

Precision Dairy Farming

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What is Precision Dairy Farming?

Precision Dairy Farming is the use of technologies to measure physiological, behavioral, and production indicators on individual animals to improve management strategies and farm performance. The trend toward group management may be reversed with Precision Dairy Farming as the focus returns to individual cows through the use of technologies. Technologies included within Precision Dairy Farming range in complexity from daily milk yield recording to measurement of specific attributes (such as fat content or progesterone) from milk samples taken at each milking. The main objectives of Precision Dairy Farming are maximizing individual animal potential, early detection of disease, and minimizing the use of medication through preventive health measures.

Potential Benefits of Precision Dairy Farming

Benefits thought to come from Precision Dairy Farming technologies include increased efficiency, reduced costs, improved product quality, minimized adverse environmental impacts, and improved animal health and well-being. These technologies are likely to have the greatest impact in the areas of health, reproduction, and quality control. Benefits realized from summarizing data and reporting exceptions are anticipated to be higher for larger herds, where individual animal observation is more challenging and less likely to occur. As dairy operations continue to increase in size, Precision Dairy Farming technologies become more feasible because of increased reliance on less skilled labor and the ability to take advantage of economies of size related to adoption of technology.

A Precision Dairy Farming technology allows dairy producers to make more timely and informed decisions, resulting in improved productivity and profitability. Real time data can be used to monitor animals and create exception reports to identify meaningful deviations from the normal pattern. In many cases, dairy management and control activities can be automated. Alternatively, output from the system may provide a recommendation for the manager to interpret. Information obtained from Precision Dairy Farming technologies is only useful if it is interpreted and used effectively in decision making. Integrated, computerized information systems are essential for interpreting the mass quantities of data obtained from Precision Dairy Farming technologies. This information may be incorporated into decision support systems designed to facilitate decision making for issues that require compilation of multiple sources of data.

Historically, dairy producers have used experience and judgment to identify animals that were unusual. While this skill is invaluable and can never be fully replaced with automated technologies, it is inherently flawed by limitations of human perception of a cow's condition. Often, by the time an animal exhibits clinical signs of stress or illness, it is too late to intervene. These easily observable clinical symptoms are typically preceded by physiological responses not obvious to the human eye (e.g. changes in temperature or heart rate). Thus, by identifying changes in physiological parameters, a dairy manager may be able to intervene sooner. Technologies for physiological monitoring of dairy cows have great

potential to supplement the observations of skilled herdspeople, which is especially critical as more cows are managed by fewer skilled workers.

Current Status of Precision Dairy Farming

The list of Precision Dairy Farming technologies used for animal status monitoring and management continues to grow. Because of rapid development of new technologies and supporting applications, Precision Dairy Farming technologies are increasingly more feasible. Many Precision Dairy Farming technologies are already being utilized by dairy producers: 1) daily milk yield recording, 2) milk component monitoring (e.g. fat, protein, and SCC), 3) pedometers, 4) automatic temperature recording devices, 5) milk conductivity indicators, 6) automatic estrus detection monitors, and 7) daily body weight measurements. Other theoretical Precision Dairy Farming technologies have been proposed to measure jaw movements, ruminal pH, reticular contractions, heart rate, animal positioning and activity, vaginal mucus electrical resistance, feeding behavior, lying behavior, odor, glucose, acoustics, progesterone, individual milk components, color (as an indicator of cleanliness), and respiration rates. Many Precision Dairy Farming technologies measure variables that could be measured manually, while the remaining technologies measure variables that could not have been obtained previously.

Despite widespread availability, adoption of these technologies in the dairy industry has been relatively slow thus far. In fact, agricultural adoption of on-farm software packages, as a whole, has been much lower than predicted. The majority of information management systems available and utilized by many dairy producers have analytical capabilities that are underutilized. In practicality, their use is often limited to creating production tables, attention lists, and working schedules. Perceived economic returns from investing in a new technology are likely the main factor influencing Precision Dairy Farming technology adoption. Additional factors impacting technology adoption include degree of impact on resources used in the production process, level of management needed to implement the technology, risk associated with the technology, institutional constraints, producer goals and motivations, and having an interest in a specific technology. The most progressive producers will adopt those new technologies that appear to be profitable. When a proven technology is not adopted, the operation observes a lost opportunity cost that may lead to a competitive disadvantage.

Though Precision Dairy Farming is in its infancy, new Precision Dairy Farming technologies are introduced to the market each year. As new technologies are developed in other industries, engineers and animal scientists find applications within the dairy industry. More importantly, as these technologies are widely adopted in larger industries, such as the automobile or personal computing industries, the costs of the base technologies decrease making them more economically feasible for dairy farms. Before investing in a new technology, a formal investment analysis should be conducted to make sure that the technology is right for your farm's needs. In the future, Precision Dairy Farming technologies may change the way you manage your dairy herd. Certainly, the potential is exciting!