Today, some dairy owners are asking whether they should use crossbreeding to improve the profitability of their dairy herd. Crossbreeding is not a new concept for dairy cattle breeding, however, the answer to the question about whether to crossbreed is not straightforward. Instead, dairies must weigh the important factors and trade-offs and decide whether crossbreeding is appropriate for their dairy.

Quick Crossbreeding Tips

- First cross (F₁) animals are quite unique and some may compete well with Holsteins, however subsequent generations of crossbreds can be disappointing.
- USDA-AIPL research findings show that the best crossbreeding systems do not exceed the economic merit of genetically elite Holsteins, however the most profitable crossing systems can approach the profitability of average Holsteins.
- When crossbreeding, good sire selection is critical. Crossbreeding will not compensate for using bulls with low genetic merit.
- Crossbreeding will not “correct” management issues such as cows spending too much time standing on concrete, overcrowding pens, uncomfortable stalls, etc.
- If you choose to crossbreed, you get the most benefit from crossbreeding when you know the end objectives and develop and follow a “game plan”:
  1) Select high performing, profitable breeds that complement each other,
  2) Choose high genetic merit service sires and cows from these breeds, and
  3) Follow a STRUCTURED plan for crossing.
- If you decide to crossbreed, SIMPLE crossing systems usually are more manageable in the long run. The added heterosis benefits of more complex systems can easily be offset by making incorrect sire matings (i.e. using the wrong breed of mating sire on individual cows or having to use less profitable breeds).
- Do not forget to consider the value of cull bull calves, cows, and heifers.

Q: Will I improve female reproduction if I crossbreed?
A: If you currently have Holsteins and your management and nutrition are up-to-snuff, then you should expect to see somewhat better reproduction from F₁ s produced by mating Holstein cows to protein breed bulls. For example, when Brown Swiss and Holsteins are crossed, Daughter Pregnancy Rate (DPR) for the crossbreds should be roughly 1-1.5 percentage points higher than comparable Holsteins. When Holsteins and Jerseys are crossed, the crossbred DPR advantage over Holsteins should fall somewhere around 3.5 - 4 percentage points. Data from USDA-AIPL indicates that more than half of this fertility advantage results from the Jersey breed advantage for fertility and the remainder is due to heterosis. But, female fertility isn’t the only factor affecting profitability; USDA-AIPL research findings further indicate that the best crossbreeding systems do not exceed the economic merit of genetically elite Holstein matings.

Q: Will I improve longevity if I crossbreed?
A: How long cows remain productive in herds, measured as Productive Life, is influenced very strongly by reproduction and milk production. Cows that are pregnant have a smaller chance of being culled. Heavy producers also are less likely to be culled in the near future. For Productive Life (PL) which is highly influenced by these two traits, USDA-AIPL data indicate that PL for Holstein-Jersey F₁s will be about 1 month longer than pure Holsteins (Figure 1). The PL for Holsteins will be no different or in
some cases superior to PL for other types of crossbreds.

Q: What other differences may I expect to see from crossbreds?
A: Typically, crossbreds will have somewhat to notably higher survival, reproduction, and livability than the average of their parent breeds. These advantages may be very important in some instances, but of course, good management is necessary to realize these benefits from crossbreeding. Crossing will not “correct” problems that are due to management lapses.

Q: How do I know if the enhanced performance from a crossbred animal is from genetics or hybrid vigor? Does it matter?
A: Performance of crossbreds and profitability of crossbreeding systems are a ‘balancing act’ involving the genetics and profitability of the breeds chosen, the genetic merit of sires used, and heterosis. Research has shown that to be competitive with genetically average Holsteins, crossbreeding systems must use only the most profitable breeds, and further, the heterosis contribution must be substantial. Figure 2 can help to determine the genetic approaches that will yield the greatest genetic impact for these common traits that affect your bottom line.

Q: After the first cross, to what do I breed F1 or first cross heifers?
A: The answer to this question requires knowing whether a 2-breed or 3-breed rotational crossing system was planned. In 2-breed rotational crossing system, the first generation cross progeny (F1) should be mated to high genetic merit sires that are the same breed as dams of the F1’s. For the next generations, rotate/alternate service sire breeds by always using one of the two selected breeds that is least related to the females being mated. For a 3-breed rotational cross, first cross heifers and cows are bred to bulls of the third selected breed. Subsequent generations are bred to the breed (of the 3 selected) that is least represented in the genetic makeup of the females. So, a cow whose ‘sire stack’ is Holstein (Sire)-Jersey (MGS)-Brown Swiss (MGGS) should be mated to a high genetic merit Brown Swiss sire.

Q: Do I gain more if I use a 3- or 4-breed rotation?
A: From a theoretical perspective, more complex crosses can have merit, because over many generations, these more complex crosses will capture more total heterosis. However, as more breeds are included, it becomes increasingly difficult to identify genetically elite sires in subsequent dairy breeds. Despite favorable effects of heterosis, crossbreeding with mediocre service sires yields mediocre crossbred progeny.

Q: What happens if I keep crossing different breeds to maximize heterosis?
A: Because crossbred performance and profitability is a combination of the genetics and profitability of the breeds chosen, the genetic merit of sires used, and heterosis, continuously using new breeds to maximize heterosis will yield considerably less profitable cattle than a more well-designed system with a limited number of breeds.

Q: What about some of the European ‘exotic’ breeds that we are hearing so much about? Would breeds like the Swedish Red, Norwegian Red, or Montbeliarde add value to a crossbreeding system for U.S. dairies?
A: At this time, we have no data to suggest that crossbred progeny from these European ‘exotics’ sire would be more profitable or outperform crossbred progeny from Brown Swiss or Jersey sires. We know that Jersey and Brown Swiss sires are selected based on progeny performance under the environmental, production, management, and economic conditions experienced by U.S. dairies. Data is insufficient to determine how the European ‘exotics’ would perform in U.S. dairies – for example, will they maintain good reproduction when exposed to summer conditions in the U.S.; is their milk yield high enough to make these breeds profitable and competitive options in crossbreeding systems for U.S. dairies?

Q: If I am using crossbreeding, does it matter which sires I use?

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**Figure 2** A comparison of the effectiveness of sire/breed selection and heterosis on common traits of economic impact.

**Q:** Do I need to worry about inbreeding if I am crossbreeding?

**A:** In rotational crossbreeding systems, inbreeding should be managed for all matings when a breed of service sire is being used that is part of the ‘sire stack’ of the cow or heifer.

**Q:** Will I get more milk from crossbreds?

**A:** The answer depends on your viewpoint. If you own Jersey cows and breed them to Holstein service sires, then on average the crossbred daughters are expected to produce more milk than their Jersey dams. If you own Holstein cows and breed them to Jersey service sires, then the crossbred progeny are expected to produce less milk than their Holstein dams. Overall, milk yield of females in a well-designed crossbreeding system can approach yield of Holsteins, but in general won’t exceed Holstein milk yields (see Figure 1, “What is heterosis?”).

**Q:** Can I still use DHIA if I am crossbreeding?

**A:** Yes! In fact, USDA-AIPL is working to incorporate more information about dairy crossbreds into our National Dairy Genetic Database. Discussions are ongoing to determine the best approach for using data from crossbred daughters for sire evaluations.

**Q:** Where can I find reliable research results on crossbreeding?

**A:** There is relatively little information on the results of crossbreeding involving today’s high genetic merit cattle. The USDA-AIPL has begun to summarize information on crossbreds found in U.S. herds today to help dairies evaluate crossbreeding for their operations. This information can be accessed at any of the following websites: http://www.adsa.org/jds/papers/2003/d0331036.pdf.

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**Relative Performance of Dairy Breeds in the U.S.**

(more stars indicate more favorable performance).

<table>
<thead>
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<th>US Breed size</th>
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