Economic and environmental benefits of crossbreeding dairy cows with beef bulls

Given the challenging conditions within the dairy industry today, dairy farmers are seeking solutions to enhance their bottom lines. Traditionally, dairy farmers select genetics for dairy cows with a main focus on increased milk production and better levels of fat and protein. However, in a market that is currently saturated with low-priced milk, a set of broader considerations regarding beneficial genetics to improve value for excess calves could provide a compelling income diversification strategy for dairy farmers. One such solution involves crossbreeding dairy cows with beef bulls, which results in higher calf prices, better quality meat at greater volumes for the beef market, and improved conception rate, among other economic and environmental benefits. Such results can largely be attributed to using genetics designed to enhance performance metrics for beef production.

Male Holstein and Jersey calves, and about one third of heifers, are sold as calves for veal when the market is robust. Jersey heifers not going into herd replacement or the veal market have little to no value, while Holstein calves (male or female) that are not used for veal will typically be raised and sold for beef. However, dairy calves are usually purchased at a steep discount compared with traditional beef calves. As most dairy farms aren't in the beef production business, they usually offload the calves to beef farmers or ranchers. Profits range depending on the market, but dairy producers often make very little on these calves. When dairy calves are raised for beef, they require more feed over a longer period of time before reaching weight sufficient for slaughter, leading to higher feed costs and greater feed requirements.

In the past few years, an increasing number of dairy farmers have begun to see calves as a separate income stream and have developed successful strategies to improve the financial returns from calves that are not used for herd replacement. Excellent results have been seen from crossbreeding dairy cows (both Holstein and Jersey) with bulls from beef breeds (Angus, Limousin and others) to improve carcass quality and yield, as well as improved feed efficiency compared to pure dairy calves. In addition, improved conception rates, calving ease, reduced stillbirths, and a higher price for the calves make the cross a winning proposition for dairy producers.

Since dairy calves will always exist in the market because they are essential to make cows lactate, increasing the quality, quantity and overall value of meat production increases revenues. It is also likely to be beneficial to the environment. If more meat can be produced with the same or fewer resources as crossbred calves require less feed to get to marketable size, environmental impacts per pound of beef produced can be reduced, profits for dairy and beef producers increased, and more food can be made available with the same dairy and beef herd sizes. This would lead to reductions in greenhouse gas emissions, land use, feed and water per pound of beef produced.

Price differential beef vs. dairy calves				
	Price/calf	Revenue (Price x excess calves*)		
Lactating herd size		**150 Head**	**1,500 Head**	**9,399,000 Head (national dairy herd)**
Low end dairy calf price	$35	$2,614	$26,141	$163,801,970
High end dairy calf price	$100	$7,469	$74,690	$468,005,628
Low end beef calf price	$128	$9,523	$95,229	$596,707,175
High end beef calf price	$330	$24,648	$246,476	$1,544,418,571
Increased value low end (low end beef - high end dairy)		$2,054	$20,540	$12,870,155**
Increased value high end (high end beef - low end dairy)		$22,033	$220,335	$138,061,660**

*See **Appendix 1** for calculations on excess calves per herd size.

**Numbers represent if only 10% of the national dairy herd were to implement this practice.

Some dairies have already transitioned to this model. In today's market, dairy calves may sell for $35-$100 while crossbred calves can sell for $128-$330[1]. For dairies of varying sizes, this represents an increase in gross profits of at least 28% and up to 840% depending on fluctuating calf prices, representing a significant financial incentive for the dairy (see table above for examples from 150, 1500 and national dairy herd). If even 10% of the nation's 9.4 million milk cows were to transition to this model, this could represent an increase of value of at least $13 million, going up to as much as $138 million depending on calf price. If 50% of the national herd were to transition, the range of value-added jumps to between $64 million and $690 million. Given supply and demand forces, if the market were to add such a high volume of crossbred calves, it's likely that the calf price would come down and the additional value per cow for the dairy would be less. Despite this, the value will remain higher than for traditional dairy calves, and the additional benefits of improved conception rate and calving ease, as well as reduced stillbirths and vet costs, will still benefit dairy farmers.

Not only does crossbreeding increase the calf price, it can also improve the conception rate of cows by up to 55%. If it costs $45 to inseminate a heifer with a 63% success rate for first service, and we estimate a 36% improvement in conception rate[2], that means a savings, on average, of $19 per heifer. For a dairy with 1,500 cows, that savings could be $45,000 (considering 30% of the herd to be heifers and the remainder to be lactating cows). If the conception rate is increased by 50% (vs. 36%), savings could be $57,000, and this is only for an improvement in the rate of conception. When this figure is increased by savings for stillbirths avoided, improved calving ease and reduced vet costs, as well as the higher price for calves, the business case for crossbreeding dairy cows is compelling. What's more, since many dairies are already inseminating cows to produce calves for milk production, and beef semen are comparable in cost to traditional dairy semen, this business opportunity will change little in terms of process or cost. Of course, this does not account for the use of sexed semen or other genetics for optimal milk performance that may be used for insemination of a portion of the herd for herd replacement, but it serves to illustrate the magnitude of benefits that can be achieved with relatively minor expense or change to process.

On the beef production side, yields are greater for crossbred calves than for pure dairy calves. In addition, crossbred cattle grade better (are more valuable) than traditional dairy, resulting in better pricing with minimal production changes. Based on illustrative data, crossbred calves can be worth $276/head more than Holsteins, leading to a $20,000 to $206,000 increase in value for excess calves in the same 150 (75 excess calves) or 1,500 herd size (747 excess calves) respectively (see Appendix 2 for calculations). Meanwhile, $77,000 are saved in feed costs for a 1,500 head dairy, leading to a nearly $300,000 increase in value overall across dairy and beef value chains. All of this suggests higher profits with fewer resources, resulting in a win for the dairy producer and buyers of dairy calves for beef production, as well as for the environment. If these numbers are taken to a nationwide level with only 10% of the dairy herd, the increased value in the beef market for excess calves could be $406 million. For 50% of the dairy herd, this number jumps to two billion. Meanwhile, for 10% of the herd, $48 million in feed costs could be saved and $242 million for 50% of the herd. Even with potential price reductions for a greater volume of calves and product available, the value and increase in yield grades, as well as the feed savings, represent a compelling argument for feedlots to purchase these calves.

[1]Calf prices change on a daily or weekly basis and these ranges are based on average values from January-February 2019 to demonstrate potential benefits.

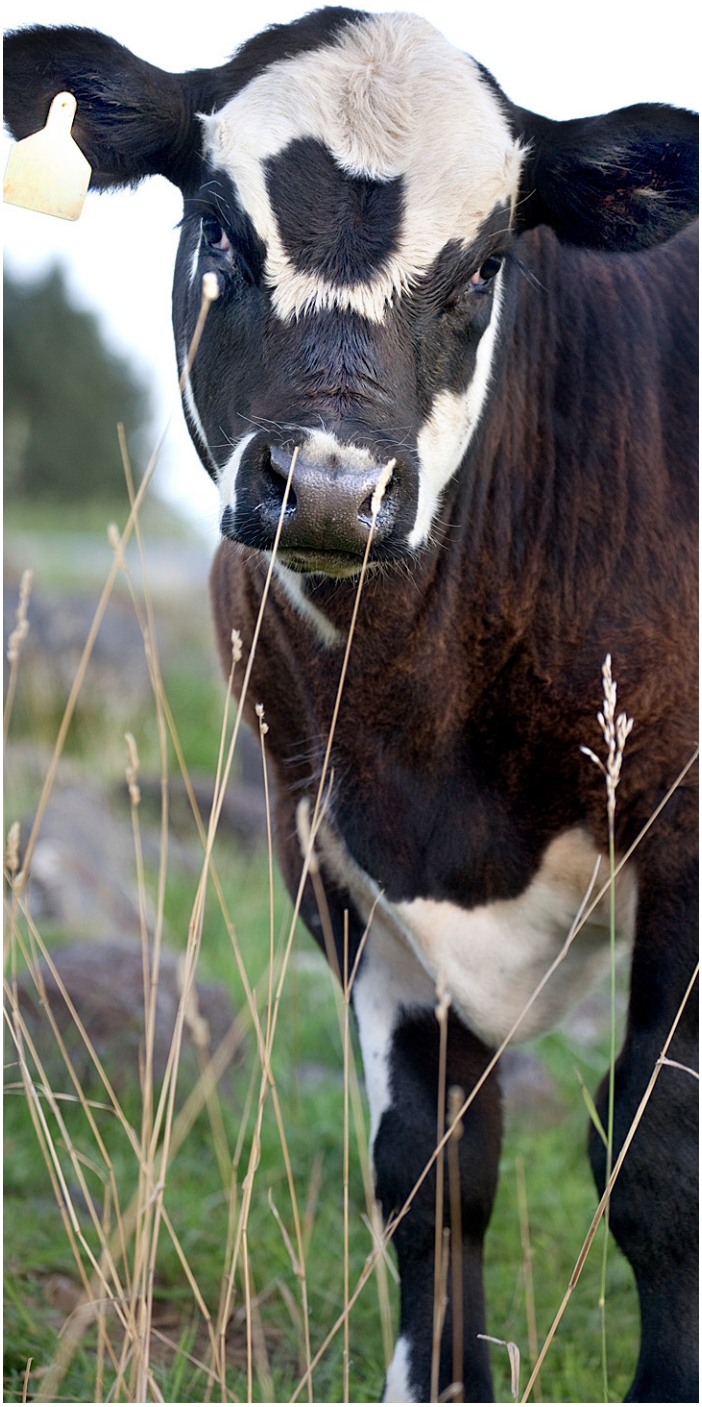
[2]Conception rate improvement from ABS InFocus program for Holsteins; improvement rates for Jersey are higher but the same rate was applied for the nationwide herd for a more conservative estimate.

	Crossbred Steer		Holstein Steer		Beef Steer	
	150 Herd Size	1,500 Herd Size	150 Herd Size	1,500 Herd Size	150 Herd Size	1,500 Herd Size
Head	75	747	75	747	75	747
Days on feed	174.3	174.3	289	289	143.4	143.4
Feed cost (day)	0.9	0.9	0.9	0.9	0.9	0.9
Feed costs	$157	$157	$260	$260	$129	$129
Feed costs saved (crossbred vs Holstein)	$7,710	$77,102				

In many ways, some of the benefits of this model are already being realized. For early adopter dairies, financial gains begin right away with lower AI and birthing costs. Improved returns continue through the sales of calves with higher beef values. For feedlots and others in the downstream beef production systems, less time spent finishing animals and greater value will result due to the production improvements gained from crossbreeding.

In addition to a clear value proposition for dairies and feedlots, there are benefits for other supply chain players as well. There is market opportunity for buyers who currently have trouble sourcing relatively uniformly sized middle meats such as ribeye, tenderloin and strip. Dairy and beef/dairy calves are produced throughout the year, allowing for a smoothing of the supply of animals. Further, given advances in genetics, the resulting calves have the likelihood of being relatively consistent in size and quality, making it easier to supply food service companies and steakhouses reliably with the cuts they want year-round, likely with increased efficiency and reduced costs for a consistent product.

Few opportunities provide wide reaching benefits across multiple supply chains like crossbreeding dairy calves to beef bulls. From immediate value created for the dairy in terms of reproductive efficiencies, to increased prices for the dairy and beef markets, crossbreeding enhances profits with resources that were already present in the market. Small, relatively inexpensive changes can have the potential to make large impacts for the dairy farmer, the beef market and for the environment.



Appendix 1: Dairy Herd Replacement

Example dairy farm herd replacement			
Lactating herd size	**150 Head**	**1,500 Head**	**9,399,000 Head (national dairy herd)[i]**
Calf-heifer culling rate (%/year)	10%	10%	10%
Average age to pregnancy (months)	14	14	14
Adult cow culling rate (% year)	35%	35%	35%
Calving interval (months)	13	13	13
Replacement heifers needed (no growth or shrink, annual)	55	553	3,467,839
Total number of calves (annual)	130	1,300	8,147,896
Excess calves (annual)	75	747	4,680,056

Appendix 2: Beef Value Calculations

	Crossbred Steer		Holstein Steer		Beef Steer	
	150 Herd Size	1,500 Herd Size	150 Herd Size	1,500 Herd Size	150 Herd Size	1,500 Herd Size
Excess calves	75	747	75	747	75	747
HCW (lb)	919	919	803	803	884	884
Prime & Choice (%)	81%	81%	58%	58%	73%	73%
Yield grade 1 & 2 (%)	39%	39%	70%	70%	41%	41%
Select price/100lb*	$217	$217	$217	$217	$217	$217
Value (no premium)	$1,996	$1,996	$1,744	$1,744	$1,920	$1,920
Total premiums/discounts	$53	$53	$29	$29	$44	$44
Value/animal	$2,049	$2,049	$1,773	$1,773	$1,964	$1,964
Total value	**$153,047**	**$1,530,474**	**$132,427**	**$1,324,269**	**$146,666**	**$1,466,655**
Difference per animal (crossbred vs Holstein)	$276	$276				
Difference all heads (crossbred vs Holstein)	$20,620	$206,205				

[i]2018 USDA nationwide data on milk cows. https://www.ers.usda.gov/data-products/dairy-data/

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