Precision Dairy Management and the Future of Dairy Production in Ontario

J. Rodenburg

Factsheet

ORDER NO. 07-065 AGDEX 410/20 DECEMBER 2007

PRECISION DAIRY MANAGEMENT

A new, alternative model for labour-efficient dairy production is emerging. Part of this trend in automation, robotic milking — an example of "precision dairy management" — dramatically reduces labour requirements. Because it is voluntary, it provides more freedom for the cow and lends itself well to monitoring animal welfare through level of activity, weight changes and udder health. This system also responds to measured changes with individual feeding adjustments, without the added labour traditionally associated with individual care. Unlike traditional mechanization, which depended on large equipment applied to large production units, "precision dairy management" uses sensor-based management tools that define animal needs and robotic equipment that automatically delivers individual management applications. By expanding the number of animals managed by a family unit and increasing the level of precision in individual care, this kind of technology allows moderate-size family dairy farms, with 100–250 cows, to be more competitive, by improving labour efficiency and the productivity and health of the cows.

Society may perceive this as beneficial to maintaining a strong rural economy. Precision technologies also improve food safety through better animal identification and traceability, and animal wellbeing through improved health monitoring and individual care. Specific technologies that can be included in the broad category of precision livestock management include:

- electronic (radio frequency) identification systems and associated management software
- automatic sorting systems
- robotic milking systems
- robotic calf-feeding systems
- pedometers/activity monitors for heat detection, lameness detection and health monitoring
- rumination monitors
- step/gait analyzers to detect lameness
- sensors to detect parturition contractions
- electronic scales to assess body weight changes
- inner-ear temperature sensors
- automated feed delivery systems
- in-line sensors to assess milk quality and composition, and animal health and reproductive status

With unemployment at a 32-year low, labour resources available to agriculture are shrinking. Traditional dairy production is labour intensive. The Ontario Dairy Farm Accounting Project (ODFAP) reports that average paid and family labour is 1.42 hr/hectolitre of milk produced. Valued at $31, this is the largest production cost factor, representing more than 40% of gross income. The most profitable herds reported 0.72 hr/hectolitre, or less than one-third of the 2.27 hr reported on low-profit farms.

TRADITIONAL MANAGEMENT

Currently, more than 4,000 family dairy farms play a vital role in the rural communities of Ontario. With an average herd size of 50–70 cows, these farms are viewed as more "environmentally sustainable" and less in conflict with other land uses, than larger livestock operations, and they are more in tune with public expectations for animal care, because individual attention can be provided. But this traditional farm may not be economically sustainable. In ODFAP, high-profit farms were much larger than low-profit farms (120 vs. 45 cows) and had higher production per cow (8,700 L vs. 6,500 L). Trends in international trade agreements will likely increase pressure on the dairy industry to lower prices, so greater efficiency will be essential in the future.

MECHANIZATION

Traditionally, labour efficiency has improved through large-scale mechanization and economies of scale. For the dairy industry, particularly in the US, this has led

Ministry of Agriculture, Food and Rural Affairs

Ontario

to the development of large herds, making efficient use of large milking parlours and unskilled labour. Hence, Midwest US dairies now milk up to 3,000 cows three times daily, often in 60- or 70-stall rotary parlours. While such mass handling of large groups of cows is efficient, it reduces individual animal care. At current market demand, if Ontario adopts this model, our estimated 330,000 dairy cows could be managed on 100 very large dairies. Robotic milking and precision management applied on family dairies with 120–200 cows may offer a viable alternative.

CHOOSING COST-EFFECTIVE TECHNOLOGY

Since not all the technologies listed here fit every situation, adoption decisions should be based on cost benefit, calculated using a partial budget.

Cost Benefit of Robotic Calf Feeding

Robotic milk-feeding systems, suitable for up to 30 calves, cost $9,000–$14,000 and replace the labour of feeding calves with full automation. They record frequency of visits and meals and when equipped with scales and a temperature sensor in the drinking nipple, monitor growth and body temperature. Feeding levels are automatically adjusted for age, size and health status.

In a study at Allenwaite Farms, caring for 40–50 calves required 7.7 min/calf/day, with bucket feeding individual calves, vs. 3.8 min/calf/day with group housing and robotic feeding. On a farm with 10 milk-fed calves, this saving represents 38 min/day or 230 hr/year. Assuming housing, bedding and feed costs are similar, a $12,000 feeder can be financed for $1,700/yr at 7.5% interest over 10 yr. Additional electricity, maintenance and repairs might add a further $200/yr, but there is a $100/yr saving in not buying buckets, nipples, etc., so the net partial budget indicates the feeder adds $1,800/ yr in expenses. With a labour saving of 230 hr, $7.83/hr is saved. If labour costs are higher than this or if the freed-up time can be invested profitably in caring for more cows, this is a profitable choice.

Other factors include impact on calf health and growth. Accurate feeding, more frequent meals and the ability to track intake and monitor performance add value to the feeder, while greater disease risk in group housing takes some value away.

Cost Benefit of Robotic Milking

For a herd of 120 cows, two single-box robotic milking systems, capable of handling 60 cows each, require an investment of $400,000. Field studies in Ontario report that robotic milking herds devote an average of 1 min/cow/day to milking-related handling and clean-up, while parlour-milking herds of similar size require 3.28 min/cow. This is a difference of 1,664 hr/year for 120 cows. If the parlour investment, including the building space, is $250,000 and all other things are equal, using the financials from the first example, the additional investment in robotic milking has a cost of $12.75/hr of labour saved.

In practice, a detailed analysis would show additional expenses for higher maintenance and electrical costs, and additional benefits from more flexible work scheduling, but it appears that robotic milking can be practical on many Ontario farms.

SUMMARY

Farms that apply precision management technologies to their full potential are demonstrating that a family unit of one full-time operator, with part-time help from a spouse or school-aged children, can manage 120–160 cows, without non-family labour. As labour costs increase, precision management tools that increase the labour efficiency of family farms will continue to gain in importance and popularity.

This Factsheet was authored by Jack Rodenburg, Dairy Systems Production Program Lead, OMAFRA, Woodstock.

Agricultural Information Contact Centre:
1-877-424-1300
E-mail: ag.info.omafra@ontario.ca
Northern Ontario Regional Office:
1-800-461-6132

www.ontario.ca/omafra

POD
ISSN 1198-712X
Également disponible en français
(Commande nº 07-066)