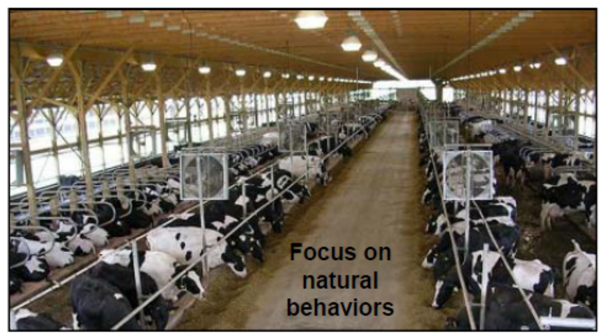
- Cows need time to be cows – practice natural behaviors

Environmental Enrichment… Not Just for Zoos

- Can improve biological functioning
  - Lifetime reproductive success
  - Inclusive fitness
  - Health
- Cope with stress in surroundings, reduce frustration, increase fulfillments of behavior needs, promote positive affective states

Mandel et al., 2016

Create the Perfect "Home Office"



Categories of Environmental Enrichment

- **Social** – stable groups vs regrouping, timing of moves, pair moving
- **Occupational** – exercise and psychological/cognitive enrichment
- **Physical** – isolate (calving, sick), comfortable housing
- **Sensory** – general farm noise (music), mirrors, smells, grooming
- **Nutritional** – varied feed or methods of delivery…feeding more space

Mandel et al., 2016

Provide a Physical and Social Environment that Supports Cow Comfort

- Clean, dry, and comfortable resting place
  - Cow prefer softer lying surface (sand)
  - Stall design/size is important
- Appropriately grouped and stocked pens
  - Primiparous vs. multiparous cow groups
  - ≤120% stall stocking density; less for transition cows
- Heat stress abatement for lactating and dry cow
- Air quality, flooring, …

Dairy Farmers of America

Notes:

The economics of cow comfort: Why it pays to make improvements

Albert De Vries

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UF IFAS

2017 Cow Comfort Conference, Liverpool, NY, March 20-21, 2017

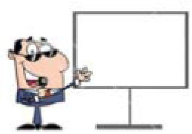
Stocking density

- Cows / stall
- Feed bunk space / cow
- Total area / cow
- Shade / cow

Transition cows
Lactating cows

Overview

- Stocking density
- Cooling dry cows



USDA-NAHMS Dairy Survey 2007

Percentage of freestall operations by current, maximum, and average number of cows per stall

	Percent Operations					
	Density					
	Current		Maximum		Average	
Cows per Stall	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Less than 0.95	38.9	(4.2)	13.4	(3.5)	34.9	(4.1)
0.95 to 0.99	7.4	(1.9)	3.1	(1.1)	8.1	(2.0)
1.00 to 1.04	12.6	(2.7)	25.7	(3.7)	16.2	(3.1)
1.05 to 1.09	10.7	(2.3)	9.3	(2.2)	12.0	(2.5)
1.10 or more	30.4	(3.7)	48.5	(4.2)	28.8	(3.7)
Total	100.0		100.0		100.0	

57% (rows 1.00 to 1.04 through 1.10 or more, Average)

N = 2500 dairy farms

USDA-NAHMS (2010)

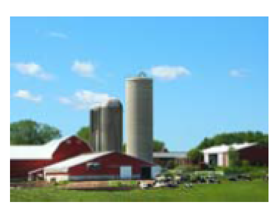
Stocking density Acknowledgments

- Wageningen University (the Netherlands):
  - Haile Dechassa (MSc student)
  - Dr. Henk Hogeveen
- University of Tennessee (USA):
  - Dr. Peter Krawczel
- Southeast Milk Inc., Milk Check-off Program
  - Partial funding

J. Dairy Sci. 99:3848 (2016)

Wisconsin survey 1999

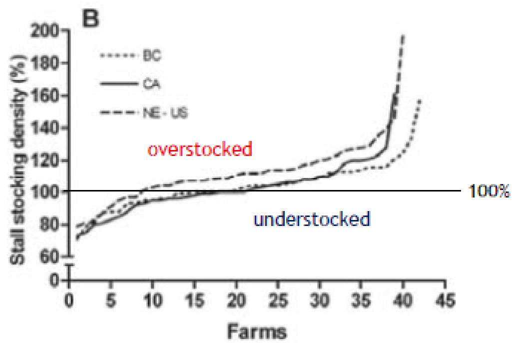
- 4-row barns: 111% stocking density
- 6-row barns: 104% stocking density



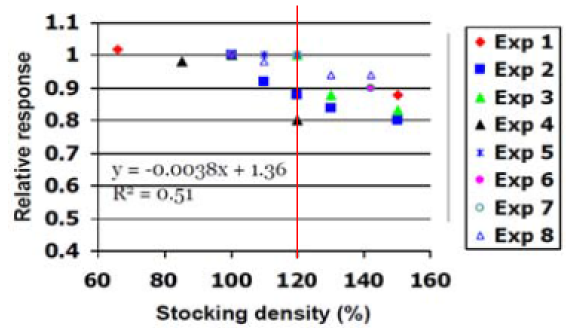
Bewley et al., 2001

Stall stocking density

British Columbia (BC; n = 42), California (CA; n = 39), northeastern United States (NE-US; n = 40).



Overstocking and resting time: max = 120%?



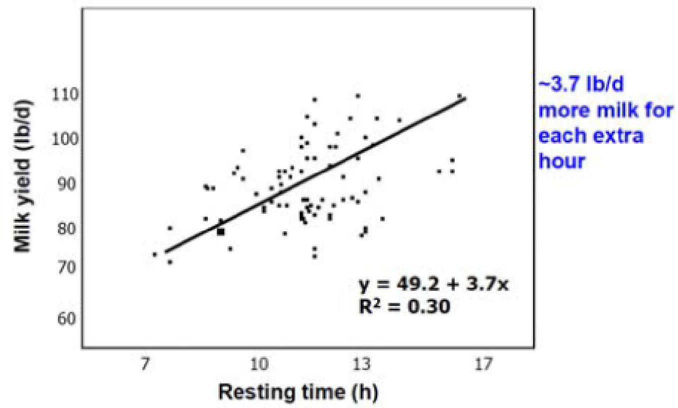
(Winkler et al., 2003; Fregonesi et al., 2007; Wierenga and Hopster, 1990; Matzke and Grant, 2002; Hill et al., 2009; Krawczel, 2008; 2009; 2010)

Slide Peter Krawczel, U of Tennessee

Basic concepts

- Overstocking reduces cow's ability to practice natural behaviors (Wechsler, 2007)
- Response to overstocking depends on facilities and grouping (P. Krawczel)
- Overstocking improves economic returns on investments in facilities (Bewley et al., 2001)
- How much overstocking is most profitable?

Resting time and milk yield



Grant et al., 2004

Slide Peter Krawczel, U of Tennessee

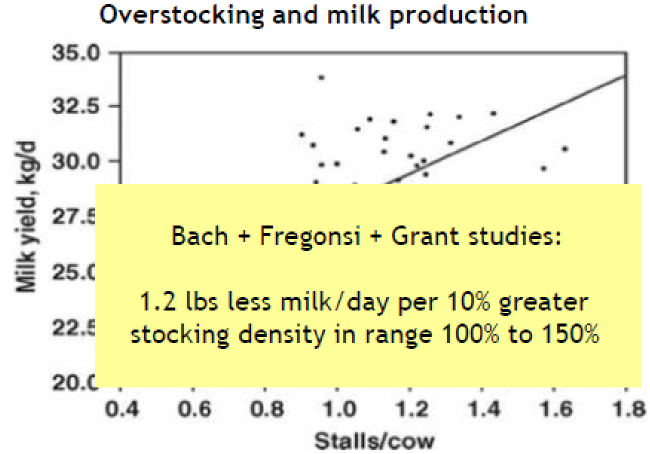
Typical time budget for lactating dairy cow

- Basic behavioral needs:
  - 3 to 5 h/d eating
  - 10 to 14 h/d lying (resting)
  - 2 to 3 h/d standing/walking in alley (grooming, agonistic, estrous activity)
  - ~0.5 h/d drinking
  - 20.5 to 21.5 h/d total needed
  - 2.5 to 3.5 h "milking"

\+ 24 hours / day

Slide Peter Krawczel, U of Tennessee

Overstocking and milk production

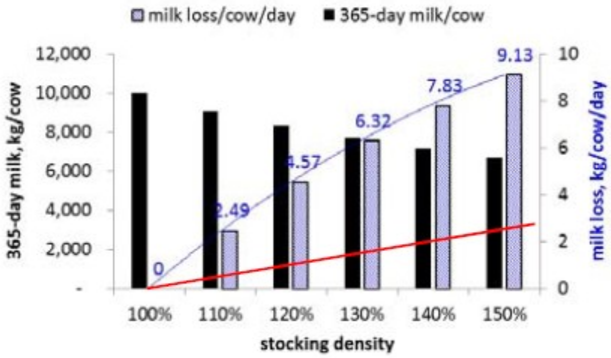


Bach et al., 2008

Slide Peter Krawczel, U of Tennessee

"Fewer cows in pen did not change bulk tank milk yield"

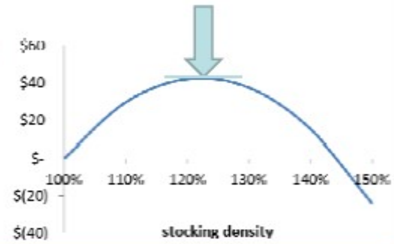
Example: 10,000 kg milk/stall



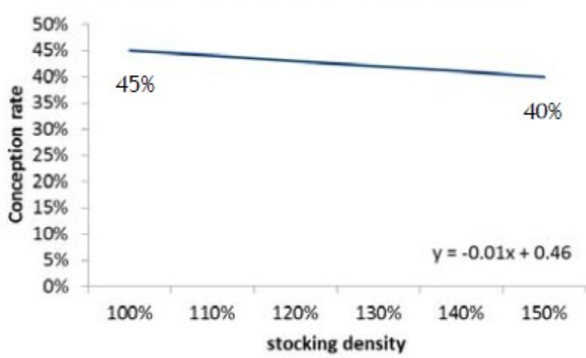
Literature: 0.55 1.10 1.65 2.20 2.75 kg

Marginal economics

- Marginal profit = profit from the additional cow - decrease in profit from all other cows already in the pen
- Add cows to pen until marginal profit/stall = $0



Conception rate decreases



Per 1%-unit greater stocking density, a loss of 0.1%-unit conception rate

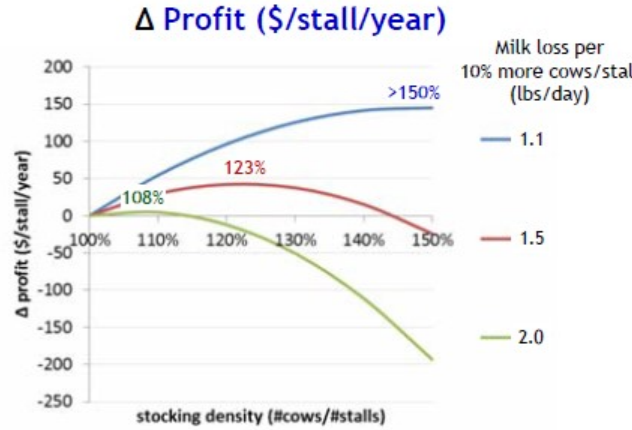
Schefers et al., 2010

Approach

- Stall stocking density = cows / stall
- Includes effects of stocking density on:
  - Milk production
  - Fertility
- Calculate changes in herd measures
  - Herd budget model
  - Vary stocking density 100% → 150%
  - Measure profit/stall/year

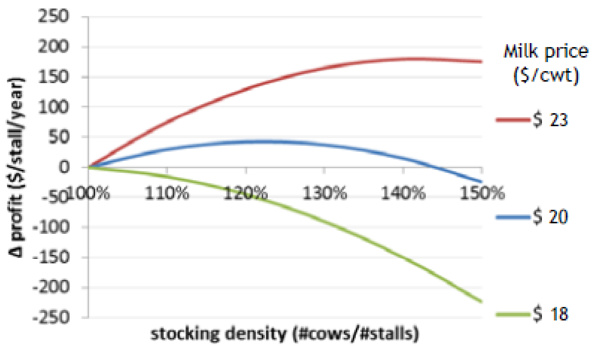
Effect of milk loss

Δ Profit ($/stall/year)



Effect of milk price

Δ Profit ($/stall/year)



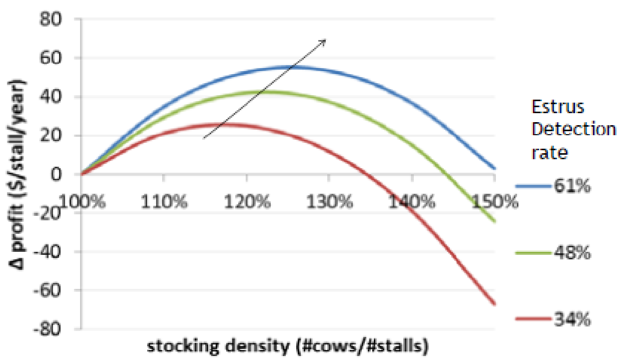
Milk loss 1.5 lbs/day per 10% overstocking

... In this case, the farmer's decision to overstock by over 30% resulted in very large milk checks due to milk prices even though his milk per cow remained level. I've learned that overstocking is not necessarily a bad thing when it comes to profitability.

Email exchange with dairy consultant
April 2015

Reproduction has smaller effect

Δ Profit ($/stall/year)

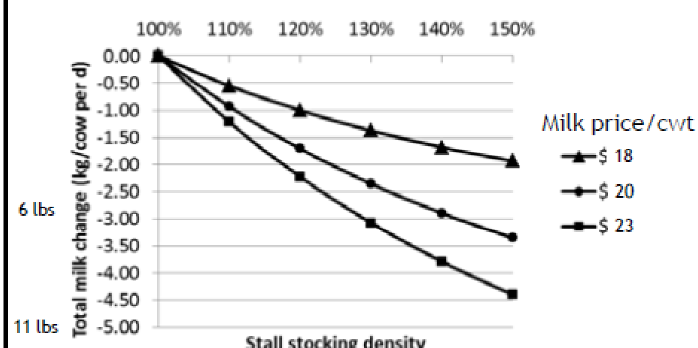


Welfare Assessment

- Lying time (Hill et al., 2009)
  - Hours / day
- Stall use index (Overton et al., 2003)
  - # cows lying / # cows not eating
- Feeding activity (Huzzey et al., 2006)
  - % Cows eating simultaneously

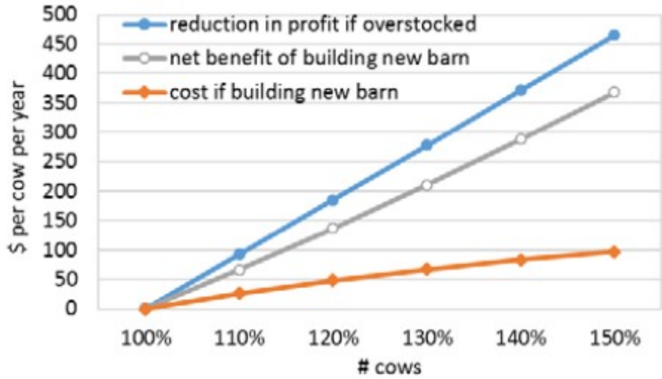
Overstocking reduces welfare of cows

How much ↓ milk yield for =profit?

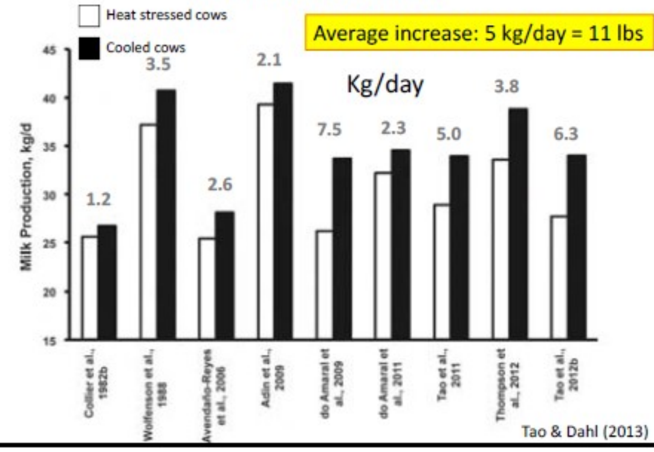


Overstock or build new?

Assumption: Build new: $291/overstocked cow /year

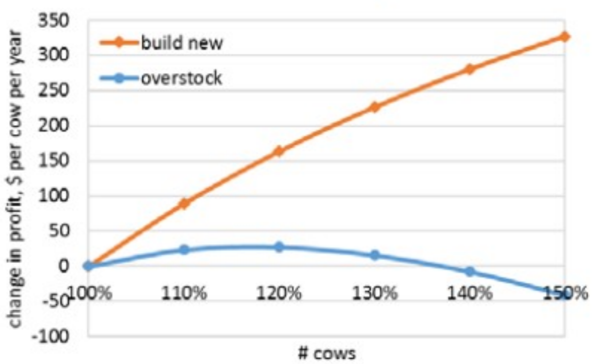


Cooling during the dry period increases milk yield in the next lactation

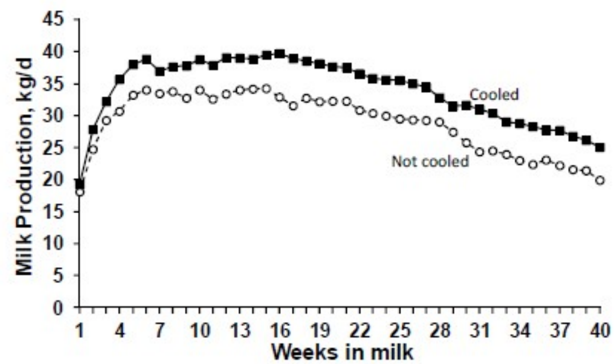


Tao & Dahl (2013)

Build new more profitable than overstocking



Decrease in milk production is consistent throughout the next lactation



Tao et al. (2011)

J. Dairy Sci. 99:9931–9941
http://dx.doi.org/10.3168/jds.2016-11566

Economic feasibility of cooling dry cows across the United States

F. C. Ferreira,*† R. S. Gennari,* G. E. Dahl,* and A. De Vries*[1]
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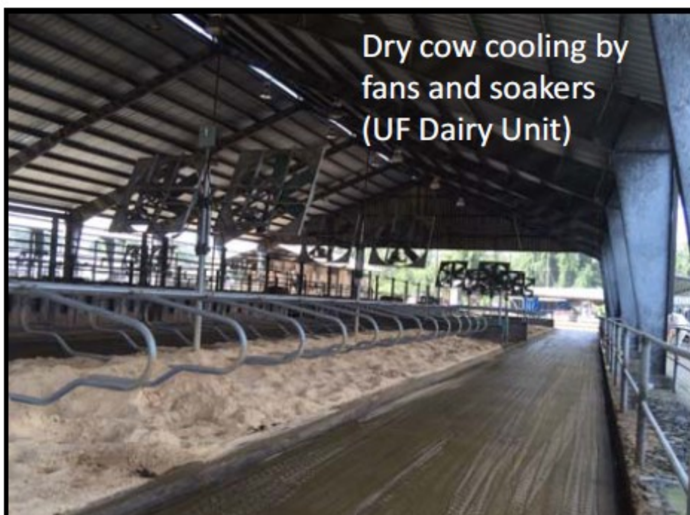
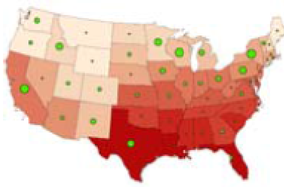
Albert De Vries

J. Dairy Sci. 99:9931 (2016)



Quantify the potential economic losses due to heat stress in dry cows across the USA: methods

- # dairy cows in each state, 15% dry
- Heat stress day: THI > 68
- Loss 11 lbs/day, entire subsequent lactation (if heat stress day)
- Only parities ≥ 2 affected
- Milk revenue minus feed cost: $0.15/lb of milk (not made)

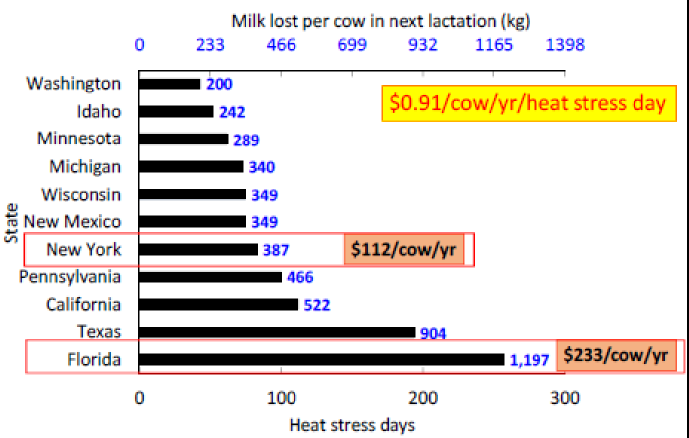


Dry cow cooling
NAHMS, Dairy 2014

	Percent Operations*			
	Region			
	West		East	
Cow cooling method	Percent	Std. error	Percent	Std. error
Dry cows				
Covered structure/building (e.g., barn, shed)	57.3	(3.1)	73.9	(1.7)
Shade (other than covered structure/building)	57.9	(3.2)	51.2	(1.9)
Sprinklers or misters	43.5	(2.4)	7.5	(0.9)
Fans	33.8	(2.5)	51.2	(1.9)
Tunnel ventilation	3.8	(0.9)	11.6	(1.3)
Other	1.7	(1.0)	1.2	(0.4)
Any	82.1	(2.8)	96.0	(0.8)

*Excludes very small operations (<30 cows).

Milk and economic losses in the next lactation
10 states with the most dairy cows + Florida



Evaluate the economic feasibility of cooling dry cows: methods

- 15% of cows are dry at any time
- 60 day dry period
- Heat stress day: THI > 68
- Loss 11 lbs/day, entire subsequent lactation (if heat stress day)
- Only parities ≥ 2 affected
- Milk revenue minus feed cost: $0.15/lb of milk (not made)
- Fixed and variable cooling system cost
- Soakers + coolers (+ new barn)

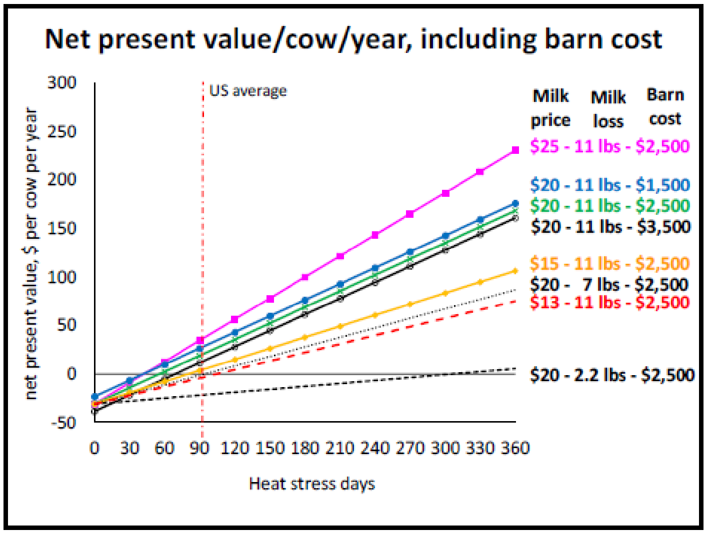
Potential economic losses in the USA weighted by the number of cows per state

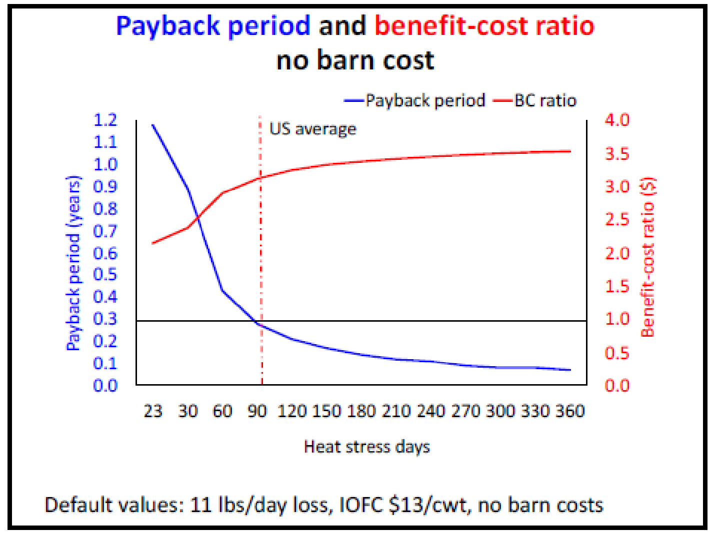
Number of heat stress days per year: **96**
Milk lost in next lactation: **447 kg = 983 lbs**
Economic losses per cow per year: **$87**

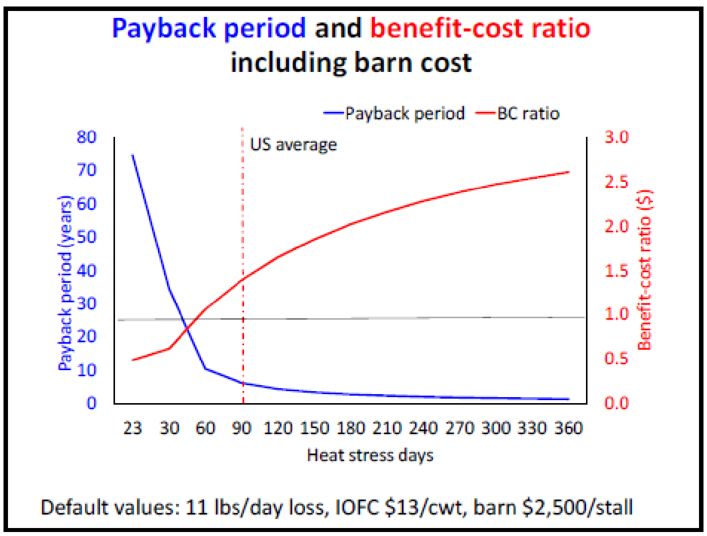
USA:
$810 million/year if dry cows under heat stress

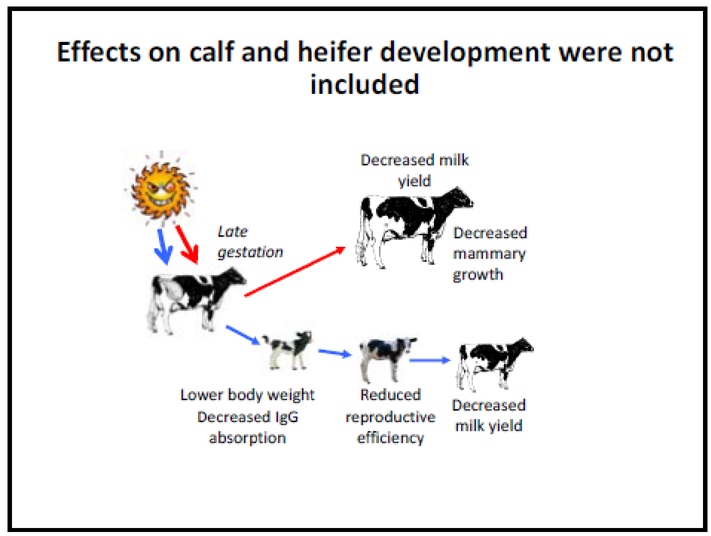
Cooling system costs

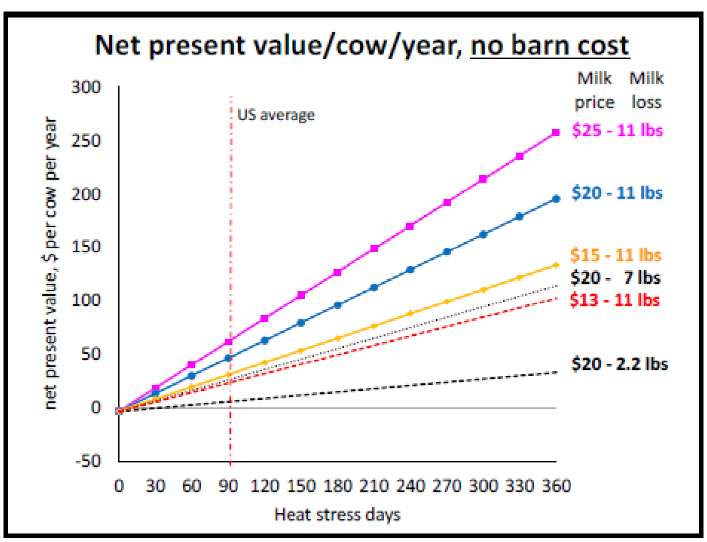
Fixed		Variable (per heat stress day)	
Fans (per unit)	$700	Electricity	$1.62
Maintenance (per fans)	$15	Water (per liter)	$0.0004
Soakers (per stall)	$8.19		
Energy demand charge	$37		
Barn (per stall)	$2,500		
Sand cost (per dry cow stall)	$90		











Take home messages

- Quantitative measures of overstocking on factors that directly affect cow cash flow (milk yield, fertility, culling) are **scarce**
- Some overstocking is **profitable** under plausible economic conditions (say 120% stocking density)
- Stocking density should be **reduced** when milk sales - feed cost per cow decreases
- **Build new** may be more profitable than overstocking
- Large economic losses if **dry cows** are under heat stress
- **Cooling** dry cows is profitable when a new barn needs to be built for 89% of the cows in US
- Cooling dry cows is **very profitable** when building a dry cow barn is not needed (except Alaska)

Thank you

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Notes:

Speaker and Panelist Biographies

Dr. Albert De Vries
Associate Professor
Department of Animal Sciences
University of Florida
devries@ufl.edu

Albert De Vries is currently an associate professor in the Department of Animal Sciences at the University of Florida. He grew up on a dairy and swine farm in Renswoude in the Netherlands. He went to Wageningen University where he received a B.S. and M.S. in Animal Science with a minor in Agricultural Economics in 1991. In 1995, he came to the US to pursue a Ph.D. in Animal Sciences at the University of Minnesota with a focus on dairy science, applied economics, operations research, and statistics. After graduation in 2001, Albert accepted a faculty position at the University of Florida. He currently teaches two undergraduate dairy courses and advises undergraduate dairy students and graduate students. His research interests are in optimization of culling and replacement strategies, statistical process control, economics of reproduction and genetics, and precision dairy farming. In his extension role, he works with the allied dairy industry and dairy farmers on farm financial management and to apply the results of dairy systems management research. Albert is married to Kim who is a small animal veterinarian. Together they have twin daughters Grace and Karen and four cats. They live in Newberry, Florida.

Dan McFarland, M.S.
Agricultural Engineering Educator
Penn State Extension
dfm6@psu.edu

Dan is currently the Agricultural Engineering Educator for Penn State Extension with program responsibilities in Southeast Pennsylvania. He received his A.A.S. from S.U.N.Y. Cobleskill in Agriculture Engineering in 1978. He then received his B.S. and M.S. in Agricultural Engineering from Iowa State University in 1988 and 1989 respectively. In 1989 Dan joined Penn State Extension, and his current program emphasis involves animal shelter and environmental systems design. Dan works closely with producers and agricultural professionals on issues related to new animal shelter design and existing facility improvement. His educational efforts include farmstead design and layout, ventilation system design and management, animal comfort and well-being, stall design, feeding area design, animal cooling, and watering systems. In addition to regular duties, Dan has written articles for national dairy publications, prepared papers for ASABE conferences, and been an invited speaker at industry sponsored seminars on topics related to cow comfort and animal shelter design.

Dr. Robert Lynch, D.V.M.
Dairy Herd Health and Management Specialist
Cornell University PRO-DAIRY
rlynch@cornell.edu

Dr. Lynch is part of Cornell University's PRO-DAIRY Program. Dr. Lynch grew up in Elmira, New York. He completed his undergraduate work at Rochester Institute of Technology and received his D.V.M. from Tufts University, School of Veterinary Medicine in 1997. Dr. Lynch worked in private practice for 8 years in Southeast Pennsylvania where his responsibilities included all large animal species with an emphasis on dairy cattle. Dr. Lynch also was a partner in his practice for 4 years. In 2007, Dr. Lynch completed the Dairy Production Medicine Certificate course at Penn State University. He joined Pfizer's Cattle Veterinary Operations team in 2005, which later became Zoetis, and provided dairy technical support for the Northeastern US. As part of the Dairy Herd Health and Management Program at Cornell, Dr. Lynch works to enhance dairy management strategies to improve herd health, productivity, and farm profitability. He supports New York State dairy producers by leading educational programs, integrating research results, identifying research needs, collaborating on-farm with advisors, and participating in industry wide initiatives.

Emily Yeiser Stepp, M.S.
Director, National FARM Animal Care Program
National Milk Producers Federation
eyeiserstepp@nmpf.org

Emily Yeiser Stepp grew up just outside of Annapolis, Maryland. She began her involvement in the dairy industry through the 4-H dairy leasing program where she was able to "borrow" a calf from a local dairy farm to show at local, county, and state fairs. Yeiser Stepp was involved in Maryland 4-H and the leasing program for over 10 years and then went on to pursue a B.S. degree in Animal Science with a minor in Agribusiness Management from Penn State University. Upon graduation from, Emily worked for ABS Global Inc. as their Young Sire Program Specialist in the Mid-Atlantic region. She then obtained her M.S. in Dairy Science from Virginia Tech in 2011.

Yeiser Stepp served as the Dairy Initiatives Manager for the Center for Dairy Excellence in Harrisburg, Pennsylvania for 4 ½ years and immediately prior to her role with the FARM Animal Care Program, she served as the Dairy and Beef Extension Coordinator at the University of Maryland. Emily and her family maintain a small herd of 30 registered Holsteins and Brown Swiss under the Spots-Pride prefix, that are housed at Palmyra Farm in Maryland. Emily and her husband currently reside in Northern Virginia.

Dr. Gordon Jones, D.V.M.
Central Sands Dairy, WI
gordon.a.jones@att.net

Dr. Gordon (Gordie) Jones currently lives in De Pere, WI. He attended Michigan State University and received his B.S. in Dairy Science and his D.V.M in 1977. He practiced Dairy Performance Medicine in Wisconsin for 22 years, and was a Technical Service Specialist for Monsanto Dairy for 3 years. Dr. Jones currently is an independent dairy performance consultant and a partner of Central Sands Dairy LLC, a 4,000 cow dairy. He also works for Quality Milk Sales as a production consulting specialist and a nutritionist for a consortium of large dairies. Dr. Jones is the designer of Fair Oaks Dairy in Indiana, a dairy farm with more than 20,000 cows. He was also the nutritionist and on the management team for the first 7 years, until starting Central Sands Dairy, where he was the designer and managing partner for 5 years.

Dr. Jones has consulted with dairy producers and veterinarians both across the U.S. and internationally on dairy herd performance, nutrition, cow environments, dairy housing, expansion, dairy management, personal SOPs, and cow comfort. He has placed considerable emphasis on housing design to keep cows clean, dry, and comfortable. He has influenced the development of several cow comfort features in barn construction through work with environmental consultants and contractors. Dr. Jones has also consulted for many different dairies and companies in China - AustAsia Modern Dairies, Fonterra, WWS, Boumatic to name a few. Dr. Jones was awarded the Merial Excellence in Preventive Medicine Award for Dairy by the American Association of Bovine Practitioners in 2001. That is the highest honor for performance in AABP. Gordie and his wife, Mary, have been married 40 years and have 3 children.

Dr. Heather Dann
Research Scientist
William H. Miner Agriculture Research Institute
dann@whminer.com

Dr. Heather Dann is a research scientist at the William H. Miner Agricultural Research Institute in Chazy, NY. She grew up on a dairy farm in New York. She received a B.S. in Animal Science with Honors and Distinction from Cornell University in 1996, and a M.S. focusing on improving energy supply to late gestation and early postpartum dairy cows from the Pennsylvania State University in 1998. She then received her Ph.D. from the University of Illinois in 2004, focusing on dietary energy restriction during late gestation in multiparous cows. For the past 12 years, her research at Miner Institute has focused on dairy cow nutrition and management.

Lisa Ford, M.P.S.
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Cayuga Marketing
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Lisa Ford currently works as a special projects manager for Cayuga Marketing. She provides support to farms in the areas of on-farm safety, animal well-being, and milk quality. She sits on the boards of the Empire State Milk Quality Council and the NY Animal Agriculture Coalition. Lisa is a certified 2nd party evaluator and trainer for the National Dairy FARM program. She studied Sustainable Agriculture at the University of Maine and has a M.P.S. from Cornell University in International Agriculture and Rural Development. For her master's project, she worked with dairy farmers in Honduras. She was previously a territory representative of the Dairy team with Merck Animal Health, and previous to that, a bilingual educator with Cornell Quality Milk Production Services. She brings a special skill set to her job because of her ability to help train and educate Spanish speaking employees. Lisa participated in the Peace Corps and Crisis Corps where she spent several years in Central America.

Corwin Holtz, M.S.
Holtz Nelson Dairy Consulting
holtz296@frontiernet.net

Corwin is president of and an active consultant in Holtz Nelson Dairy Consultants, LLC. - a group of seven independent dairy nutrition and management consultants working with dairy producers in New York, Pennsylvania, and the New England states. Corwin formed this group in early 2004, with the focus on maximizing cow health and productivity hrough the use of client-grown forages and grains, and supplying management consultation over a wide variety of daily management topics that impact farm profitability, land resource use, and environmental stewardship. Corwin grew up in the CA and got his Dairy Science Degree from Cal Poly, San Luis Obispo in 1978. This was followed by two years of work in the A.I. industry and then as a farm manager for a 350 cow dairy in CA.

He then obtained a M.S. in Ruminant Nutrition and Reproduction at Cornell University, and was a faculty member at Cal Poly for 1.5 years and for 5 years in the Dairy Management teaching and extension program at Cornell University. In 1994 he entered the commercial feed business and held a variety of technical support and research positions. From 2000-2002 he was a co-project and farm manager for the building and development of a 1,000 cow commercial/research dairy facility in central New York for DeLaval. In addition to his work activities Corwin is a member of ADSA, PAS, and is a very active board member of the Northeast Agribusiness and Feed Alliance.

Corwin resides in Dryden, NY, with his wife Debby and has the good fortune of having their daughter , son-in-law, and two grandchildren living in the same town.

Daryl Martin
Glenview Dairy
glenviewdairy@icloud.com

Daryl grew up on a 30 cow tiestall dairy. At the age of 12, his family built a 150 cow freestall barn and parlor. Later, when he got married, he rented a dairy farm and had 380 head. They were about 1.5 years into it when they had a respiratory mycoplasma outbreak which left them with only 60 head. He sold the cows and equipment and went to work for Seneca Iron Works known as Seneca Dairy Systems today. For 10 years Daryl run their sales and dairy design team, doing everything from remodel to green field designs.

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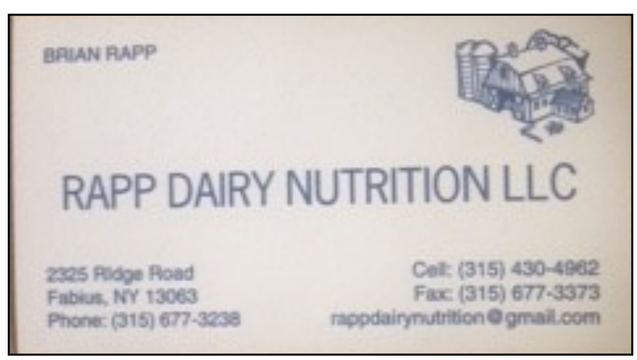
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