Management Opportunities for Improving Profitability of SE Dairies:
Where are the Real Dollars?

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Management opportunities for improving profitability of SE dairies: Where are the real dollars?
Bruno do Amaral, Ph.D.,
Dairy Nutritionist Consultant
Calf and Heifer Specialist
Purina Animal Nutrition LLC

Agenda
• Background
• Opportunities for SE
  – TEAMWORK
  – Management – heat abatement
  – Nutrition - Feeding
  – Grouping / Rations
  – Calf and Heifer program

Background

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Teamwork

Owner, nutritionist, veterinarian, herd manager, feeder, pusher, milker...everyone at the farm is equally important to the success and profitability of the business

TEAMWORK

coming together is a beginning
keeping together is progress
working together is success

- Henry Ford

Teamwork

• Job description – training - expectations
• Accountability
• Set goals – know your KPIs
• Team meetings
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Heat Stress Abatement

Heat Stress Dry Cows

• Florida studies
  – Experiment 1
  – Experiment 2
  – Experiment 3
Milking Cows

- After calving
  - All cows were housed in a free stall barn with cooling (fans and misters)

Calf Body Weight (lbs)

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Heat Stress</th>
<th>Cooling</th>
<th>Difference (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>68.3</td>
<td>97.0</td>
<td>28.7</td>
</tr>
<tr>
<td>2</td>
<td>87.0</td>
<td>98.0</td>
<td>11.0</td>
</tr>
<tr>
<td>3</td>
<td>91.7</td>
<td>102.4</td>
<td>10.7</td>
</tr>
</tbody>
</table>

Fans and Sprinklers

On: 71°F Sprinklers
- On for 2 min every 5 min
Heat Stress Decreases Calf Birth Weight

Cooling Cows Prepartum Improves Milk Production in the Subsequent Lactation

Experiment 2 - FCM

Experiment 3 Milk Production
Heat Stress Abatement Increased Mammary Epithelial Cell Proliferation In the Dry Period

Experiment 3 – Mammary Gland Development

Effects of Heat Stress in Utero on Calf Performance
Maternal Heat Stress Decreases Serum Total IgG of Calves

Treatment effect: $P = 0.03$

TRT: $P = 0.03$

Tao et al., 2012a

Maternal Heat Stress Impairs Lymphocyte Proliferation of Offspring

$\text{SEM} $

$\text{Stimulation Index, fold}$

TRT: $P = 0.05$

Tao et al., 2012a

Maternal Heat Stress Decreases Offspring’s Milk Production

Trt: $P = 0.11$

Cooling: 68 lbs
Heat stress: 58 lbs

Effect of Heat Stress on Lactation

Adapted from Collier et al., 2006

Weeks Postpartum

Milk yield (kg)

Purina
Bucket Facing of Defacer

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Nutrition - Feeding

- What are your goals?
  - Milk production
  - Health
  - Reproduction
  - Butterfat
  - Cost
  - Profitability

Goals

Specific
Measurable
Attainable
Relevant
Time-bound
Nutrition - Feeding

What are your goals?
- Milk production
- Health
- Reproduction
- Butterfat

Do you know your KPIs?
Do you use reliable data to make intelligent decisions

Cost or Profitability?
Use reliable data to make decisions and not feelings

Cost or Profitability?

Calibrate®

Measures:
- Starch
  - Content and Digestibility
- Fiber
  - Content and Digestibility

GNR® and PHR® Degradability Index Report

Customer: Full Circle Dairy
Company: Waite, Greg
Location: BAE #34
Sample Type: Corn Silage
Hybrid: None Given

Dairy Specialist: Bruno do Amaral

Data Received: 12/01/13
Data Reported: 12/01/13
Lab Number: 341410
Dry Matter (%): 35.1
Starting NDF (%): 30.9
Ending NDF (%): 36.0
PHI: 144.2
Calibrate Values
Why use Ruminal Digestibility Data?

- Increasing feed efficiency
- Diet cost savings (substituting high cost ingredients with lower cost ingredients)
- Forage management
  - Hybrid and specie selection for higher digestibility
  - Harvest management
  - Storage management
- Increasing dietary energy safety (higher corn silage $$$)
- Milk composition diagnosis
- Ingredient inventory management and availability
  - Tight inventory or availability
- Increasing dry matter intake (DMI) and production
- Increasing dietary forage levels

Calibrate -Okeechobee, FL

6.8 lbs of milk

Calibrate –Mayo, FL

12 lb DM corn silage

27 lb DM corn silage
Feed Efficiency

- Lbs of milk per lbs of DM consumed
- Optimum range of 1.4 to 1.8
- Forage quality, days in milk, age, growth, changes in BCS, body weight, feed additives, and environmental factors will impact feed efficiency.
Groups / Rations

- Fresh heifers
- Fresh cows
- High group
- Middle – low pregnant
- Far off
- Close up
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Calf and Heifer Program

• What are your goals?
  – Cheap, cheap, cheap
  – Cost/day
  – Cost/lb of gain

• Do your 1st lactation animals peak at 85% of what your mature cows are peaking?
• What is the age at first calving?
• What is BW at first calving?

Calf and Heifer Program

• Do you know your numbers?
  – What is the ADG up to weaning?
  – What is mortality?
  – What is morbidity?
  – What is your cost/lb of gain

What do beef calves get?

• Beef calves drink 4 to 8 times per day
• About 20 lb. or 2.4 gallons (~10 quarts) per day
• At 12.5% solids = 2.5 lb of dry matter per day
• 27% protein, 30% fat (dry matter basis)

What does a typical dairy calf get?

• Milk fed twice/day
• ¾ to 1 gallon per day
• Usually delivering 0.75 to 1 lb of dry matter per day
• 20% protein, 20% fat (dry matter basis)
Proceedings 50th Florida Dairy Production Conference, Gainesville, April 9, 2014

What is the Result?

- **Beef: All Calves**
  - 2.1% born dead
  - 1.1% dead within 24 hours
  - 2.3% mortality from 24 hours to weaning
- **Dairy: Heifer Calves**
  - 6.5% stillborn & dead at 48 hours
  - 7.8% mortality from 48 hours to weaning
- **5.5% total loss; birth to weaning**
- **14.3% total loss; birth to weaning**

Dairy Source: USDA 2007 NASS
Beef Data Source: USDA 1997 NASS

Efficiency of feed conversion with traditional calf feeding practices compared to those fed a higher plane of nutrition (Birth to 6 weeks)

- Calf
- Higher Plane Calf
- Lambs
- Piglet

Dry Matter Intake (kg DM)

- (.37)
- (.59)
- (.71)
- (.78)

Adapted from Davis and Drackley, 1998

Milk Yield Response to Increased Pre-weaning Milk or Milk Replacer Nutrient Supply

<table>
<thead>
<tr>
<th>Study</th>
<th>Milk yield, lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foldager and Krohn, 1994</td>
<td>3,092†</td>
</tr>
<tr>
<td>Bar-Peled et al., 1998</td>
<td>998†</td>
</tr>
<tr>
<td>Foldager et al., 1997</td>
<td>1,143†</td>
</tr>
<tr>
<td>Ballard et al., 2005 (@ 200 DIM)</td>
<td>1,543†</td>
</tr>
<tr>
<td>Shamay et al., 2005 (post-weaning protein)</td>
<td>2,162‡</td>
</tr>
<tr>
<td>Rincker et al., 2006 (proj. 305@ 150 DIM)</td>
<td>1,100ND</td>
</tr>
<tr>
<td>Drackley et al., 2007</td>
<td>1,841‡</td>
</tr>
<tr>
<td>Raith-Knight et al., 2009</td>
<td>1,583NS</td>
</tr>
<tr>
<td>Morrison et al., 2009 (no diff. calf growth)</td>
<td>0</td>
</tr>
<tr>
<td>Moullem et al., 2010 (post-weaning protein)</td>
<td>1,013†</td>
</tr>
</tbody>
</table>

*Van Aalten 2011  S = Significant P<0.05  t = P<0.10 NS = P>0.10

Feeding 3X Daily

% of Operations Feed Calves 3X

- 2007: 35%
- 2008: 45%
- 2009: 50%
- 2010: 65%
- 2011: 75%

*Coincidence or trend? Trying to do what is best for the calf!*

2007 - DCHA Data 5.4%
2008 - Personal Research 4.5%
2009 - Personal Research 6.5%
2010 - DHM 25% + 36% Cons
2012 - DHM 30% + 30%

Purina

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Adapted from Davis and Drackley, 1998
Pasteurized Milk Balancer
SE Trial

Bruno Amaral, Ph.D.
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Purina Animal Nutrition LLC

Body Weight Gain

Cost / lbof gain

<table>
<thead>
<tr>
<th></th>
<th>49 days</th>
<th>63 days</th>
<th>69 days</th>
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</thead>
<tbody>
<tr>
<td>Balancer</td>
<td>$2.26</td>
<td>$2.06</td>
<td>$1.97</td>
</tr>
<tr>
<td>Control</td>
<td>$2.29</td>
<td>$2.19</td>
<td>$2.05</td>
</tr>
</tbody>
</table>

Treatment and Mortality Costs

<table>
<thead>
<tr>
<th></th>
<th>Treatment$/calf</th>
<th>Mortality $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balancer</td>
<td>$7.81</td>
<td>$6.75</td>
</tr>
<tr>
<td>Control</td>
<td>$11.51</td>
<td>$12.84</td>
</tr>
</tbody>
</table>
Summary

• Calves fed Pasteurized Milk Protein Blend (Balancer):
  - Gained 24 lbs (16.1%) more weight
  - Were 1.3 inches (3.8%) taller
  - Were 2.2 inches (7.3%) longer
  - Had 33 L (17.2%) more body volume
  - $0.25 (17.2%) cheaper / lb of gain
Thank you

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MANAGEMENT OPPORTUNITIES FOR IMPROVING PROFITABILITY OF SE DAIRIES: WHERE ARE THE REAL DOLLARS?

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INTRODUCTION

If somebody told you that you could increase milk production in your herd without changing the ingredients and cost of the ration, would you believe it? If your answer is NO, I hope you will change your mind after this discussion. If your answer is YES, I hope you can finish up writing this chapter… (just kidding). My objective on writing this paper is to bring up areas of opportunities for improving the profitability of your farm (teamwork, management, nutrition, feeding, grouping, rations, and calf and heifer program).

I always heard that “behind every great/successful man there stands a woman”. Indeed, this is very well true. In my career, I have seen that behind every successful dairy farm, stand a great team of people. They are the ones pulling together for the success of the dairy. Focus on teamwork on your operation will pay off big time. There is no “I” on the TEAM and everyone at the farm is equally important to the success and profitability of the business. Build a good team and you will have a successful and profitable story to tell.

Among the opportunities for the dairies to improve profitability, management practices such as cooling cows is a high priority in the SE. Heat stress during lactation accounts for 10 to 25% of milk production loss on average (Collier et al., 2006). In states that are not as prepared for cooling cows as the SE, when heat waves come there is anywhere from 4 to 30 lb-drop in milk production.

On the other hand, how can we quantify the effects of heat stress on dry cows? Is there really an effect of heat stress on dry cows? During the dry period, the cells in the udder are recovering from the previous lactation and preparing for the next. This is the time to replace the old milk secretory cells and make them grow for supporting milk production for the next lactation. Heat stress during this important time of cell turnover can dramatically impact transition into the subsequent lactation.

I will describe the series of experiments done at the University of Florida evaluating the effects of heat stress on dry cows.

EXPERIMENT 1

Researchers at the University of Florida (do Amaral et al., 2009) evaluated the effects of heat stress on dry cows. Cows were dried off 45 days before the due date and assigned to two
treatments: heat stress (HT) and cooling (CL). Cows were kept in a free stall barn (Figure 1). Cows under cooling had fans and sprinklers whereas the heat-stressed group did not. Both treatments received the same dry cow ration from dry off until they calved. After calving, the animals were moved to a sand-bedded free stall with fans (J&D Manufacturing, Eau Claire, WI) and sprinklers (Rainbird Manufacturing, Glendale, CA) that turned on automatically whenever the ambient temperature exceeded 70°F. Cows were heat stressed only during the dry period. Milking cow ration was similar for both groups.

**Figure 1-** Free stall barn divided into four quadrants for the heat stress and cooling treatments.

![Free stall barn divided into four quadrants for the heat stress and cooling treatments.](image1)

**Figure 2-** Free stall barn bedded with sand and equipped with fans and sprinklers for the milking cows.

![Free stall barn bedded with sand and equipped with fans and sprinklers for the milking cows.](image2)
**RESULTS EXPERIMENT 1**

Cows exposed to heat stress tended to have a dry period 7 d shorter than those that were cooled (38 vs. 45 d, respectively). Calf BW was 28.7 lb lighter for calves born from cows under heat stress compared with those born from cooled cows (68.3 vs. 97 lb, respectively). Rectal temperature for heat-stressed cows was higher than cooled cows (102.5 vs. 101.3°F, respectively).

Milk production up to 30 weeks of lactation was higher for cows cooled during the dry period compared to those heat-stressed (Figure 3). The average increase in 3.5% FCM in cooled cows was 18.7 lb of milk/cow/day (Table 1) compared to cows exposed to heat stress. **Remember that in this experiment the cows were heat-stressed only during the dry period.** The magnitude of response in milk production is related to heat stress load and intensity.

**Figure 3. Effects of cooling or heat stress during the dry period on the production of milk in the subsequent lactation (Adapted from do Amaral et al., 2009).**

![Graph showing milk production over weeks of lactation for Heat Stress and Cooling groups.](image)

**Table 1- Milk yield, 3.5% FCM yield, 3.5% FPCM yield, ECM yield, and milk components of cows exposed to heat stress or cooling during the dry period.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Heat Stress</th>
<th>Cooling</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield, lb/day</td>
<td>57.7</td>
<td>74.3</td>
<td>0.04</td>
</tr>
<tr>
<td>3.5% FCM,1 lb/day</td>
<td>57.5</td>
<td>78.0</td>
<td>0.01</td>
</tr>
<tr>
<td>3.5% FPCM,2 lb/day</td>
<td>57.3</td>
<td>76.0</td>
<td>0.02</td>
</tr>
<tr>
<td>ECM,3 lb/day</td>
<td>58.0</td>
<td>76.9</td>
<td>0.02</td>
</tr>
<tr>
<td>Fat, %</td>
<td>3.5</td>
<td>3.9</td>
<td>0.07</td>
</tr>
<tr>
<td>Protein, %</td>
<td>3.2</td>
<td>3.0</td>
<td>0.62</td>
</tr>
<tr>
<td>Fat yield, lb/day</td>
<td>1.98</td>
<td>2.87</td>
<td>0.01</td>
</tr>
<tr>
<td>Protein yield, lb/day</td>
<td>1.76</td>
<td>2.204</td>
<td>0.09</td>
</tr>
</tbody>
</table>

1. 3.5% FCM = (0.4324 × milk yield) + (16.216 × milk fat yield).
2. 3.5% fat- and protein-corrected milk (FPCM) = (12.82 × kg of fat) + (7.13 × kg of protein) + (0.323 × kg of milk).
3. ECM = (0.327 × kg of milk) + (12.95 × kg of fat) + (7.20 × kg of protein) (Tyrrell and Reid, 1965).
This experiment confirms that exposure of cows to cooling during the dry period increases milk production relative to animals exposed to heat stress, as observed in other studies as well (Wolfenson et al., 1988; Avendaño-Reyes et al., 2006; Urdaz et al., 2006). Milk fat concentration and yield were greater for cooled cows compared with heat-stressed cows. Similarly, Avendaño-Reyes et al. (2006) reported an increase in milk fat yield in the subsequent lactation with cows that were cooled prepartum compared with cows under heat stress. However, it must be emphasized that there were differences in the duration and intensity of cooling among previous studies and the current experiment. For example, Collier et al. (1982) provided only shade as the heat stress abatement treatment, whereas in this study heat-stressed cows were shaded. Urdaz et al. (2006) only cooled cows during the final 3 wk of the dry period, whereas this study cooled cows for the entire dry period. These experimental differences might explain the apparently large milk yield response in the current study relative to earlier reports. Collier et al. (1982) attributed the effects of heat stress during late gestation to reduced placental and maternal hormone production, which in turn reduced mammary gland growth and postpartum function. These results do not exclude the possibility that a reduction in placental function might also contribute to the lesser milk yield of heat-stressed cows. Indeed, given the aforementioned spectrum of responses to dry period heat stress abatement on subsequent yield, it is likely that multiple factors are responsible for the loss of production.

**EXPERIMENT 2**

This second experiment (do Amaral et al., 2011) had a similar design as experiment 1 (do Amaral et al., 2009) and evaluated the effect of heat stress on immune function in addition to milk production and components.

Rectal temperature was increased in heat-stressed cows compared to those cooled (102.4 vs. 101.8° F, respectively). In addition, heat-stressed cows had greater respiration rates (78 vs. 56 breaths/min, respectively), shorter dry period (39 vs. 46 d, respectively), and lighter calves (87 vs. 98 lb, respectively). The average increase in 3.5% FCM in the subsequent lactation was 10.3 lb/cow/d in cows cooled during the dry period compared to the heat stressed cows (Table 2 and Figure 1).

<table>
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<tr>
<th>Variable</th>
<th>Heat Stress</th>
<th>Cooling</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield, lb/day</td>
<td>71.0</td>
<td>76.0</td>
<td>0.09</td>
</tr>
<tr>
<td>3.5% FCM, lb/day</td>
<td>67.9</td>
<td>78.2</td>
<td>0.07</td>
</tr>
<tr>
<td>3.5% FPCM, lb/day</td>
<td>67.0</td>
<td>75.8</td>
<td>0.11</td>
</tr>
<tr>
<td>ECM, lb/day</td>
<td>67.7</td>
<td>76.5</td>
<td>0.11</td>
</tr>
<tr>
<td>Fat, %</td>
<td>3.3</td>
<td>3.8</td>
<td>0.01</td>
</tr>
<tr>
<td>Protein, %</td>
<td>2.9</td>
<td>2.8</td>
<td>0.41</td>
</tr>
<tr>
<td>Fat yield, lb/day</td>
<td>2.20</td>
<td>2.87</td>
<td>0.02</td>
</tr>
<tr>
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<td>1.98</td>
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EXPERIMENT 3

The third year experiment was similar to the previous two in design and evaluated the effect of heat stress on mammary gland cell proliferation in addition to milk production and components. The authors reported that cows exposed to heat stress during the dry period produced on average 11 lb less milk than those cooled (Figure 2).

In order to understand the reason for the low milk production in heat-stressed cows, this study also evaluated how the mammary gland cells of cooled or heat-stressed cows proliferate. Heat stress decreased mammary epithelial cell proliferation which may be a contributing factor for the low milk yield.
In addition to cooling, cows need to be comfortable to produce milk. Bedding is a key factor on cow comfortable and needs to be a priority. It is important that we maximize the amount of hours that cows lie down. The frequency of bedding stalls, the depth of the stalls and the stocking density of your barn will impact milk production.

Water quality and availability is also important for dairy cows. We need to provide clean quality water during all times. During heat stress water intake will increase. The attention to details will make a difference.

The use of technology nowadays helps the dairyman to be more efficient and more profitable. Understanding ruminal digestibility of starch and fiber helps the nutritionists tremendously on formulating rations that will maximize forage intake and improve profitability at the farm. Calibrate® technology measures ruminal digestibility of starch and fiber on a proprietary GPN and RUNDF scale that in combination with the Calibrate® nutritional calculator, deliver the precise information for the nutritionist to improve feed efficiency, milk production and components, and profitability.

In addition to provide current information on your forage and ingredients, it allows you to create a data base to improve your forage program (hybrid and specie selection for higher digestibility, harvest management, storage management, etc).

On several herds across the country, the average ROI on Calibrate® is greater than 6:1. Another area of opportunity for the SE dairies is the calf and heifer program. When it comes to calf nutrition, do you know your numbers?

Calf raising practices across the country can be very different and each farm has its own way of raising their calves. However, the end goal on most calf operations is universal: to raise calves economically in order to achieve optimal performance once they freshen. “While very simple in theory, this goal may not be attainable if producers and calf managers don’t have a system in place to measure the effectiveness of their calf nutrition program”. Key performance indicators or KPIs are often used to evaluate the performance of the lactating herd. KPIs can also be useful tools to assist in evaluating calf performance and how calf nutrition programs...
contribute to lifetime profitability of the operation. Use KPIs to make more informed management decisions.

In order to exemplify the importance of utilizing KPIs, I will share with you an actual herd that I worked with recently. This operation was evaluating the cost-effectiveness of implementing a higher plane of nutrition in its calf feeding program versus continuing with its existing feeding program.

Two feeding programs evaluated:
1- Current feeding program: Pasteurized waste milk and an 18 percent calf starter.
2- Higher plane of nutrition feeding program: Pasteurized waste milk with a Pasteurized Milk Balancer® supplement along with a 20 percent calf starter. (A Pasteurized Milk Balancer® (Purina Animal Nutrition LLC) is a supplement product developed to be added to pasteurized milk to increase the total solids fed and also to balance fat and protein in the final solution.)

IN order to determine which program would add more to the dairy’s bottom line, we evaluated both programs at the farm level, using 20 animals per treatment.

Both groups received the following liquid nutrition:
- At birth: 4 quarts of colostrum
- Maternity barn: 2 quarts 8-12 hours after birth
Pasteurized waste milk was then fed at the following rates:
- Day 1-14: 2 quarts twice per day
- Day 15-28: 3 quarts twice per day
- Day 29-42: 4 quarts twice per day
- Day 43-49: 8 quarts once per day

The total solids concentration in the pasteurized milk averaged 12.5 percent total solids. For the group fed a higher plane of nutrition, 0.5 pounds of Pasteurized Milk Balancer® supplement was added per gallon of pasteurized milk. The solution of pasteurized milk plus Pasteurized Milk Balancer® supplement averaged 16.5 percent total solids.

During the field demonstration, starter intake was also measured on all calves from birth to weaning (49 days). Throughout the field demonstration, calves on the higher plane of nutrition doubled their birth weight in 49 days whereas those on the pasteurized milk only did not. The average daily gain for calves that were fed a higher plane of nutrition was 1.77 pounds per day compared to 1.29 pounds per day for calves fed pasteurized milk only. The cost per pound of gain up to weaning on the group fed a higher plane of nutrition was $2.26 per pound of gain compared to $2.29 per pound of gain for calves fed pasteurized milk only.

At first glance, it looked as if there was an advantage to feeding calves a higher plane of nutrition of only $0.03 per pound of gain. However, there are other contributing factors that affect profitability besides weight gains. Thus, we decided to take it a step further by evaluating treatment and mortality costs.

For the higher plane of nutrition group, treatment and mortality costs averaged $7.81 per calf and the pasteurized milk only group had average treatment costs of $11.51 per calf. There was a lot of money spent on treatments in the group fed a lower level of nutrition.

If calves do not ingest enough nutrients to support growth and immune function, their defense mechanism can become compromised and treatment and mortality cost could be increased.
Use KPIs to make intelligent decisions. By knowing all the KPIs (including treatment and mortality cost), this producer was able to evaluate the cost per pound of gain adjusted for treatment and mortality cost which was $2.43 per pound of gain on the higher plane of nutrition group compared to $2.68 on the pasteurized milk group. From this, it was concluded that calves fed a higher level of nutrition increased farm profitability $0.25 per pound of gain.

From this exercise, we found that measuring calf performance and tracking KPIs of interest can help dairy producers make more informed decisions to maximize lifetime profitability. To put it simply, by measuring all of your costs, you are able to make wiser economic decisions for your calf feeding program.

**TAKE HOME MESSAGES**

- Built a team of people on your operation. This is the key for your success.
- Heat stress abatement strategies for your dry and milking cows pay off big time.
- Focus on cow comfort (bedding, water quality, cooling).
- Identify your goals and focus on them.
- Take advantage of available technology and information to improve your profitability. There is no need to reinvent the wheel.
- Understand your KPIs, feed a higher plan of nutrition to your calves, be more profitable.
- Travel to different places, conferences, operations. Fresh air and new ideas will help you be more profitable.

**REFERENCES**


