

# Evaluating Overall Health and Physical Movement of Dairy Heifers in Confinement vs. Management Intensive Grazing

## Final Report for ONE11-134

Project Type: Partnership

Funds awarded in 2011: \$11,650.00

Projected End Date: 12/31/2011

Region: Northeast

State: New York

Project Leader:

[A.Fay Benson](#)

Cornell Co-op Extension

## Project Information

### Summary:

This project was designed to add information to previous studies done by Fay Benson which were established to help Northeast dairy farmers managing their animals in confinement systems understand how grazing their dairy herd replacements for a portion of the year could have many benefits. Benson has customized grazed yearling heifers for the Hardie Farm of Lansing NY for the past 4 years. The animals which were on his system during the grazing season in 2009 and 2010 were used for this study. The study had two components: Overall Health and Physical Movement of grazing dairy heifers. For Overall Health we found that there was evidence of increased longevity of the pasture animals in the milking herd (only 3% cull rate vs. 7% cull rate), yet no statistical difference was found. When doing an analysis of variance we found that since there was wide variation within the groups, the required animal pool to determine a significant difference was in the thousands and our numbers were just over 100.

The physical movement portion of the study did measure the steps differences between heifers in confinement vs. those on pasture. Three of the interesting findings were:

1. Animals on pasture walked 3 times as much per day as those in confinement, 6000 steps vs. 2000 respectively.
2. Animals, on return to confinement housing dropped from the 6000 steps/day to less than 2000 steps in their first day back in the barn.
3. When average daily temperature is overlaid on the steps per day, there is an inverse correlation. This information has led to the plans for "Shade Paddocks" for my system in 2013.

These measurements were captured by the Ice Tag 300 wireless pedometers.

## Introduction:

**Overall Health:** In a previous SARE report (ONE10-113) one of the topics was the economics of grazing heifers vs. keeping them in confinement. The results showed there was a cost advantage for the grazing them, even for 5 months of their lives. Since there was a cost advantage to grazing at the heifer stage we wanted to see whether there were any differences in the economics which showed up for the animals after they entered the milking herd. In this study we identified the 59 animals on pasture in 2009 and the 61 animals on pasture in 2010. Two groups representing the confinement groups were identified. These animals were + or - 1 month of age of the pasture groups. We then compared a number of health indicators such as: production, using the Mature Equivalent (ME305), percentage culled and for what reasons, breeding performance and metabolic problems.

**Physical Movement:** In SARE project ONE05—033 , we identified the health benefits to bred dairy heifers which were grazed compared to their herd mates which were kept in confinement. Using information from another study which achieved similar results (Comparison of Economic and Animal Performance of Dairy Heifers in Feedlot and Pasture-Based Systems) we theorized that the health benefit came from increasing the physical movement of heifers on pasture. In this study we wanted to measure if and how much difference there was between groups of animals in pasture vs. confinement systems. Using the Ice Tag 300 Pedometers which are attached to the ankle of the animals, we tracked: standing time, activity level, and number of steps of animals while still in confinement before they moved to the pasture in May of 2011. We then used the pedometers to measure the animals after they went back from pasture to the confinement in Nov of 2011.

## Project Objectives:

The inspiration for this work on heifer grazing came during a pasture walk on a farm in Schuyler Co, NY in the summer of 2003. The group was viewing a grazing system belonging to a retired military man. He contract grazed replacements for a neighboring dairy. Some of the participants had similar operations and all participants agreed that grazing dairy replacements produced a healthier and stronger animal than comparable animals raised in confinement. The conversation was that there was significant opportunity to graze more replacements, especially with the dairies of more than 500 milking animals. The graziers felt that the barrier was that they only had circumstantial evidence when proposing the health advantages of grazing to dairyman who were raising their replacements in confinement.

The opportunities for both dairy farmers and custom graziers is large. According to the New York State Agricultural Statistics there are 500,000 heifers raised in New York each year to be replacements for the state's 630,000 dairy herd.

Approximately half of the heifers are on farms with 500 or more milking animals. The vast majority of these heifers are raised in confinement housing, fed stored feeds, and their manure is included into the farm's CAFO plan. As a custom heifer grazer for a 1200 cow dairy, what gives me the most satisfaction has nothing to do with production, growth, or lower cost. It is the fact that the animals that come to my pasture in the spring have never been outside before. When they go back in the fall they will never get to be outside again, but for that summer they are animals in as close to their natural state as possible. Which includes the opportunity for running on a surface which allows them sure footing which promotes muscle growth and joint structure. The sun light they are exposed to, the air they breathe which is cleaner than the air of a confinement barn, and the diet of fresh grass which what

their rumen system was designed for. All these items lead to an animal with greater well being which can't be measured but I do observe it.

Each of the 3 SARE projects were designed to either remove a barrier for a farmer who raised their animals in confinement, or illustrate an opportunity for them to try the practice themselves or contract with an experienced grazer. This project's Performance Targets were as follows:

#### Overall Health

In our project design we were to compare milking animals which were separated into two groups both owned by the Hardie Farm Dairy. The first group spent one grazing season as a yearling heifer in the MIG System on the Benson Farm. The other group was of similar aged animals which stayed in confinement at the host farm. We stated that we would use animals which spent a grazing season in years 2009, 2010 or 2011. We would identify a comparable herd mate which stayed in confinement during those periods.

In reviewing the Dairycomp 305 records it was determined that the animals which spent the summer of 2011 would not have completed a 305 day milking lactation at the time of the comparison. Without this they could not have an actual 305 day performance only a projected ME305. A 305 day production record is an accepted standard in milking animals since the goal of a dairy herdsman is for the cow to spend 60 days "Dry" each year before she gives birth. This leaves 305 days of milking per year. For this reason only the animals which spent 2009 and 2010 season at the Benson Farm and an appropriate herd mate were used in the comparison. In our original plan we were to have 150 pairs to compare. We ended up with 119 pairs in our comparison for health, production, and longevity performance.

#### Physical Movement

We had two Performance Targets under Physical Movement: The first was to measure if there was any difference between the activity levels of animals as they moved from the confinement housing to pasture and then back again. The second was to see if we could detect changes in physical activity of animals on pasture relative to the length of time they stayed in a paddock.

The reason for the first target was to work towards an understanding of what caused the improved health indicators seen in ONE05-033. In that study 50% of the confinement animals were treated for low grade fever after calving. Of the pasture animals only 15% were treated. Using information taken from a University of Minnesota study comparing similar groups of heifers, it was found that the pasture animals were taking in higher amounts of dry matter prior and post calving. Our theory was that the increased physical activity on pasture also increased dry matter intake. The first step to test this theory was to measure whether there was a difference in physical activity.

The reason for the second performance target of measuring if there was a predictable activity change in animals the longer they stayed in a paddock came from observations of the investigator that animals moved less when they came into a paddock since there was ample fresh forage for them. The longer they were in the paddock it seemed they walked more between bites. The goal was to see if this increased activity could be measured with the pedometers.

Working with the Ice Tag 300 Pedometers had both challenges and rewards. On the challenges side, the straps provided with them did not fit a heifer's ankle. The straps were replaced by dog collar which still led to the loss of 5 of the 10 units in the confinement barn at the Hardie Farm. We were able to reuse some of the units to complete the trial but there were not as many data points for some of the

comparisons. The reward of using the Ice Tag 300's was that the data we did receive was very useful. The units measured activity or vibration of the animals which would vary even while the animals were lying down. This allowed differentiating between resting and sleeping. In addition the units registered standing or laying and also the number of steps taken. This information was recorded for every minute for up to 3 month periods. This level of measurement gave an excellent opportunity to study the physical movements of animals over a long period of time.

## Cooperators

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## Research

### Materials and methods:

As stated earlier the main goal of the work on heifer grazing is to increase the number of heifers grazing in the Northeast. The projects were intended to address barriers and to illustrate opportunities of the practice to dairy farmers. There has been benefit of the three separate studies all being interlinked in their topic since with each study there is outreach in the form of meetings, articles and individual inquiries. The outreach allows the information from the previous studies to be highlighted again. Farmers, as with any adult learner need to consider a topic multiple times before they may apply the information.

Tools used for this project included the Ice Tag 300 pedometer. They had a number of challenges, such as 4 of the 10 units used in the first year's trials were defective. The company exchanged the units for another unit, the Ice Tag Pro. We had 10 of these units for the 2011 trials. The units came with straps that were too large for the heifers, after crafting new straps, 5 units were lost at the beginning of the study. They were attached to animals that stayed in the confinement housing. It appeared the amount of manure/moisture combined with the close proximity of the animals, likely caused units to be stepped on and slipped from the animal's leg. Even with the losses and the defective units the data collected has provided much insight into the movement of animals on pasture and confinement housing.

The units were able to record 4 functions:

- Motion Index (MI), which is essentially measuring the vibration of the animals. Even an animal lying down could have an MI.
- % Standing Time
- % Lying Time - The combination of these two percentages would equal 100%
- Steps taken by the animals

Measurements were recorded and stored in the ankle mounted units every second.

This created 86,400 data points/day. The units could store up to 3 months of data. The units would need to be removed from the animal for reading. To download the data to the computer would take 10-15 minutes for each pedometer.

## Research results and discussion:

### Overall Health and Longevity

For the first performance target on overall health we did not plan to see as significant of a change in health indicators in this study as was seen in ONE05-033 which was done with bred animals. This study had 121 animal pairs for comparison. Half were grazed starting at 9-10 months of age. After the grazing season of 5 months they returned to the farm for breeding and they remained in the same housing with their herd mates. Our interest was to show farmers that the economic benefit shown in ONE10-113 which showed that a farmer could save approximately \$1.26 per day by grazing their animals, was not offset by negative impacts on their health as the animals entered lactation.

Slides # 1 and 2 shows a comparison health and production indicators for the two groups over two years. There does not appear to be any significant differences. However, it was calculated that for the combined 2009 + 2010 Pasture Animals, 3% were culled as heifers while, or the combined years of Heifers in Confinement, 7% were culled as heifers. Even though this was evidence of increased longevity of the pasture animals in the milking herd, yet no statistical difference were found. When doing an analysis of variance we found that since there was wide variation within the groups, the required animal pool to determine a significant difference was in the thousands.

The lack of difference was expected since the time of grazing was a total of 5 months out of 24 months of the heifers life. It also occurred 9 months before the animals entered the milking herd. For the rest of the time the two groups were treated the same.

### Physical Movement

We found a significant difference in the amount of physical movement between the Pasture Animals and the Confinement Animals. This was recorded with both the Motion Indicator and the Steps function of the pedometers. In Slide #3 you can see that the steps per day were nearly 300% higher for the pasture animals. The graph was created with information from readings of 2 animals on pasture and 2 animals in confinement. The spikes seen in both lines were caused by one of the animals going through estrous. It was typical to see steps go up by nearly double when an animal went through estrous.

The other information that can be seen in Slide #3 is the variability in steps per day in the pasture animals compared to the animals in confinement. In an effort to explain the variability I found the historical weather data for the grazing period. The relationship between average daily temperature and steps taken by the animals on pasture can be seen in Slide #4. There seems to be an inverse affect of temperature on steps taken per day.

Slide #5 shows the comparison between one animal in confinement vs. another on pasture. The graph is for two days, broken into one hour increments. The confinement animal had longer periods of laying time. Both days this occurred from 2AM till 6AM. The most active time for the pasture animal was between 1PM till 6PM.

### Return to Confinement

The physical activity of the animals when they returned to confinement after the summer grazing season was ended, was surprisingly sudden. The graph in Slide #6

shows the average of 2 animals, two weeks before they return to confinement vs. the average of two animals which were in confinement for the whole period. The steps per day of the pasture animals dropped the 300% in one day. The average was at first slightly lower than the confinement animals but then rose to be similar. Again the spikes were caused by estrous cycles of the animal.

- [Spreadsheet for comparison info for Grazing vs Confinement Heifers. 2009&2010](#)
- [Satistical Analysis of 2 years of heifers in confinement and on pasture](#)
- [Comparison of pasture heifers vs. confinement heifers, after they enter the milking herd](#)
- [Slides 3,4&5](#)
- [300% Drop in Steps When animals Return to Confinement](#)

Research conclusions:

The pedometer data which showed the extreme drop in movement during times of high outdoors temperature has led me to plan "Shade Paddocks" which will be used only for a few hours on the hottest of days. The design of these paddocks will allow the improvement of grazing plants. This will allow the animals to continue to graze during a time they traditionally didn't.

Work on the shade paddocks started in April of 2013 with the visit of Brett Chedzoy a Cornell Extension Agent who specializes in Silvo-Pasture. He gave directions on how much clearing needs to happen so that enough light can stimulate the grass growth. We should have at least 3 areas ready for the animals in the summer of 2013.

## **Participation Summary**

## Education & Outreach Activities and Participation Summary

### **PARTICIPATION SUMMARY:**

Education/outreach description:

Meetings and publications related to this project:

- The first results of this project were shown at a poster session of the NE Pasture Consortium Meeting on January 24th - 28th 2012 in Latham, New York.
- The PI was an invited speaker at the Grazing Opportunities Meeting in Owego NY on March 20th. He showed the information from the SARE project and how graziers could use the information to help create a custom heifer grazing operation
- Through the PI's position as a Cornell Extension Agent concerned with Small Farm activities, the results of this study are shared with other farmers, ag educators and campus faculty.
- The PI was an invited speaker and reported on this project at the National Grazinglands Conservation Initiative meeting in Orlando FL. On Dec 9th - 12th, 2012.
- His report is published in the proceedings of that meeting which hasn't been posted at the time of this report.

- The link to that proceedings will be posted on the “Girls of Summer” Facebook Page: <https://www.facebook.com/pages/The-Girls-of-Summer/126506034060573>
- The May 2013 issue of American Agriculturalist featured an article written by Fay Benson about the SARE work on grazing heifers.

The PI has been invited to present the findings from the SARE work at two future meetings: March 16th, Norwich Grazing Conference, and March 20th Renseler County Dairy Grazing Meeting.

- [Poster displayed at the 2012 NE Pasture Consortium Annual Meeting](#)

## Project Outcomes

Project outcomes:

While this study did not include an economic component, the author wrote an article that did a financial analysis of the costs of grazing replacement heifers.

- [Economics of Heifers on Pasture](#)

## Farmer Adoption

One farmer contacted the PI after that meeting and asked for help in setting up a heifer grazing business. He started operation in the summer of 2012. His contact is: Brian Reaser, 570-716-4061.

He used the information generated as a result of this SARE study to convince a dairy farmer to custom graze some of his heifers at Brian's farm.

Assessment of Project Approach and Areas of Further Study:

## Areas needing additional study

Areas of additional study which were identified as a result of this study are:

- What is the relationship between outside temperature and animal activity?
- Is humidity also connected? How can graziers use this information to improve the performance of their grazing systems?
- The study done at the Univ. of Minnesota showed an increase in Dry Matter Intake after the animals returned from pasture. More work is needed to measure the weight and eating habits of animals that return and how long the affect lasts.
- A study of the change of muscle and fat on heifers in confinement and pasture systems would be beneficial. Currently clients of custom graziers rate their performance on weight it would be good to identify what the weight gain is and whether it is muscle or fat.
- A new method of graphing breeding efficiency has been used to compare a farm's breeding program. It has been suggested to the PI to use this new method to compare the first breeding efficiency between the two groups of heifers. SARE will be contacted if this work shows anything significant.

- [Pictures](#)

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