



# Texas Dairy Matters

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## Precision Dairy Technologies: Benefits, Opportunities, and Investment

By Dr. Barbara Jones<sup>1,2,3</sup>

<sup>1</sup>Assistant Professor, Tarleton State University

<sup>2</sup>Director, Southwest Regional Dairy Center

<sup>3</sup>Research Scientist, Texas A&M AgriLife Research, Stephenville

Precision dairy technologies is a rapidly growing field, increasing practicality for dairy-herd managers at all levels. Precision dairy technologies is the use of technologies to monitor production, behavior, and physiological variables on individual animals to prevent disease, make timely and informed on-farm decisions, and improve overall herd and farm performance. Precision dairy technologies do not only include wearable technologies, but also includes image based technologies, real-time location systems, and milk based technologies. Areas of monitoring individual animals continues to grow. Monitoring behavior surrounding heat detection is the most widely used measurement. Technologies currently exist that can measure milk yield, methane production through eructation, animal location, body temperature, body weight, body condition, calving detection, rumination, rumen pH, mastitis, milk components, milk quality, milk conductivity, progesterone, animal mobility, gait, hoof health, lying/standing behavior, activity, and feeding behavior. Examples of technologies currently available in the commercial market are presented in Figure 1. Though precision dairy technology is a rapidly growing field, the benefits, areas of opportunity, and investment economics are important areas to be aware of if interested in adoption of a technology.



Figure 1. Examples of wearable precision dairy technologies located at the University of Kentucky (Photo credit, <https://afs.ca.uky.edu/dairy/extension>)

**Benefits:** Many apparent benefits exist surrounding precision dairy technologies, they include:

- Increasing farm efficiency
- Improving timely and informed decision making
- Monitoring individual animals
- Improving product quality
- Decreasing on-farm costs
- Minimizing adverse environmental impacts
- Improving animal health and well-being
- Improving producers quality of life
- Improving producers daily on farm time-budgets

**Opportunities:** Although apparent benefits exist, areas of opportunity also occur and they include:

- Limited biological understanding of the physiological and behavior variables herd-managers are trying to manage
- High investment costs
- Slow adoption rates by producers
- Little on-farm technical support
- Low or no integration of precision dairy technology data with other data
- Rural connectivity challenges

**Investment in technologies:** As the trend continues toward fewer, larger dairy operations, these larger dairies are able to take advantage of technologies because of the economies of size. However, investment in technologies is only valuable if the technology variable addresses a management area that needs improvement and will be used routinely. No technology is

considered “the best” as the needed improved management area is different for each farm. A number of factors influence whether an investment should be made and which technology should be purchased, they include:

- Investment cost
- Warranty period
- Reliability of recording data
- Sensitivity and specificity
- Ease of use
- Data collection frequency
- Labor requirements to use the system
- Customer and technical support

Investing in a technology is a big decision. Before investment, knowledge of the system and what the system can provide the specific herd and herd-manager is crucial information.

Therefore, seven key questions should be asked to the company before investing in a technology:

1. What is the total cost of the technology? This includes, the hardware, the software, data usage, replacement of the technology when broken, and customer/technical support costs.
2. What is the warranty of all parts of the technology?
3. How will the technology be used to manage the herd?
4. What does the customer/technical service model look like?
5. Is on-farm representation of the company available?
6. What is the sensitivity/specificity of the variable of interest?
7. Has 3<sup>rd</sup> party validation and research with the technology been performed? If so, what were the results?

Investing in a technology system can be a big investment. Knowledge of investment economics before adopting a technology is key. The below link will help specifically with investment analysis of three different heat detection technologies:

<http://www.uky.edu/Ag/AnimalSciences/dairy/decisiontools/HeatDetection/HeatDetection.html>

This link will help with any questions about the above dashboard tool:

<https://afs.ca.uky.edu/files/heat-detection-manual-6-5-17.pdf>

### **Current and past research:**

Researching precision dairy technologies is an exciting yet challenging area. This exciting area has room for growth and more research is warranted in all areas. All research results of current on-going research will be shared at a later date.

- Past research (conducted at the University of Kentucky):
  1. Using precision dairy technologies to assess cow comfort. Lying behavior technologies were used to determine differences between cows housed on Dual Chamber Cow Waterbeds and Rubber-Filled mattresses. Cows housed on the Dual Chamber Cow Waterbeds lied down 45 minutes longer per day than cows housed on Rubber-Filled mattresses.

- 2. Lameness detection using precision dairy technologies. Multiple technologies were located on/in the cow and in the milking parlor. Behavior, production and physiological variables were compared to visual lameness detection data. Precision dairy technologies were not able to detect lame cows in this study, suggesting that more research is warranted before applied to commercial operations.
- Current research (conducted at Tarleton State University and Texas A&M AgriLife Research):
  - 1. Feed additive effects on cow performance and methane discharge of dairy cows. This study fed a feed additive to 24 cows and a control diet to 24 cows. Methane discharge was monitored from both groups via the GreenFeed unit from C-Lock Inc. Data from this study has not been fully analyzed.
  - 2. Lying time effects on reproduction. This study is getting ready to start on farm.
  - 3. Surveying producers to better understand why adoption of precision dairy technology is low on large farms. A survey will be sent to producers in the southwest via email and mail to better grasp why adoption rates are low.
  - 4. Correlation of different technologies that measure the same variable located on the same cow, at the same time. Different technologies measuring the same variable may not actually output the same information. This study will investigate the potential differences between technologies.

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