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# Pre-Investment Considerations for Precision Dairy Farming Technologies

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Precision dairy farming involves the use of technologies to measure physiological, behavioral, and production indicators on individual animals. The primary goals of precision dairy farming are to 1) maximize individual animal performance, 2) detect diseases early, and 3) minimize the use of medication through preventive health measures. Examples of precision dairy farming technologies include milk yield recording systems, milk component monitors, activity monitors, lying and rumination behavior monitors, milk conductivity indicators, and heat detection monitors. The individual animal information these technologies collect supplements observations of the herdspeople and others and improves animal monitoring and decision-making.

Adoption of precision dairy farming technologies has been slow thus far, likely because of 1) unfamiliarity with available technologies, 2) concerns with benefit relative to cost, 3) apprehension of technology, 4) difficulties learning or implementing the technology, and 5) previous bad experiences with technologies. However, some producers realize the opportunities precision dairy farming may provide for reducing farm labor and allowing more personal time. Technologies may benefit small farms as well as large farms because they allow the small farmer to specialize in an area (i.e. heat detection) where time management demands often become limiting. In addition to personal benefits, potential exists for increased efficiency, reduced costs, improved milk quality, reduced environmental impact, and improved animal health and well-being.

## Questions to Ask

Precision dairy farming technology investments should be considered on an individual operation basis. These technologies do not follow a "one size fits all" model. Each dairy is different, and what works for one may not work on another. To assess whether a technology will work for your operation, start by asking the following questions:

### Does your dairy's management currently involve a computer?

Being comfortable around a computer is important in precision dairy farming. Almost all precision dairy farming technologies work through a computer program and will require daily interaction to produce useful reports and information for decision-making. Dairy operations most likely to benefit from these technologies are those that already use dairy management software (i.e. PCDART, DairyComp 305). However, regardless of an individual's familiarity to computers, working with any new computer program will require some training and adjustment.

### Is the farm currently using good management practices?

Precision dairy farming cannot completely correct poor management nor does it replace current management systems. In fact, when applied to unorganized systems, precision dairy farming technologies may make managing the operation harder through information overload. Technologies and computers do not replace good management but can enhance it. Dairy farmers who already understand, evaluate, and respond to cow needs are those who will benefit most from these technologies.

### Does the operation know its own strengths and weaknesses?

Being aware of which areas need improvement on a dairy will allow easier decisions to be made about investment in precision dairy farming, including which technologies will work best for you. Focusing on areas that are already strong will result in very few observed benefits. For example, a farm already doing a good job with heat detection may not see as much benefit from investing in a heat detection technology.

### What is the dairy's willingness to take risk?

Many precision dairy farming technologies are rather new and not yet widely adopted. Sometimes investing in an early technology may involve some risk (i.e. the company going out of business or development of a newer, improved model). However, the first adopters of new technologies are generally the ones who benefit from them most because they see returns first.

### Do you understand the economic benefits?

An investment analysis considers how a potential investment will affect a business. No matter how great a technology is, the benefits of investing in the technology must outweigh the costs. Before investing in any technology, farm management should set a threshold for minimum acceptable returns. A net present value analysis will help determine the true investment profitability. Some technologies may not prove to be profitable, but investment may still be worthwhile because of improvements in quality of life.

The answers to these questions will help determine if precision dairy farming technologies are a good fit for an operation. However, it is still important to consider other farm-specific and economic factors when making this decision. If precision dairy farming technologies are not a realistic option now, they may be in the future. Continually reassess the dairy operation to determine when precision dairy farming technologies may become a good choice for improving dairy management.

## Which Technology?

The list of available precision dairy farming technologies is growing rapidly. Once you have decided you are ready for precision dairy farming, the next step is to choose a technology (or multiple ones) to use. An ideal technology will be low-cost, reliable, robust, flexible, easy to maintain and update, and will provide information about something going on within an animal that a producer can immediately turn into an on-farm action. Consider some of these other questions when looking at potential technologies for your operation:

### Technology Purpose

Determine if the technology will bring value to the operation.
- Does the technology fulfill a need for the operation, or is it addressing something that does not require changing?
- What will this technology improve on the operation?

### Company Interaction

Installing precision dairy farming technologies will involve long-term interaction with the company that manufactures it. Be sure to talk to farmers or extension agents who have worked with the company previously to answer the following questions.
- Has the technology been used on commercial farms, not just the manufacturing company's research farms?
- What kind of customer service, training, and technical support does the manufacturer provide and for what length of time?

- Does the company value farmers' opinions when updating or making changes to the device?

### How the Technology Works

Know whether the technology will work in a way convenient for your operation before committing your time and money to it. Again, talking to other farmers and extension agents about these concerns may be beneficial.
- What is required for collection of data from the technology?
- How reliable is the technology? How often does it fail to perform as desired?
- Is data measured continuously or does the animal have to make a trip to the parlor for data collection?
- How frequently are tags misread?
- How do notifications about animals appear on the computer? Are reports easy to understand?
- Does the computer specify what to do with detected animals or do you have to interpret it?
- If the technology is designed for event detection (i.e. heat, mastitis, or disease):
  - Can the manufacturer provide data indicating what percentage of cases (sensitivity) are detected (goal: >80%)? A technology should capture most of the desired events to be worthwhile.
  - Can the manufacturer provide data indicating how many false alerts (specificity) occur (Goal: <1%)? This is where some technologies fall short. Although this is a strict criterion to use, false alerts can waste time and resources for a dairy producer. A 1% false alert means you will receive 10 false alerts for every 1000 milkings. By comparison, 10% or 25% false alert rates would lead to 100 or 250 false alerts per day.
- How long is the data stored on the computer?
- How does the system handle transferring units (tags, etc.) from one animal to another?

### Economics

Consider all types of economic investment and return that this venture involves. Ask yourself the following questions.
- What are the fixed (usually equipment) and variable (tags or reagents) costs involved in using the equipment?
- What kind of service fees are required after initial purchase?
- Does the technology measure a single parameter or multiple ones?
- Does the system use batteries and, if so, how often would they need to be replaced and how much do they cost?
- How long will the technology last before needing to be replaced?
- What is the warranty or replacement policy?
- What is the benefit to cost ratio of investing in this technology?
- How long will it take to recoup the investment?

## Getting Started

Choosing which technology to use is only the beginning—technologies do not run themselves. Setbacks might include learning to interpret data, changing labor management, and developing effective ways to incorporate new information into daily routines. Equipment failure, data transfer mistakes, and animal ID errors inevitably will occur at some point.

To prepare for this adoption period, remember that the learning process involves three steps: an early learning phase, a consolidation phase, and an advanced user phase. The early learning phase, which involves understanding the concepts of the new technology, and the consolidation phase, which involves applying that knowledge to the farm's specific requirements, often occur naturally. Up to that point, the new information will simply make tasks that you were already doing before installation easier. The advanced user phase involves expanding upon and improving dairy management by searching for new ways to use the information the technology provides. Failure to implement this last step is how many farms lose the full potential of the technology.

The benefits received from using the technology will depend on the commitment to it. Even if the technology is perfect at detecting a specific disease, that information is only beneficial if you apply it to management practices. What you do with the information provided by a technology is as important as, or perhaps more important than, the actual information. Positive results are more likely if a producer commits to understanding the software and sets goals for using it.

Another common discouraging factor is seeing less economic returns than expected. However, keep in mind that the quickest economic returns will be from those technologies that affect heat detection and reproduction. Technologies dealing with other factors on the farm, although they may still be economically beneficial, will require a longer period before seeing benefits. For example, the economic benefits of a technology that helps extend productive life are more difficult to see and measure.

## Future of Precision Dairy Farming

Precision dairy farming is a new concept. However, it has potential to change the way dairy cows are managed. Research continues on the development of new technologies that monitor rumen pH, jaw movement, feeding behavior, progesterone levels, heart rate, respiration rate, sleeping time, and much more. This enhanced form of dairy management has limitless potential.

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