



## Efficiency is a mixed bag

**H**OLSTEINS continue to be the predominant dairy breed in the U.S. Strong selection for milk production and inbreeding within the breed has, however, led to some decline of functional traits such as health, fertility and survival.

This, coupled with milk pricing systems that favor high milk component levels, have elevated the interest in crossbreeding. The benefits of crossbreeding include the potential to introduce favorable genes from another breed, to remove the negative impacts of inbreeding and to maintain the gene interactions that cause heterosis or hybrid vigor.

Although many breeds have been used in Holstein crossbreeding programs, Jerseys have sparked particular interest because of their milk composition and fertility. Clear evidence exists of improved milk solids percentages and improved functional traits such as fertility, health and productive life with Jersey x Holstein crossbreds compared with purebred Holsteins.

Feed costs represent between 79 and 83 percent of the total cost of producing milk. With feed comprising the largest operating expense, efficiency of converting feed to milk has been used as a benchmark to assess profitability. Dairy cows' feed efficiency is customarily defined as the ratio of milk output to feed input.

Since feed efficiency is a ratio of two quantities, cows with higher milk production, lower intake or both may be more efficient. Although information on comparative feed efficiency between Holstein and Jersey x Holstein crossbreds has been historically scarce, researchers at several universities have evaluated those genotypes recently.

### Grazing favors crosses

An experiment conducted in 2009 at the Moorepark Dairy Production Research Centre evaluated the performance of Holstein and first-generation (F1) Jersey x Holstein cows under grass-based production conditions. Feed efficiency, determined as milk solids, was more favorable for first-generation Jersey x Holstein cows than for Holsteins. The researchers suggested that Jersey x Holstein cows require approximately 11 percent less energy to produce 2.2 pounds of milk solids compared with Holsteins.

Jersey x Holstein cows have become very common in New Zealand, accounting for 36.3 percent of the national herd. The popularity of dairy crossbreeding in New Zealand has been attributed to their higher productivity in pasture-based systems, and a pricing system that incentivizes milk with higher fat

and protein content.

A New Zealand study evaluated the profitability of grazed dairy herds using Holstein, Jersey and Ayrshire mating systems. First-generation Jersey x Holstein crossbreds exhibited superior profitability per acre compared to the other crosses and their parental breeds as well. In addition, the biological efficiency of first-generation Jersey x Holstein was 6 percent higher than for Holstein herds.

### Advantage lost in confinement

Les Hansen from the University of Minnesota has stated that selection programs for Holstein's milk yield have prioritized body size, including stature, strength and body depth. Studies conducted with Holstein cows, however, have consistently reported body size and body weight as negatively correlated with feed efficiency. It could be hypothesized that reducing the size of modern Holsteins could improve feed efficiency if genetics for milk production remained constant.

Recent crossbreeding studies have compared the performance and feed efficiency of Jersey x Holstein crossbreds with pure Holsteins under high-input confinement systems.

Although in these experiments Jersey x Holstein body weights were 2 to 16 percent lower than straight Holsteins, feed efficiencies were not improved in both first-lactation and mature cows.

In addition, using respiration calorimeters, Agri-Food and Biosciences Institute researchers did not find significant effects of crossbreeding on energy digestibility, energy partitioning between milk and body tissue or efficiency of energy use for lactation. In conclusion, the authors stated crossbreeding did not influence energy maintenance requirements or energy efficiencies of first-lactation cows.

A Virginia Tech crossbreeding project evaluated the energy balance in first-lactation Holstein and first-generation Jersey x Holstein cows. Energy balance was estimated by subtracting the energy required for production, maintenance, growth and pregnancy from the energy consumed. The first week in which cows returned to a positive energy balance as well as the overall total cumulative energy balance across the lactation did not differ between genetic groups.

The experiment conducted on-farm by the University of Wisconsin extension faculty compared the yearly performance of paired pens of Jersey x Holstein crossbreds and Holstein cows. Although differences in feed efficiency were not found, the average daily gross milk income and milk income over feed cost per cow were 76 cents for Holsteins and 42 cents less for Jersey x Holstein.

In addition, when the researchers attached the premiums to the value of milk components, the daily average gross milk income and milk income over feed cost per cow were 59 cents for Holsteins and 26 cents less for Jersey x Holstein. In summary, pure Holstein cows were more profitable under both the volume and component pricing systems.

Using data received for genetic evaluation in 2000, USDA geneticists found that profit from first-generation Jersey x Holstein crosses exceeded that of purebred Holsteins in two of the three pricing methods (Net Merit and Cheese Merit; none for Fluid Merit). According to the researchers, the lower number of progeny tested bulls in the other breeds compared to Holsteins result in reduced selection intensity and slower expected genetic progress which limits their use in crossbreeding.

Results from a survey conducted by the University of Wisconsin indicated that the main disadvantages among farmers who were practicing crossbreeding in their herds at the time were: marketability of slaughter animals and bull calves, lack of uniformity in the herd, difficulty for choosing bulls for the next generation and reduced milk volume. This lack of uniformity within the milking herd could create management challenges such as the ability of cows to fit in the stalls and milking parlor.

Research results at the present time suggest total milk solids yield, resulting from the higher production of Holstein cows under confinement, overcome the higher milk concentration of Jersey x Holstein crossbreds.

Other factors in addition to efficiency of milk production must be pondered to make crossbreeding a sound economic approach for the farm. The decision is likely determined by a combination of factors of which type of milk market, predominant dairy system, local feed availability and climate seem to be most essential. 🐄

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