



**THE USE OF  
BEEF SIRE SEMEN  
IN DAIRY HERDS**

A PRACTICAL GUIDE

Les Producteurs  
de bovins du  
Québec





# Table of contents

<b>1. Beef Cross Calf Production .....</b>	<b>6</b>
<b>2. Markets.....</b>	<b>7</b>
The Veal Sector .....	7
The Beef Sector.....	7
Other Markets.....	8
Growth in the Number of Beef Cross Calves.....	8
Changes in the Price of Beef Cross Calves.....	9
<b>3. Reproductive Strategies .....</b>	<b>10</b>
Impact of Culling and Replacement Rates.....	10
Strategies for the Use of Beef Sire Semen .....	10
<b>4. Understanding Beef Bull Evaluation Criteria .....</b>	<b>12</b>
<b>5. Choice of Bulls Based on Size of Mothers .....</b>	<b>16</b>
Bull Selection Example .....	16
<b>6. Bovine Breed Genetics.....</b>	<b>18</b>
Homozygosity and the Absence of Horns.....	18
Crossbreeding and Hybrid Vigour.....	19
<b>7. Beef Bull Breeds.....</b>	<b>20</b>
<b>8. Examples of Common Crossbreeds .....</b>	<b>22</b>
Holstein .....	22
Other breeds (Jersey, Ayrshire, Brown Swiss...).....	22
<b>9. Fattening Beef Cross Calves .....</b>	<b>24</b>
For Beef Producers.....	24
For Veal Calf Producers.....	24
For Dairy Producers .....	24
<b>10. Decision Tree .....</b>	<b>25</b>

---

Québec's dairy operations are evolving rapidly in response to new practices and technologies. Artificial insemination, genomic selection and programs such as ProAction are all examples of their ongoing progress and adaptation.

The use of beef sire semen for the insemination of dairy cows is a new technique rapidly being adopted by the province's dairy operations. Thanks to Québec's dairy genetics and its industry's know-how, the advantages of implementing this new practice are promising. Accordingly, the PBQ (Producteurs de bovins du Québec) has invested in supporting knowledge transfer and in developing the expertise of dairy farmers as a way to leverage the potential gains of this new approach. This guide (and an accompanying video with English subtitles) was developed following considerable efforts which included information gathering, meetings with specialists, and consultations across the industry. Initiated by a handful of producers, this project was designed to open up the advantages of this new practice to all dairy farmers across Québec.

This initiative was made possible thanks to funding support from the PBQ's Cull Cattle and Dairy Calves Marketing Committee, the Québec Ministry of Agriculture, Fisheries and Food's sectoral development program, and the Canadian Agricultural Partnership.

Wishing you an insightful read,

A handwritten signature in black ink, appearing to read 'Pierre Ruest', with a long horizontal flourish extending to the right.

Pierre Ruest, Chair  
Cull Cattle and Dairy Calves Marketing Committee

---

The purpose of this guide is to offer dairy farmers tools and insight surrounding the **use of beef sire semen to inseminate dairy cows** to produce offspring for purposes other than maintaining milk production.

The guide includes details about the crossbred calf market, different strategies for the use of beef semen, and specifics about the various beef breeds and the choice of bull. It also examines a number of economic considerations.

Please note that information provided in this guide is sourced from the scientific literature as well as from the contributions of various actors from the field. Knowledge about the performance of crossbred calves is evolving rapidly. Markets are also continually in flux and crossbreeds other than those mentioned in this guide could come into demand in the coming years.

For more information about the information provided in this guide, write to us at [agencebrvl@upa.qc.ca](mailto:agencebrvl@upa.qc.ca) or contact us by phone at 450 679-0540, ext. 8482.

This guide was produced in August 2020.

# 1. Beef Cross Calf Production

Before selecting suitably adapted semen for dairy cow insemination, we must first define market expectations for the animals put to market. Seeing as beef cross calves are to be slaughtered for meat, the choice of beef semen will need to best match what is most sought after by the target market. From a feeder's perspective, the performance of calves, such as growth and feed conversion, are paramount. From the abattoir's perspective, beef cross calves must yield suitable meat quantity and quality, and this is true for both veal calves and fed steer. The best way to optimize the marketability of beef cross calves is to choose sires that can maximize their fattening potential. Raising these calves in such a way as to be profitable for buyers is essential in order to maintain strong prices for these animals.

Beef cross calves result from crossing dairy cow breeds with beef bull breeds.

Furthermore, the use of beef sire semen can also improve overall animal well-being seeing as crossbred calves are generally in better health. Hybrid vigour is to thank for this since it can reduce morbidity and mortality as the animals are fattened, that is, alongside basic care, such as the rapid administration of colostrum.

HYBRID  
VIGOUR

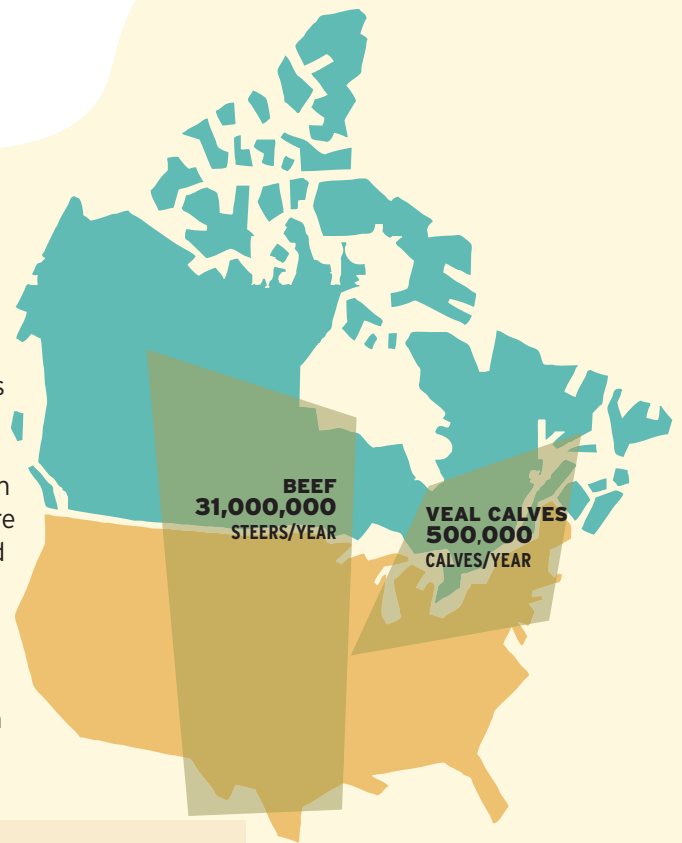
## HYBRID VIGOUR OR HETEROSIS

Biological phenomenon involving genes whereby specific characteristics of crossbred subjects are comparatively superior in relation to those of pure breeds selected for these characteristics.<sup>i</sup>

## 2. Markets

### The Veal Sector

North American veal calf production primarily takes place in Québec and the American northeast. This sector includes the production of milk-fed veal and grain-fed veal primarily from dairy calves. In North America, approximately 500,000 veal calves are produced yearly and the sector's level of demand for dairy calves depends on forecasted sales of veal. Most sought after in this sector are pure bred Holstein calves. Thanks to the benefits of hybrid vigour, beef cross calves can offer veal producers the possibility for higher meat yield, higher growth rates, and reduced morbidity.



### SEASONAL VARIATION

Demand for dairy calves is subject to seasonal supply and demand variations. This is due to increased calving during the fall season in response to high demand for dairy products. However, the demand for dairy calves over the fall season is relatively low, which generates increased supply in relation to demand. Inversely, demand spikes in the spring just as supply wanes. This is partly what explains the price variations for dairy calves throughout the year.

SEASONAL  
VARIATION

### The Beef Sector

Nearly 31 million steers are slaughtered each year in North America. This number includes beef steer breeds, dairy steer breeds and beef x dairy steer crossbreeds. Beef produced in Québec and elsewhere in Canada is sold on the North American market. Current demand for Black Angus x Holstein calves is primarily supported by feedlots raising beef cross calves, the majority of which are located in central Canada and the central United States. In light of restrictions on the number of beef cross calves that can be put to market in Québec in relation to the size of the industry, the potential impact of the province's production on overall market supply and North American beef sector prices is particularly limited. Most sought after in this sector are calves offering a good meat yield, whose coats are black, and that are free of horns.

**TRUE OR FALSE?**  
Beef cross calves  
are primarily raised  
to be fattened  
as veal calves.

**FALSE**

## Other Markets

Seeing as dairy operations with Jersey, Ayrshire, Brown Swiss and Canadienne cow breeds do not produce high volumes of calves, it becomes difficult for buyers to assemble uniform lots to be raised as veal calves or fed steer. Developing short distribution channels and supplying niche markets can offer these operations interesting recuperation opportunities. Dairy cattle breeds produce high-quality meat and offer a fairly good fattening potential when bred with beef bulls that have a high meat yield. Calves produced through these crossings can therefore offer the good conformation and performances that meet the needs of target markets as well as generate profit potential for the sector as a whole.

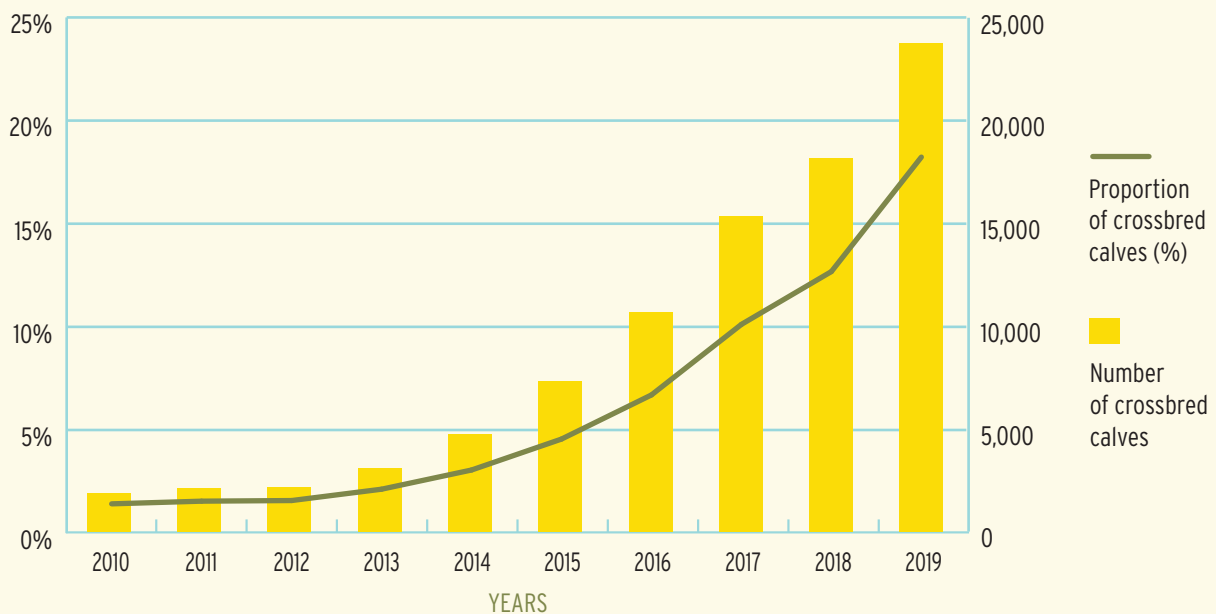
Beef cross calves with good body conformation do not exhibit hollow flanks. They have straight backs, large, short heads, and strong, large feet and legs. They also do not exhibit the angularity typical to dairy breeds. Sought-after animals will also have a healthy appearance, be clean, and have no joint or navel problems.

## Growth in the Number of Beef Cross Calves

The use of beef sire semen in dairy herds has sharply increased over the last few years. Historically, and up until 2015, its use was marginal in dairy operations. The number of crossbred calves put to market in Québec is expected to exceed 20% of market share in 2020.

GRAPH 1

Proportion of beef cross calves produced in Québec - 2010 to 2019



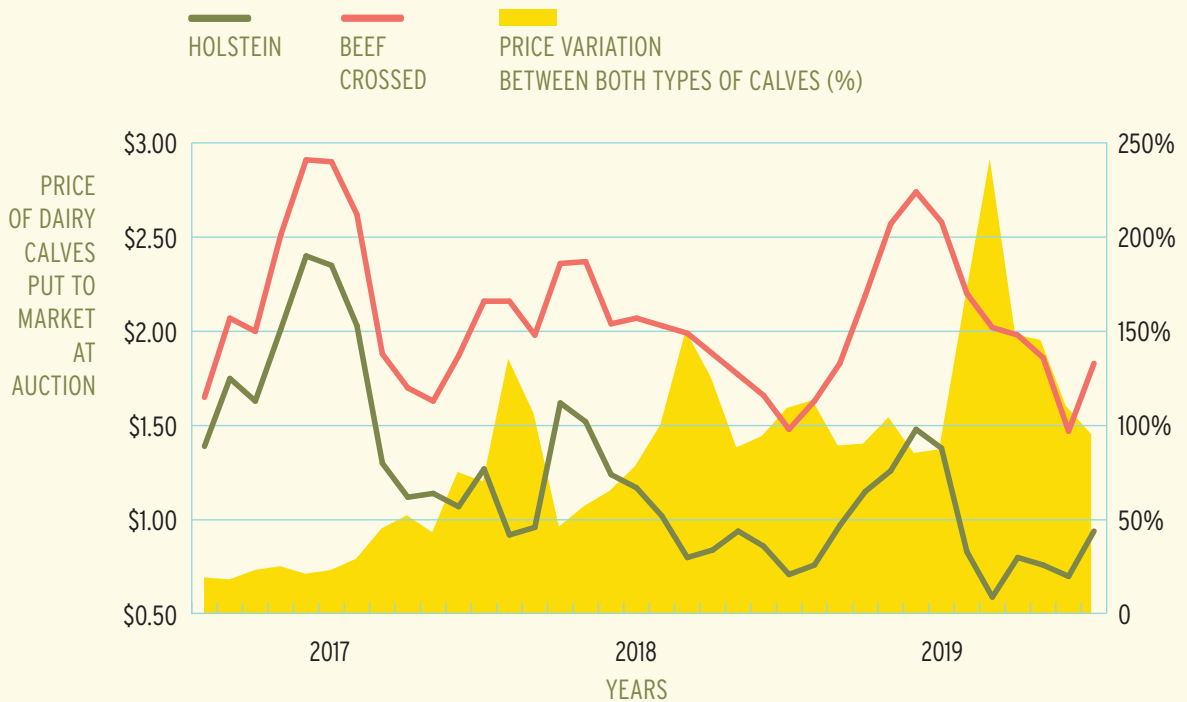


## Changes in the Price of Beef Cross Calves

Though it is difficult to predict the genetic advantage to be passed down to offspring, the choice of sires based on specific criteria helps to optimize calf potential. Though not an absolute guarantee, crossbreeding typically produces calves with a higher meat yield compared to pure bred dairy calves along with a generally better graded meat quality. However, even if crossed, some dairy calves will not develop the conformation buyers seek. The premium usually offered for beef cross calves with good body conformation will not be given to calves who lack the desired physical characteristics. As shown below in Graph 2, premiums for male Holstein beef cross calves generally fall between 50% and 150% of male purebred Holstein calves of the same weight.

### GRAPH 2

Changes in the price of dairy calves put to market at auction - 2017 to 2019



# 3. Reproductive Strategies

## Impact of Culling and Replacement Rates

An operation's dairy cattle replacement strategy is what sets the heifer calf rearing rate and directly impacts the farm's potential use of beef sire semen. Cows not contributing to producing replacement heifer calves are the best choice, as they will help improve dairy calf revenues. Producers who wish to use beef sire semen in their herds may choose to seek the help of a reproduction consultant.

## Strategies for the Use of Beef Sire Semen

A number of options are available to dairy producers once their herd maintenance strategy has been outlined. The use of beef semen can be implemented in a strictly limited fashion or can be deployed more generally. The choice is up to the producer based on the operation's needs. Presented below are a few strategies that can be adapted to meet the needs of a given farm. The rates shown are provided strictly for demonstration purposes and can be modified based on the dairy operation in question.

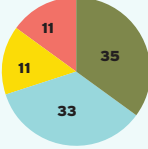
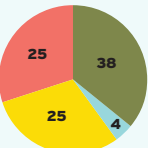
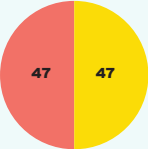
We encourage you to test out different formulas using real data from your operation. Simply drop in your numbers for each letter (A through F) and proceed with your calculations. The revenues shown are based on a replacement rate of 35%. There is no need to include heifers in your count since calvings from this group will compensate for the interval between calvings from cows over a year. Mortality for both types of calves was based on real farm data from Québec for 2018 to 2019. During this period, the survival rate of Holstein calves in the province was approximately 93.7% whereas the rate for beef cross Holstein calves was 94% (data obtained from Lactanet). The average auction sale price in 2019 for each calf category – \$2.07/live weight lb for beef cross calves and \$0.97/live weight lb for Holstein calves – is included strictly for illustrative purposes. Refer to the PBQ website's Price-Info section for current prices.

Price of semen used		Average weight of calves at time of sale (E):	lb
Conventional dairy (A):	\$	Number of cows (F):	cows
Sexed dairy (B)	\$	Average dairy calf revenues from 2019:	
Conventional beef (C):	\$	Beef crossed: \$2.07/lb	
Sexed beef (D)	\$	Holstein: \$0.97/lb	

It is also possible to use sexed beef semen to produce male beef cross calves. This semen is generally more expensive but male calves generally go for a better price than female calves. Depending on how your operation is geared, the use of sexed semen can be a smart choice which helps justify its higher cost.

**TABLE 1**

**Different Beef Sire Semen Usage Strategies in Milk Production**

		Calves obtained, including mortality																			
<p>■ <b>75% dairy semen</b> ■ <b>25% beef semen</b></p> <p>Use of beef semen to inseminate the last quarter of the dairy herd. The rest of the herd is inseminated with conventional dairy semen. Only cows with less performant genetics will be used to produce cross calves.</p>	<p>■ Dairy females ■ Dairy males ■ Beef females ■ Beef males</p> 																				
		<p><b>Dairy semen and beef semen – operational revenues:</b></p> <table border="1"> <tr> <td>Purebred dairy calf sales (excluding replacement cattle)</td> <td><math>0.4 \times (F) \times (E) \times \\$0.97/\text{lb} \times 0.937</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Sale of cross calves (50% male/50% female)</td> <td><math>0.25 \times (F) \times (E) \times \\$2.07/\text{lb} \times 0.940</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of dairy semen</td> <td><math>0.75 \times (F) \times (A) \times 2 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of beef semen</td> <td><math>0.25 \times (F) \times (C) \times 2 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td><b>Total</b></td> <td><b>Sales - Purchases</b></td> <td>=</td> <td><b>\$</b></td> </tr> </table>		Purebred dairy calf sales (excluding replacement cattle)	$0.4 \times (F) \times (E) \times \$0.97/\text{lb} \times 0.937$	=	\$	Sale of cross calves (50% male/50% female)	$0.25 \times (F) \times (E) \times \$2.07/\text{lb} \times 0.940$	=	\$	Purchase of dairy semen	$0.75 \times (F) \times (A) \times 2 \text{ doses}$	=	\$	Purchase of beef semen	$0.25 \times (F) \times (C) \times 2 \text{ doses}$	=	\$	<b>Total</b>	<b>Sales - Purchases</b>
Purebred dairy calf sales (excluding replacement cattle)	$0.4 \times (F) \times (E) \times \$0.97/\text{lb} \times 0.937$	=	\$																		
Sale of cross calves (50% male/50% female)	$0.25 \times (F) \times (E) \times \$2.07/\text{lb} \times 0.940$	=	\$																		
Purchase of dairy semen	$0.75 \times (F) \times (A) \times 2 \text{ doses}$	=	\$																		
Purchase of beef semen	$0.25 \times (F) \times (C) \times 2 \text{ doses}$	=	\$																		
<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>																		
<p>■ <b>45% sexed dairy semen</b> ■ <b>55% beef semen</b></p> <p>Another strategy is to use sexed dairy semen to produce replacement cattle and beef semen for the rest of the dairy herd. More than half of farm-born dairy calves will therefore be beef crossed.</p>	<p>■ Dairy females ■ Dairy males ■ Beef females ■ Beef males</p> 																				
		<p><b>Sexed dairy semen and beef semen – operational revenues :</b></p> <table border="1"> <tr> <td>Purebred dairy calf sales (excluding replacement cattle)</td> <td><math>0.1 \times (F) \times (E) \times \\$0.97/\text{lb} \times 0.937</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Sale of cross calves (50% male/50% female)</td> <td><math>0.55 \times (F) \times (E) \times \\$2.07/\text{lb} \times 0.940</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of sexed dairy semen</td> <td><math>0.45 \times (F) \times (B) \times 2.5 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of beef semen</td> <td><math>0.55 \times (F) \times (C) \times 2 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td><b>Total</b></td> <td><b>Sales - Purchases</b></td> <td>=</td> <td><b>\$</b></td> </tr> </table>		Purebred dairy calf sales (excluding replacement cattle)	$0.1 \times (F) \times (E) \times \$0.97/\text{lb} \times 0.937$	=	\$	Sale of cross calves (50% male/50% female)	$0.55 \times (F) \times (E) \times \$2.07/\text{lb} \times 0.940$	=	\$	Purchase of sexed dairy semen	$0.45 \times (F) \times (B) \times 2.5 \text{ doses}$	=	\$	Purchase of beef semen	$0.55 \times (F) \times (C) \times 2 \text{ doses}$	=	\$	<b>Total</b>	<b>Sales - Purchases</b>
Purebred dairy calf sales (excluding replacement cattle)	$0.1 \times (F) \times (E) \times \$0.97/\text{lb} \times 0.937$	=	\$																		
Sale of cross calves (50% male/50% female)	$0.55 \times (F) \times (E) \times \$2.07/\text{lb} \times 0.940$	=	\$																		
Purchase of sexed dairy semen	$0.45 \times (F) \times (B) \times 2.5 \text{ doses}$	=	\$																		
Purchase of beef semen	$0.55 \times (F) \times (C) \times 2 \text{ doses}$	=	\$																		
<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>																		
<p>■ <b>100% beef semen</b></p> <p>Producers that do not raise their own replacement cattle inseminate all their cows with beef semen. All dairy calves are beef crossed. This strategy requires the purchase of replacement cattle for the herd.</p>	<p>■ Beef females ■ Beef males</p> 																				
		<p><b>100% beef semen – operational revenues:</b></p> <table border="1"> <tr> <td>Sale of cross calves (50% male/50% female)</td> <td><math>(F) \times (E) \times \\$2.07/\text{lb} \times 0.940</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of semen</td> <td><math>(F) \times (C) \times 2 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td><b>Total</b></td> <td><b>Sales - Purchases</b></td> <td>=</td> <td><b>\$</b></td> </tr> </table>		Sale of cross calves (50% male/50% female)	$(F) \times (E) \times \$2.07/\text{lb} \times 0.940$	=	\$	Purchase of semen	$(F) \times (C) \times 2 \text{ doses}$	=	\$	<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>						
Sale of cross calves (50% male/50% female)	$(F) \times (E) \times \$2.07/\text{lb} \times 0.940$	=	\$																		
Purchase of semen	$(F) \times (C) \times 2 \text{ doses}$	=	\$																		
<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>																		
<p><b>100% sexed beef semen – operational revenues:</b></p> <table border="1"> <tr> <td>Sale of calves (90% male/10% female)</td> <td><math>(F) \times (E) \times \\$2.34/\text{lb} \times 0.940</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of semen</td> <td><math>(F) \times (D) \times 2.5 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td><b>Total</b></td> <td><b>Sales - Purchases</b></td> <td>=</td> <td><b>\$</b></td> </tr> </table>		Sale of calves (90% male/10% female)	$(F) \times (E) \times \$2.34/\text{lb} \times 0.940$	=	\$	Purchase of semen	$(F) \times (D) \times 2.5 \text{ doses}$	=	\$	<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>								
Sale of calves (90% male/10% female)	$(F) \times (E) \times \$2.34/\text{lb} \times 0.940$	=	\$																		
Purchase of semen	$(F) \times (D) \times 2.5 \text{ doses}$	=	\$																		
<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>																		
<p><b>100% conventional Holstein semen – operational revenues:</b></p> <table border="1"> <tr> <td>Calf sales (excluding replacement cattle)</td> <td><math>0.65 \times (F) \times (E) \times \\$0.97/\text{lb} \times 0.937</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td>Purchase of semen</td> <td><math>(F) \times (A) \times 2 \text{ doses}</math></td> <td>=</td> <td>\$</td> </tr> <tr> <td><b>Total</b></td> <td><b>Sales - Purchases</b></td> <td>=</td> <td><b>\$</b></td> </tr> </table>		Calf sales (excluding replacement cattle)	$0.65 \times (F) \times (E) \times \$0.97/\text{lb} \times 0.937$	=	\$	Purchase of semen	$(F) \times (A) \times 2 \text{ doses}$	=	\$	<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>								
Calf sales (excluding replacement cattle)	$0.65 \times (F) \times (E) \times \$0.97/\text{lb} \times 0.937$	=	\$																		
Purchase of semen	$(F) \times (A) \times 2 \text{ doses}$	=	\$																		
<b>Total</b>	<b>Sales - Purchases</b>	=	<b>\$</b>																		

## 4. Understanding Beef Bull Evaluation Criteria

Meat from pure breed dairy cattle is naturally marbled. Growth characteristics are therefore to be considered before meat quality since conformation, meat yield, and growth are the primary shortcomings of fed breeds. Beef bulls chosen for dairy cow insemination must have good genetic potential in terms of weight gain performance in order to compensate for the low meat yield of dairy cattle breeds.

**Dairy breeds** = good degree of marbling and lesser carcass conformation

**Beef breeds** = higher yield and greater carcass conformation

Seeing as there is much more uniformity among dairy breeds than among beef breeds, it becomes all the more important to consider the right performance criteria when time comes to inseminate a dairy cow with beef sire semen. The goal is to maximize the fattening potential of beef cross calves all while limiting the impact on the health of the cows as a lengthy gestation or the delivery of a large calf can cause calving complications. A difficult birth can impede production during early lactation and can affect future reproductive performance.

In cattle production, estimates of sires' genetic potential can be estimated using EPD, a measure comparable to Estimated Breeding Values in dairy production. Bull EPDs are calculated for a number of important traits and also account for, among others, their inheritability and the performance of the bull and its relatives and descendants. EPDs allow us to rank the genetic potential of a given bull in relation to its breed and to predict the improvements to be passed on to its progeny. A bull with an EPD above zero is not necessarily a proven sire. To ascertain this, its EPD must be compared to the average among others of the same breed, often called the "breed average."

Since the genetic assessment program of each beef breed association has its own selection criteria and its own specific bases of comparison, it is not possible to make comparisons across beef breeds using EPDs (see Section 7 for comparable beef breed traits). Though EPDs were initially designed to estimate performance improvements within each beef cattle breed, bull EPDs are also useful to dairy producers when seeking better control of their crossbreeding program. By observing the results achieved from a dairy producer's first beef cross calf cohorts, it becomes easier to identify what needs to be improved upon first, and EPDs therefore become a particularly useful basis of reference to achieve desired results and subsequently produce high-quality calves without compromising calving ease for the mothers.

**TRUE OR FALSE?**

**Angus crossings never cause calving problems.**

**FALSE**

Expected Progeny Difference (EPD) is an estimate measure of the difference between the performance of an individual's descendants for a given trait and the average performance of its breed's reference descendants.

The EPDs described below are generally obtainable and are useful when choosing a beef bull for dairy cow insemination. The higher up on the list, the more important the EPD is in the bull selection process.

### TRUE OR FALSE

**Cows served with beef semen will encounter problems after calving.**

**FALSE**

**Calving Ease (%):** ease with which the bull's calves are born to heifers in relation to the breed average. This trait is a function of, among others, the weight and conformation of the calves.<sup>xi</sup> This score is important in dairy production since difficult calvings have an impact on cows' productivity and health.

The importance of calving ease cannot be understated when choosing a bull. Difficult calvings can give rise to veterinarian costs, calf death, and reduced dietary intake. They can also impede re-breeding. The number of difficult calvings can increase when using large beef breeds, in particular due to the birth weight of the calves. In the context of dairy production, bulls that contribute to difficult calvings should never be used, not least when it comes to heifer insemination. The use of beef semen is not the cause of health issues among dairy cows per se, but rather the use of semen that was not appropriately selected for dairy cattle.

Calving ease can vary greatly within a single breed. This is why this criterion must be carefully considered. Choosing bull semen with a high calving ease score reduces the likelihood of the cow having calving difficulties.

**Therefore, in order to support calving ease, it is important to choose a beef bull that is well adapted to the size and parity of your female cattle. Calving ease should be taken into consideration when choosing semen, particularly when time comes to serve a heifer.**

**Birth weight (lb):** expected difference between the average birth weight of a bull's calves and the breed average.<sup>i</sup> Higher weights can potentially lead to calving complications. Further, whereas this is not done in cattle production, dairy cows are fed a special pre-calving diet which can lead to rapid weight gain for the calf during the final days of gestation. Birth weight is a major consideration, particularly for heifers and smaller breeds which both run a higher risk of complications when calves are large in size. An average score is preferable to ensure a low probability of calving complications while also producing calves of sufficient weight for buyers at auction. Indeed, if birth weight is particularly low, producers will obtain a less interesting price at auction compared to another calf of the same age. Calf weights sought after by buyers range from 90 to 120 lb.

**The size of the female is an important aspect when it comes to finding a bull that will produce calves of appropriate weight.**

**Yearling Weight (lb):** a calf's inherent capacity to grow over the first year of its life, expressed as a unit of weight.<sup>i</sup> A higher score in relation to its breed is desirable as it indicates good growth potential for calves at the feedlot, which can compensate for the lesser potential of dairy breeds in this respect. The yearling weight EPD is useful to assess calf growth potential.

**Look for a bull with a high yearling weight EPD.**

**Meat yield (%):** a calf's lean meat yield capacity in relation to the breed average. This trait is measured based on rib eye area and backfat thickness. A higher value is preferable in that it can compensate for the lower meat yield of dairy breeds. When this EPD is not obtainable for a given breed, EPDs for rib eye area and backfat thickness are good surrogate indicators for lean meat yield.

**Look for a bull with a high meat yield.**

**Height (inches):** When available for a bull, the height EPD can be used to estimate the expected difference between the hip height of a bull's calves and that of the breed average. Frame score is another bull height indicator. It is calculated from the animal's hip height and the age of the animal at the time the measure is taken. Frame scores range from 1 to 9. The taller the animal, the higher the score.

The height of bulls used will have a significant impact on the revenues of dairy producers and feeders. A tall cow will need to be inseminated with the semen of a bull of average height in order to avoid penalties at the abattoir.

**Look for a bull whose height is appropriate for the mother.**

## HEIGHT

This trait is particularly important for Holsteins because of the tallness of Holstein females. Some abattoirs penalize animals whose height exceeds 58 inches since they slow down slaughter lines and can be prone to contamination from coming into contact with the floor. It is wiser to choose bulls whose frame score is less than 6 or 6.25 to ensure they don't exceed limits set by the abattoir.

HEIGHT

**Rib eye area (square inches):** the rib eye area capacity of a bull's calves in relation to the breed average. This measure is an indicator of the quantity of muscle on the carcass. A higher rib eye area EPD indicates a better potential to produce calves with carcasses with a high lean meat yield.

**Look for a higher score for this EPD.**

**Marbling (%):** a calf's capacity to produce quality meat in relation to the breed average. Marbling is an indicator of the amount of intramuscular fat which translates into meat that has more juiciness and flavour. This EPD allows for better grading at the abattoir and thereby represents a premium for the feeder. Breeds with a high degree of marbling generally yield less meat, much like dairy breeds. The choice of bull must therefore seek to increase the meat yield without compromising the degree of marbling. Diet has a significant impact on the amount of intramuscular fat.

**Look for a bull with a moderate to high marbling score.**

## Gestation Length

When a bull's associated gestation length is available, it is advisable to compare it to that of the cow to be inseminated. Since gestation length in beef breeds is typically longer than the most commonly used dairy breeds, gestation can extend up to a week longer when crossing these breeds.

A longer gestation means fewer productive days for the cow which translates poorly, economically speaking, for the dairy operation. The calf's birth weight will also tend to be higher. Testing beef bulls in dairy herds allows producers to determine whether gestation length is impacted by the crossing, particularly since we know that males generally affect this trait more predominantly. A heifer's first calving will generally involve a shorter gestation as well as involve more difficulty.<sup>ii</sup> Table 2 presents gestation length for Holstein cows based on the bull breed used. You'll see how some breeds are associated with longer than average gestation lengths.

If you have access to this information, you'll have the advantage of choosing beef bulls associated with shorter gestation lengths.

**Average gestation length for different BEEF BREEDS (data supplied by Lactanet)**

Breed	Average gestation length (in days) for Holstein crosses (Québec, 2018-2019)
Black Angus	279
Red Angus	281
Hereford	282
Belgian Blue	282
Simmental	283
Charolais	284
Limousin	285

**Average gestation length for different DAIRY BREEDS (data supplied by Lactanet)**

Breed	Average pure breed gestation length in days (Québec, 2018-2019)
Ayrshire	282
Canadienne	282
Guernsey	284
Holstein	279
Jersey	279
Dairy Shorthorn	282
Brown Swiss	287

Certain semen suppliers have test data from beef bull and dairy cattle crossings. These results are usually available (sometimes on request) and are easier to use than EPDs since they explicitly involve Holstein crossings. Producers can learn more about this from their reproduction consultant.

TABLE 2

TABLE 3

## 5. Choice of Bulls Based on Size of Mothers

The table below outlines the key aspects to bear in mind for a heifer’s first pregnancy as opposed to subsequent ones. Calving ease is considered less of an issue for multiparous mothers namely because they have reached their full-grown height. Dairy breeds naturally offer good quality marbling and, though this is a desirable trait, it is not a key consideration when choosing a beef bull.

**Key Considerations when Choosing Beef Sire Semen**

Heifers	Cows
1. Calving safety (calving ease, birth weight)	1. Rapid growth (yearling weight, meat yield, rib eye area)
2. Rapid growth (yearling weight, meat yield, rib eye area)	2. Calving safety (calving ease, birth weight)
3. Meat quality (marbling)	3. Meat quality (marbling)

### Bull Selection Example\*

In the following tables, the first row of data shows the bull’s EPD score. For every trait, we see the expected difference between the performance of the bull’s progeny and the average performance of reference descendants of its breed. The second row shows the breed average. By comparing rows 1 and 2, the bull’s score can therefore be compared to the breed average. The third row shows the bull’s percentile rank among its breed for each trait. A score of 1 is excellent while a score of 99 indicates that the bull does not carry much potential for the trait in question.

■ 1 to 30 / ■ 31 to 70 / ■ 71 to 99

\* In an effort to shorten the genetic profile descriptions of the bulls in this section (shown below each table), performance scores for each trait are shown as being associated with the bulls themselves even if these performances are in fact associated with their progeny.

#### BULL A

	Calving Ease (CE)	Birth Weight (BW)	Yearling Weight (YW)	Rib Eye Area (REA)	Lean Meat Yield (LY)	Marbling (MARB)
EPD	+7,0	+0.9	+143	+0.60	63	+0.49
Breed average	+3,1	+2.2	+80	+0.41	33	+0.35
TOP % ranking	20	20	1	15	1	20

In this example, the calving ease of Bull A is greater than its breed average, ranking it among the top 20% of its breed for this trait. Also, the birth weight of calves from this bull is 1.3 lb lighter than the breed average, which should minimize calving difficulties. This bull has an excellent lean meat yield score. Its marbling score is also good, and the rib eye area score is higher than the average. This bull appears well suited for a dairy cow or an average height heifer. Calves from this bull should also perform well in terms of fattening in light of their particularly high yearling weight and their very strong potential in terms of meat quantity and quality.

**GOOD CHOICE FOR A COW OR FOR A HEIFER**



## ➤ BULL B

	Calving Ease (CE)	Birth Weight (BW)	Yearling Weight (YW)	Rib Eye Area (REA)	Lean Meat Yield (LY)	Marbling (MARB)
EPD	+6,0	+0.4	+44	+0.29	-6	+0.58
Breed average	+3,1	+2.2	+80	+0.41	33	+0.35
TOP % ranking	25	15	95	70	99	10

Due to its calving ease and birth weight scores, Bull B is also an interesting candidate. However, its yearling weight, meat yield, and rib eye area show scores that fall below the breed average. Calves from this bull will have a lower lean meat yield. Seeing as beef cross calves are raised for meat, this bull would not be the best choice in a dairy herd.

**✗ NOT A RECOMMENDED CHOICE**

## ➤ BULL C

	Calving Ease (CE)	Birth Weight (BW)	Yearling Weight (YW)	Rib Eye Area (REA)	Lean Meat Yield (LY)	Marbling (MARB)
EPD	+5,0	+3.1	+146	+1.03	91	+0.36
Breed average	+3,1	+2.2	+80	+0.41	33	+0.35
TOP % ranking	35	70	1	1	1	40

As opposed to Bull B, Bull C has an excellent meat yield score, yet its high birth weight score could lead to calving complications. Since dairy cows receive a special pre-calving diet and seeing as minimizing calving complications is important to preserve the cow's health, this bull should never be used for a female's first two pregnancies. This bull's calving ease score is average, which represents an acceptable level of risk for multiparous cows.

**✓ GOOD CHOICE FOR A MULTIPAROUS COW**

**✗ NOT RECOMMENDED FOR A HEIFER**

In Québec, you can get help with beef bull EPD interpretation from members of the Groupe Bovi-Expert consultant team. You can find these consultants through regional Agriconseil networks.

### TRUE OR FALSE?

All beef bulls produce quality beef cross calves.

**FALSE**

# 6. Bovine Breed Genetics

## Homozygosity and the Absence of Horns

Typically, more than one gene is involved in how a genetic trait is expressed, but this is not the case when it comes to the absence of horns, a trait expressed through a single gene. The phenotype for this trait depends on the genetic makeup of both parents which each pass on one allele to their progeny (P or p). As the absence of horns is a dominant trait, any animal with at least one P allele will not grow horns (otherwise known as being polled). As such, if the mother or father is homozygous polled (PP), calves will also be polled. Even if a heterozygous bull (Pp) is polled, some of its descendants may be horned (pp). The choice of homozygous bulls is therefore important if one seeks to produce polled calves. As shown in Table 5, the proportion of polled calves will differ based on their parents' genotype.

In beef production, polled cattle are those that are sought after. This is not the case in veal production since calves are slaughtered at a younger age. Polled cattle are preferable in that they run much less risk in terms of injuring one another, injuries that can impact the quality of carcasses and represent economic losses. Ensuring that calves are polled means either choosing homozygous polled bulls or otherwise dehorning or disbudding calves. Since the polled trait is dominant, genetic selection is the easiest way to ensure that calves are polled.

An animal may be homozygous for other traits, including colour. It is therefore possible to choose a homozygous black bull. However, this trait depends on a number of genes and genetic phenomena and can be expressed in various ways, such as the black-red coats of Jerseys-Black Angus crosses. The absence of horns and black coats are two traits sought after by steer buyers. Calves that are not entirely black are penalized at auction.

GENETICS 101

### GENETICS 101

**Alleles:** all the possible forms of a single gene

**Phenotype:** observable traits of an individual, conditioned by its genotype and living environment

**Genotype:** an organism's complete genetic information

**Polled:** bull with a hornless phenotype. Using a polled sire is not a guarantee that descendants will also be hornless. Only genotyped bulls who are confirmed homozygous polled can reliably produce polled calves. A heterozygous polled bull has a 50% chance of producing horned calves if the mother is horned.

TABLE 5

**Proportion of polled calves per genotype and phenotype of genitors**

	Genotype	Polled bull		Horned bull
		Homozygous (PP)	Heterozygous (Pp)	Horned (pp)
Polled cow	Homozygous (PP)	100%	100%	100%
	Heterozygous (Pp)	100%	75%	50%
Horned cow	Horned (pp)	100%	50%	0%

The Angus breed is the only one widely used for crossbreeding as all individuals from this breed are polled. Though bulls of other breeds may be polled, they must be homozygous for this trait in order to produce polled calves.

It is best to choose a bull known to be homozygous polled.

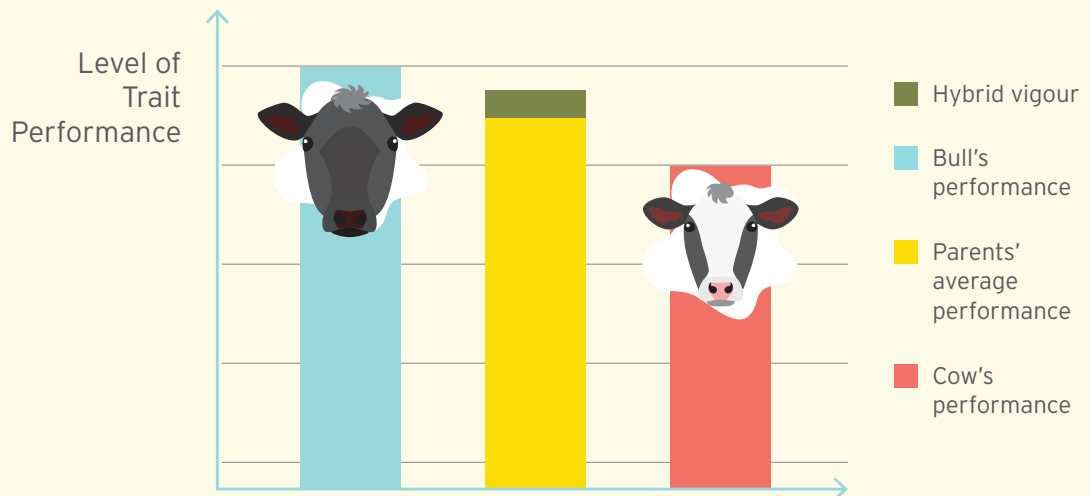
## Crossbreeding and Hybrid Vigour

For certain traits, the performance of animals produced from crossing two breeds will score higher than their parents' average. By choosing bulls with a high potential for growth and meat yield, producers can obtain beef cross calves with a higher potential for these traits than their parents. A calf's vigorousness, resistance to illnesses, growth rate, and calving ease are all improved thanks to hybrid vigour. Crossbreeding can therefore generate gains in productivity from birth to slaughter for the whole of this new sector.

Producers should maximize the advantages of hybrid vigour when selecting a bull for the production of fed calves.

**Illustration of a beef cross calf's hybrid vigour. Hybrid vigour refers to the improved performance of calves in relation to the average performance of their parents.**

FIG. 1



## 7. Beef Bull Breeds



When looking for a bull, it quickly becomes apparent how beef cattle breeds outnumber dairy cattle breeds. Breed characteristics also differ widely, making the choice more complex. Some breeds are polled, others have a greater degree of marbling, while others offer an excellent lean meat yield. What's more, within any one breed, you can find different lineages with particular traits which produce significant performance variations for any given trait. For example, the Black Angus breed includes lineages with a high potential for growth and others that are specialized in the production of good breeding females. Some bulls are therefore not suited to maximize conformation of crossed calves to be put to market.

It is important to choose the relevant traits when it comes to producing calves that will meet the needs of the market. Beef breeds have the potential to improve the conformity of dairy calf carcasses as well as these calves' potential for growth.

Find below the traits suitable for fattening the main beef breeds used to inseminate dairy cows in Québec.<sup>iii</sup>

**Breeds Widely Used for Crossbreeding**

**TABLE 6**

Breed	Breed traits	Bull characteristics to check
 <b>Black Angus<sup>iv</sup></b>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• Average height</li> <li>• Polled</li> <li>• Feed efficient</li> <li>• High degree of marbling</li> <li>• Tendency for backfat deposition</li> <li>• Uniform black coat</li> <li>• Hardy</li> </ul>	<ul style="list-style-type: none"> <li>• Meat yield</li> <li>• Rib eye area</li> <li>• Growth</li> </ul>
 <b>Belgian Blue<sup>v</sup> or British Blue<sup>vi</sup></b>	<ul style="list-style-type: none"> <li>• Very high meat yield</li> <li>• Average height</li> <li>• Rapid growth</li> <li>• Lean meat</li> <li>• Low quantity of backfat</li> </ul>	<ul style="list-style-type: none"> <li>• Calving ease</li> <li>• Birth weight</li> <li>• Homozygous polled</li> </ul>






### COMMERCIAL CROSSBREDS (HYBRIDS)

Hybrids can also pass down beneficial traits to their descendants. Bull crossbreeds such as Simmental x Angus (Sim-Angus) or Limousin x Angus (Lim-Flex) can be interesting choices if they have the relevant complementary traits. Potential for growth and body conformation of Simmental and Limousin breeds, and the meat quality of Angus breeds, are all characteristics feeders and abattoirs look for. Hybrids are not, however, recommended when it comes to inseminating heifers.

**HYBRIDS**

# TABLE 7

**Other Breeds with Crossbreeding Potential**

Breed	Breed traits	Bull characteristics to check
 <p><b>Red Angus<sup>iv</sup></b></p>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• Average height</li> <li>• Polled</li> <li>• Feed efficient</li> <li>• High degree of marbling</li> <li>• Tendency for backfat deposition</li> <li>• Hardy</li> </ul>	<ul style="list-style-type: none"> <li>• Meat yield</li> <li>• Rib eye area</li> <li>• Growth</li> </ul>
 <p><b>Charolais<sup>iv</sup></b></p>	<ul style="list-style-type: none"> <li>• Very high meat yield</li> <li>• Average to above-average height</li> <li>• Rapid growth</li> <li>• Beef conformation</li> <li>• Lean meat</li> <li>• Low degree of backfat</li> </ul>	<ul style="list-style-type: none"> <li>• Calving ease</li> <li>• Birth weight</li> <li>• Gestation length</li> <li>• Homozygous polled</li> </ul>
 <p><b>Hereford<sup>iv</sup></b></p>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• Average height</li> <li>• Feed efficient</li> <li>• High degree of marbling</li> <li>• Hardy</li> </ul>	<ul style="list-style-type: none"> <li>• Growth</li> <li>• Homozygous polled</li> </ul>
 <p><b>Limousin<sup>iv</sup></b></p>	<ul style="list-style-type: none"> <li>• Very high meat yield</li> <li>• Average height</li> <li>• Rapid growth</li> <li>• Lean meat</li> <li>• Beef conformation</li> </ul>	<ul style="list-style-type: none"> <li>• Gestation length</li> <li>• Homozygous polled</li> </ul>
 <p><b>Simmental<sup>iv</sup></b></p>	<ul style="list-style-type: none"> <li>• High meat yield</li> <li>• Above-average height</li> <li>• Rapid growth</li> <li>• Beef conformation</li> <li>• Feed efficient</li> </ul>	<ul style="list-style-type: none"> <li>• Calving ease</li> <li>• Birth weight</li> <li>• Gestation length</li> <li>• Homozygous polled</li> </ul>

The market availability and variety of beef sire semen vary per bull breed.

## Other Breeds

Other beef cattle breeds – such as Blonde d’Aquitaine, Galloway, Gelbvieh, Highland, Maine-Anjou, Parthenais, Piemontese, Salers, Shorthorn, Speckle Park, etc. – carry a variety of traits and could prove interesting choices. At this time, however, these breeds are less frequently used for crossbreeding with dairy cattle. The Wagyu breed, known for its high degree of marbling, has its own niche market but is not a good choice for sale since this cross-breed is not identifiable at auction.

### TRUE OR FALSE?

**Belgian Blue crossbreeds always present problems.**

**FALSE**

## 8. Examples of Common Crossbreeds

As noted earlier, the choice of bull merits careful consideration. Though breed is an important aspect to keep in mind, a bull's genetic assessment data (EPDs) is the best way to minimize calving difficulties and maximize calf fattening potential.

### Holstein

With Black Angus: This crossing is highly sought after by steer producers but also by veal calf producers. These calves are therefore in demand at auction. Crossings produce black, polled animals with ample marbling. Meat yield is not as high as other crossbreeds, but carcasses generally get a good grading from abattoirs due to the quality of their meat.

With Sim-Angus or Lim-Flex hybrids: This type of crossing aims to strike a balance between the high quantity of meat of Simmental and Limousin breeds and the marbling of Angus meat. Some American feedlots choose Sim-Angus and Lim-Flex bulls to produce beef cross calves with the traits they seek.

With Belgian Blue or British Blue: This type of crossing produces progeny with high yields of lean meat. Since this meat is less marbled, it is less highly graded by Canadian beef grading standards, but the meat yield is particularly high. Veal producers are particularly interested by this type of crossbreed. In order to minimize calving difficulties, it is best to choose a bull with a high calving ease score. The British Blue lineage comes from a selection of Belgian Blue breed individuals that produce calves that are easier to deliver and whose gestation is shorter.

#### Advantages of Holstein x Beef Breeds

TABLE 8



Breed of the mother	Breed of the bull (in order of suitability for crossings)	Bull breed aspects of interest	Important characteristics
Holstein	Black Angus	<ul style="list-style-type: none"> <li>Increases meat yield</li> <li>High degree of marbling</li> <li>Polled</li> </ul>	<ul style="list-style-type: none"> <li>Good calving ease</li> <li>Short gestation length</li> <li>High meat yield</li> <li>Strong growth</li> <li>Good beef conformation</li> <li>Moderate height</li> <li>Polled</li> <li>Favour a black coat for auction</li> </ul>
	Hybrid (Sim-Angus, Lim-Flex, ...)	<ul style="list-style-type: none"> <li>Increases meat yield</li> <li>High degree of marbling</li> </ul>	
	Belgian Blue, British Blue	<ul style="list-style-type: none"> <li>Greatly increases meat yield</li> </ul>	
	Charolais, Limousin, Simmental	<ul style="list-style-type: none"> <li>Greatly increases meat yield</li> <li>Rapid growth</li> </ul>	
	Red Angus, Hereford	<ul style="list-style-type: none"> <li>Increases meat yield</li> <li>High degree of marbling</li> </ul>	

### Other breeds (Jersey, Ayrshire, Brown Swiss...)

With Belgian Blue or British Blue: Much like Holstein crossings, these crossbreeds are in keeping with the principle of hybrid vigour, as the meat yield and growth rate is vastly improved. It is important to choose a bull with a good calving ease score. The British Blue lineage was created to improve the Belgian Blue breed's calving ease and reduce its gestation length.

With Sim-Angus or Lim-Flex hybrids: Much like Holstein crossings, these crossbreeds seek to strike a balance between the meat yield of Simmental and Limousin breeds and the degree of marbling of Angus meat. In Québec, this type of crossing can produce calves that can prove interesting for farm-based feedlots or for direct sale of calves to feeders.

**TABLE 9**

**Advantages of Crossing Different Beef Breeds with Other Dairy Breeds**



Breed of the mother	Breed of the bull (in order of suitability for crossings)	Breed aspects of interest	Important characteristics for bull selection
<b>Jersey</b>	Limousin	<ul style="list-style-type: none"> <li>• Greatly increases the meat yield</li> <li>• Rapid growth</li> <li>• Moderate height</li> </ul>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• Short gestation length</li> <li>• Very high meat yield</li> <li>• Strong growth</li> <li>• Good beef conformation</li> <li>• Polled</li> </ul>
	Belgian Blue, British Blue	<ul style="list-style-type: none"> <li>• Greatly increases lean meat yield</li> </ul>	
	Hybrid (Sim-Angus, Lim-Flex, ...)	<ul style="list-style-type: none"> <li>• Increases meat yield</li> <li>• High degree of marbling</li> </ul>	
	Charolais, Simmental	<ul style="list-style-type: none"> <li>• Greatly increases meat yield</li> <li>• Rapid growth</li> </ul>	
	Black Angus, Red Angus, Hereford	<ul style="list-style-type: none"> <li>• Increases meat yield</li> <li>• High degree of marbling</li> </ul>	
<b>Ayrshire</b>	Belgian Blue, British Blue, Limousin	<ul style="list-style-type: none"> <li>• Greatly increases lean meat yield</li> </ul>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• Short gestation length</li> <li>• High meat yield</li> <li>• Strong growth</li> <li>• Good beef conformation</li> <li>• Moderate height</li> <li>• Polled</li> </ul>
	Black Angus, Red Angus, hybrid (Sim-Angus, Lim-Flex, ...)	<ul style="list-style-type: none"> <li>• Increases meat yield</li> <li>• High degree of marbling</li> </ul>	
	Charolais, Simmental	<ul style="list-style-type: none"> <li>• Greatly increases meat yield</li> <li>• Rapid growth</li> </ul>	
	Hereford	<ul style="list-style-type: none"> <li>• Increases meat yield</li> </ul>	
<b>Brown Swiss</b>	Belgian Blue, British Blue	<ul style="list-style-type: none"> <li>• Greatly increases lean meat yield</li> </ul>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• High meat yield</li> <li>• Strong growth</li> <li>• Good beef conformation</li> <li>• Moderate height</li> <li>• Polled</li> </ul>
	Black Angus, hybrid (Sim-Angus, Lim-Flex, ...)	<ul style="list-style-type: none"> <li>• Increases meat yield</li> <li>• High degree of marbling</li> </ul>	
	Limousin	<ul style="list-style-type: none"> <li>• Increases lean meat yield</li> </ul>	
	Charolais, Simmental	<ul style="list-style-type: none"> <li>• Greatly increases meat yield</li> <li>• Rapid growth</li> </ul>	
	Red Angus, Hereford	<ul style="list-style-type: none"> <li>• Increases meat yield</li> </ul>	
<b>Other Breeds</b>	Black Angus, Red Angus, hybrid (Sim-Angus, Lim-Flex, ...)	<ul style="list-style-type: none"> <li>• Increases meat yield</li> <li>• High degree of marbling</li> </ul>	<ul style="list-style-type: none"> <li>• Good calving ease</li> <li>• Short gestation length</li> <li>• High meat yield</li> <li>• Strong growth</li> <li>• Good beef conformation</li> <li>• Polled</li> </ul>

## 9. Fattening Beef Cross Calves

### For beef producers

The use of beef cross calves to produce fed cattle is a unique opportunity for feeders. These calves are generally in better health and offer a better meat yield than purebred Holsteins. Their high degree of marbling due to their dairy cattle descendance allows them to earn a higher grading. We often see good feed efficiency in beef cross dairy steer alongside a lower risk of morbidity and mortality than seen in purebred dairy animals. The purchase price of these calves falls between the price of purebred dairy calves and conventional fed calves. Generally speaking, calves used for producing fed cattle are preconditioned in nurseries before being introduced to feedlots.



### For veal calf producers

Since hybrid vigour fosters good health in beef cross calves, raising these animals generally involves lower rates of morbidity and mortality. Meat yield and growth rates are higher which allow for an increase in yearly meat production. Though there are genetic differences between different cattle breeds, meat colour does not seem to be significantly altered in beef cross calves.<sup>vii</sup> It is therefore a safe bet that veal meat from fattened beef cross calves will not be downgraded. Depending on the purchase price of calves, feeding this type of animal can present itself as an opportunity for veal producers.



### For dairy producers

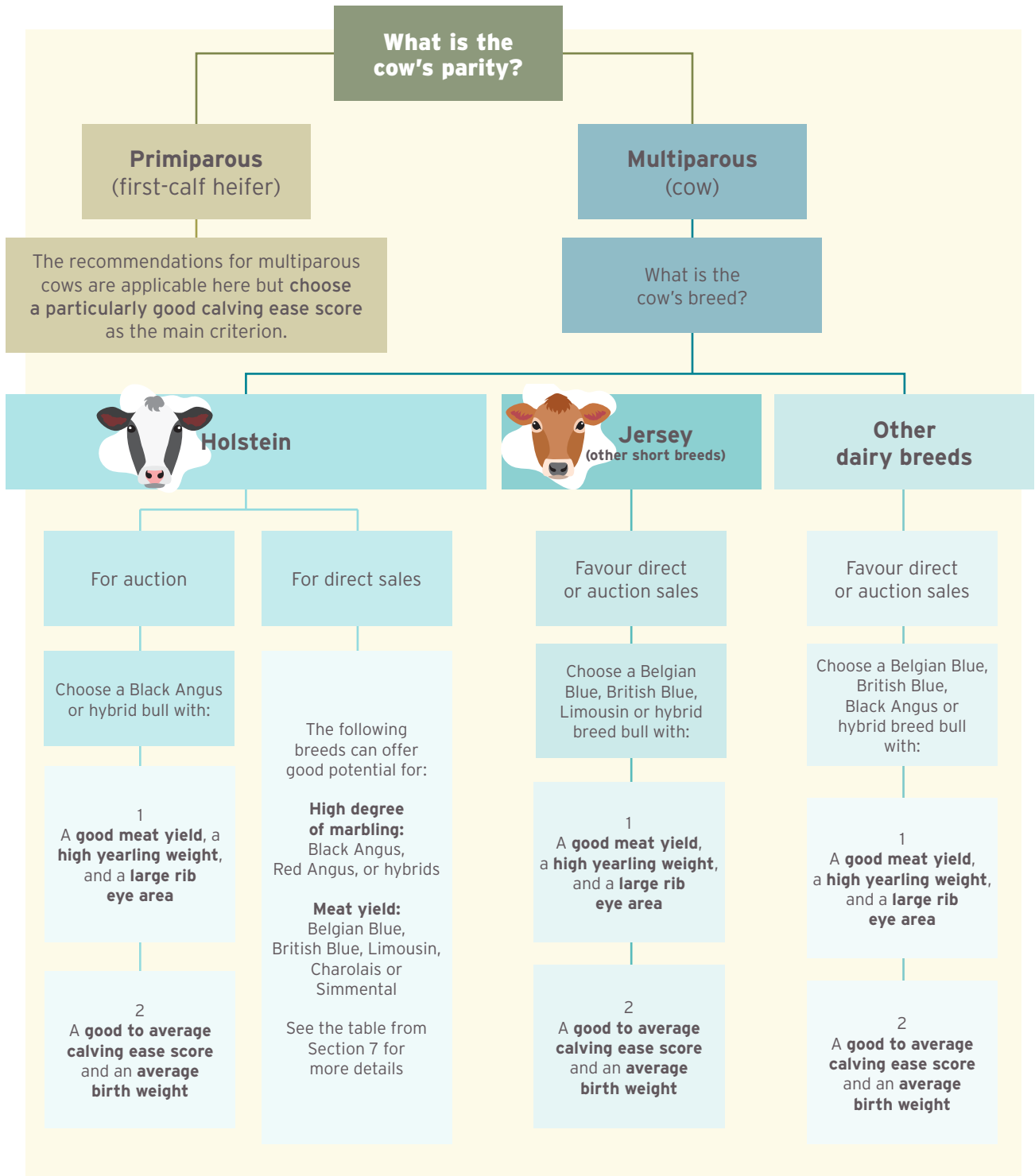
Whereas auction sales of beef cross calves can potentially be profitable, fattening these calves on the farm can also be an interesting option for dairy producers. Jersey, Ayrshire, Brown Swiss and other cross calf breeds have potential for producers looking to develop a farm market. Jersey cross offer producers a chance to develop a market for consumers looking for meat with a high degree of marbling. A nutrition consultant can help develop a feeding program that will support muscle gain in these animals. The length of time needed to raise these calves will vary based on the breeds involved in the crossing, body conformation and the targeted end weight. Partnerships can be established with butcher shops; calf meat sales made directly to consumers is also a possibility. Fattening beef cross calves can allow producers to make use of a vacant building, top up work hours for an employee, supplement work hours following a recent replacement turnover, or exploit forage crops, etc.





# 10. Decision Tree

The decision tree presented below only considers breeds that are currently in highest demand with an availability to match. Other breeds can offer good yields and/or good quality meat. See tables 6, 7, 8 and 9 for more details.



# Acknowledgements

## Thank you to our collaborators

Lactanet, Ayrshire Canada, Club Brown Swiss du Québec, Holstein Québec, Jersey Québec, ABS Global inc., Ciq, STgenetics Canada, Cogent Breeding Ltd, Unigen c/o James Peel and Belgian Blue Group, Martin Boutin, agr., agricultural producer, Joel Thibeault, consultant.

Louis Blouin, Cull Cattle and Bob Calf Marketing Director, PBQ;  
Anaïs Gingras, agr., PBQ; Laurie Noiseux, agr., PBQ and Denis Pelletier, agr., PBQ,  
Alain Roy, graphic designer, roy / branding & design;  
Johanne O'Malley, translator, WordCrafting / Mille mots.

## We also thank our technical editors

Gilles Laverdière, agr. MSc, Québec Ministry of Agriculture, Fisheries and Food;  
Germain Blouin, agr. Centre de développement du porc du Québec;  
Doris Pellerin, agr. PhD, Université Laval; Eve Martin, agr., PBQ; Maxime D'Almeida, MSc, PBQ.

## Thank you to the steering committee

Pierre Ruest, Chair of the PBQ's Cull Cattle and Bob Calf Marketing Committee;  
Gilles Laverdière, agr. MSc, Québec Ministry of Agriculture, Fisheries and Food;  
Germain Blouin, agr. Centre de développement du porc du Québec;  
Doris Pellerin, agr. PhD, Université Laval; André Hould, agr. Nutrition bœuf 3H inc.;  
André Beaumont, Comité conjoint des races de boucherie du Québec;  
Stéphane Alary, producer; Ralph Brüllhardt, producer; Sylvain Bourque, producer;  
Hélène Champagne, producer; André Couture, producer; Michel Fafard, producer;  
Guy Gallant, producer and Marie-Pier G. Vincent, producer.

## References





- <sup>i</sup> "Génétiq" in CARON, Nicolas and Anne-Marie CHRISTEN. *La production vache-veau*, Centre de référence en agriculture et agroalimentaire du Québec (ed.). 2007. Québec, Québec, Canada, p. 4-1 to 4-52.
- <sup>ii</sup> DHAKAL, Kumud et al. "Calf birth weight, gestation length, calving ease, and neonatal calf mortality in Holstein, Jersey, and crossbred cows in a pasture system" in *Journal of Dairy Science*, 96: 690-698, January 2013.
- <sup>iii</sup> PRODUCTEURS DE BOVINS DU QUÉBEC. *Utilisation de la semence de boucherie pour la production de veaux laitiers*, 2019. [internal document].
- <sup>iv</sup> FÉDÉRATION DES PRODUCTEURS DE BOVINS DU QUÉBEC. *Les races de bovins de boucherie au Québec et au Canada*, [Online], 2006. [<http://bovin.qc.ca/wp-content/uploads/2016/03/Les-races-de-bovins-de-boucherie-2006.pdf>].
- <sup>v</sup> HERD BOOK BELGIAN BLUE BREED. *The Belgian Blue Breed - characteristics*, [Online], updated June 2, 2017. [<https://www.hbbbb.be/en/pages/characteristics>].
- <sup>vi</sup> BRITISH BLUE CATTLE SOCIETY. *Breed history and characteristics*, [Online], updated September 12, [[http://www.britishbluecattle.org/the\\_breed/index.html](http://www.britishbluecattle.org/the_breed/index.html)].
- <sup>vii</sup> CAFFERKY, Jamie et al. "Effect of Breed and Gender on Meat Quality of M. longissimus thoracis et lumborum Muscle from Crossbred Beef Bulls and Steers" in *Foods*, 8, 173, May 8, 2019.



## Overview of the Guide

A dairy operation's strategy for the use of beef sire semen must be developed in line with its replacement rate (p. 10). The expansion of genomics and sex-sorting technologies opens the door on the possibility of being very selective when choosing subjects to produce replacement cattle. Genomic testing allows us to identify animals with lesser potential whose females should not be selected. These cows can be inseminated with beef semen as a way to ensure that their descendants will leave the farm. Thanks to semen sex-sorting, we can now produce replacement cattle with fewer cows than is possible with traditional semen. Cows not served with sex-sorted semen for the purpose of producing replacement cattle can now be inseminated with beef semen. Numerous strategies are available to producers to manage their reproduction program (p. 11).

Certain crossbreeds garner better prices at auction due to high demand for specific characteristics (pp. 20-21). This is the case for Holstein x Black Angus calves, which are in high demand due to the high degree of marbling of their meat, their lack of horns, and the high levels of supply. Though coat colour can have an impact on price, level of health and body conformation have a much greater influence on auction prices (p. 8). As shown in the table below, the more a calf's body conformation resembles a dairy animal, the lower a price it will garner, namely due to its inferior lifetime growth potential. A bull's EPD therefore becomes an important piece of the puzzle in order to ensure its potential to produce the types of beef cross calves sought after by the market (pp. 12-14).

Aspects that can lower the value of calves	Drooping head, drooping ears, wet navel (indicator of a very young calf) and wet or dirty hair coat; Signs of dehydration or weakness; Signs of illness, fever, arthritis, swelling of the knee(s), diarrhea, umbilical hernia (swollen navel) or the presence of discharge (p. 8); Animals with a much lower or higher weight than what is sought after (p. 13); Coat colour or discolouration. Presence of horns (p. 18).			
Cross type	Good calf Black Angus x Holstein	Not as good calf Black Angus x Holstein	Good calf Belgian Blue x Holstein	Not as good calf Belgian Blue x Holstein
Appearance				
Conformation	Straight back Strong musculature Strong feet and legs <b>\$\$\$</b>	Angular Lean <b>\$</b>	Straight back Strong musculature Strong feet and legs <b>\$\$</b>	Angular Lean <b>\$</b>

Les Producteurs  
de bovins du  
Québec



PBQ - Les Producteurs de bovins du Québec  
Maison de l'UPA  
555, boulevard Roland-Therrien, suite 305  
Longueuil (Québec) J4H 4G2  
Phone : 450 679-0540  
[www.bovin.qc.ca](http://www.bovin.qc.ca)

 PARTENARIAT  
CANADIEN pour  
l'AGRICULTURE

Canada Québec 