

Dairy Crossbreeding—Deal or No Deal?

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ISU Extension's "Millionaire Model Farms" are practicing crossbreeding. Is the crossbreeding deal a good deal for your dairy? The answer "depends" on many variables. Do you want to maximize milk production per cow? Then the answer is "no deal" to dairy crossbreeding as straight Holsteins produce around 7-10% more milk per cow than their crossbred counterparts. Do you want to maximize combined fat and protein per cow? Then the answer is probably also "no deal" at this time as straight Holsteins produce an estimated 3-5% more fat plus protein in recent research data. On the surface, it sounds like crossbreeding is a no deal situation as a conscious decision must be made to sacrifice milk and component production per cow.

However, there are many other variables to account for in the decision. For example, recognize an estimated 6% reduction in dry matter intake in the crossbreds with equal feed efficiency compared to a pure Holstein. This 6% dry matter intake reduction (Holstein-Jersey cross) may equate to about three pounds of dry matter per cow per day or .5 ton of dry matter per cow per year. The cost per cow of feed savings is only about \$75 which can compensate for 625 pounds of \$12/cwt milk or 3% of the milk lost versus pure Holsteins. Thus, some of the lost milk is recovered in feed cost savings. Economic values also need to be put on other traits that become a part of the equation.

If you want a cow that not only eats less but is smaller, lasts longer, breeds better, has less days to first service, less calving difficulty, less stillbirths, and better overall general health (less vet bills), then crossbreeding may be a deal for your dairy herd. And, in milk markets where producers are rewarded with adequate premiums for fat and protein, first generation crosses of certain breeds may exceed pure Holsteins for lifetime net profit. So, if lifetime net merit is your primary goal along with an "easier keeping" cow and you are adequately rewarded for milk components, then yes, crossbreeding can be a good deal. Dairy producers need to understand that profitability reaches far beyond pounds of milk produced per cow and crossbreeding, if managed correctly, may be a means to improve profitability.

Crossbreeding is a mating system that compliments genetic improvement. The average Holstein has about 5.2% inbreeding as of 2006 with an estimated increase of 0.1% per year. Crossbreeding counteracts inbreeding and may be a good deal for producers seeking ways to reduce effects of inbreeding on their dairy herd. The sires selected are as important as the decision to crossbreed!

Table 1. First Lactation Milk Production (actual 305 with 2x milking)

	Holstein	Montbeliarde x Holstein	Scandinavian Red x Holstein
Number of Cows	380	494	328
Milk (lbs)	21,801	20,305**	20499**
Protein (lbs)	777	743**	756
Fat (lbs)	677	645**	655**
Fat + Protein (lbs)	1,454	1,388**	1,411*
% of Holstein		-5%	-3%

*Statistically significant difference from pure Holsteins (p<.05)

**Statistically significant difference from pure Holsteins (p<.01)

The total fat plus protein difference above was maintained during the first three lactations of the above cows. Importantly, no adjustment was made to production differences in days open during the current lactation (pregnancy status) of the cows. Cows with shorter days open are penalized for 305 day production and cows with long days open or that do not become pregnant have inflated 305 day production. Thus, production and fertility must both be included, along with other important traits, in selection indexes to determine total merit of cows. Crossbred cow groups listed below (or on next page) had significantly less calving difficulty than pure Holsteins as listed in Table 2.

Table 2. Calving Difficulty and stillbirths for breed of dam at first calving

Breed of Sire	No. of births	Calving difficulty		Stillbirth
		-----%-----		
Holstein	371	16.4		15.1
Montbeliarde	158	11.6		12.7
Scandinavian Red	855	5.5*		7.7*
Breed Group of Dam				
Pure Holstein	676	17.7		14.0
Montbeliarde-Holstein	370	7.2**		6.2**
Scandinavian Red-Holstein	264	3.7**		5.1**

*Statistically significant difference from pure Holsteins (p<.05)

**Statistically significant difference from pure Holsteins (p<.01)

Table 3. Reproduction traits and survival of crossbred first-lactation cows

	Pure Holstein	Montbeliarde-Holstein	Scandinavian Red-Holstein
No. of cows	536	375	261
Days to 1 st A.I.	68	65*	66
1 st A.I conception rate	22%	31%*	30%*
No. of cows	520	371	257
Days open	150	131*	129*
Survival to 305 days, %	86	92*	93*

* Different (P<0.05) from pure Holstein

Each of the above items, along with others not depicted here have an economic value to consider and those economic values may be different for each herd as they affect calving strategies, labor efficiency and veterinary, breeding and other expenses. A 7% increase in survival to 305 days would reduce your cull rate and increase your herd's net worth. Thus, consider the total package of crossbreeding closely.

Then, remember the above research is related to F1 crosses. Preliminary data on 3-breed crosses was very similar to 2 breed crosses as depicted in Table 4 below.

Table 4. Actual 305-day production during first lactation of specific breed combinations.

Breed Combination	No. cows	No. sires	Milk	----- (lb) -----		
				Fat	Protein	Fat+Protein
2 breed crossbreds						
Montbeliarde/Holstein	366	32	20,793	773	667	1,440
Scandinavian Red/Holstein	162	15	20,834	772	671	1,443
3 breed crossbreds						
Montbeliarde (sire) x (Scandinavian Red/Holstein)	43	9	20,857	784	679	1,435
Scandinavian Red (sire) x (Montbeliarde/Holstein)	86	10	19,421	730	636	1,366

The average extent of heterosis during the first four generations of 2, 3 and 4 breed crossbreeding systems is 72%, 91% and 97% respectively. Moving to three breeds increases average extent of heterosis by 19% and to a fourth breed another 6% or 25% more heterosis for four breeds over two breeds. Crossbreeding systems using only two breeds limit the impact of heterosis and crossbreeding systems using more than three breeds may limit the impact of single breeds of high merit for specific needs.

Heterosis is a bonus that dairy producers can expect in addition to the positive effects of individual genes obtained by using top A.I bulls within breed. The bonus should be about 5% for production and at least 10% for mortality, fertility, health and survival and heterosis comes on top of the average genetic level of the two parent breeds. A color tagging system is used to identify which breed the animal gets bred to next using three or four different colors depending upon use of a three breed or four breed cross.

Producers not considering crossbreeding should take a very close look at the economic value of open days, cull rates, cow longevity, calving difficulties and death loss and the cumulative economic and labor efficiency values. In addition, consider how these factors relate to your growth or lack of growth in herd size. Also, producers not crossbreeding should pay utmost attention to inspection of pedigrees when mating bulls as inbreeding effects are not readily visible but are increasingly real in pure breed herds.

What about Holstein-Jersey Crossbreds?

Results from a Minnesota trial tend to compare relatively well with the trials above, except for calving and stillbirths. Milk volume was 7% higher in Holsteins compared to Holstein-Jersey crosses, fat was equal and fat plus protein was 2.7% higher in purebred Holsteins. The Holstein-Jersey crossbreds had 10 days fewer to first service, 78 versus 88. Average days open were 23 days less for the crossbreds, 136 versus 159. There were no differences in calving difficulty or in rates of stillbirths. The crossbred heifers had 6.4% less dry matter intake with no differences in feed efficiency.

Results from a Wisconsin study comparing groups of 140 cows on a single farm suggests Holstein-Jersey crosses are holding their own economically relative to pure Holsteins. The results showed an \$18/cow/year advantage to the crossbreds when health differences are accounted for and if the milk price is based on cheese yield, the difference jumped to \$77 per cow/year. The Holsteins averaged 51 lbs. of dry matter intake per day and produced 82 lbs. of milk while the crossbreds averaged 46 lbs. of dry matter intake and produced 70 lbs. of milk. Correcting for solids, the milk difference was 75 lbs. for Holsteins and 70 lbs. for the crossbred cows. Income over feed costs on a cheese yield basis was \$6.99/cow/day for Holsteins versus \$6.73 per cow/day for the crossbreds. When cheese yield based income over feed cost was adjusted for days open, health disorders and culling, the crossbreds outperform the Holsteins by \$77 per cow/year.

In Sum, Is Crossbreeding a Deal or No Deal?

The bottom line is crossbreeding can help achieve goals thanks to heterosis and the offset of inbreeding.

- Crossbred cows lost 7-10% of milk production and 3-5% of fat plus protein production.
- Crossbreeding often results in a smaller cow that eats less feed which can compensate for an estimated 3% of the lost milk. Less manure is also produced.
- Crossbreds may fit better in grazing systems, but don't overlook their benefit in confinement, too.
- Crossbreeding benefits many non-milk yield traits as a means of improving profitability so consider these non-milk production traits whether you crossbreed or not.
- Remember, the A.I bulls you choose to use may perform different than the bulls or breeds used in these studies so choose traits of proven sires that will meet your breeding objectives.
- If you are a grazer, the best bulls rank quite similarly whether you are in confinement or grazing.
- When selling heifers, bull calves or cull cows, the dairy and slaughter value of crossbred cattle may be less per head, depending on the breed used.
- Crossbreeding can increase the net lifetime merit of your dairy herd if managed correctly.
- The use of three or four breed rotation further maximized heterosis relative to the F1 cross.
- Crossbreeding is a mating system that compliments genetic improvement.
- The sires selected are as important as the decision to crossbreed!