Beef x Dairy Crossbreeding and Calf Management Practices on Wisconsin Dairy Farms

Winter 2023

Ryan Sterry | Regional Extension Dairy Educator |Barron, Pierce, Polk, & St. Croix Counties
Bill Halfman | Extension Beef Outreach Specialist | UW Madison Division of Extension
Erin Borchert |Intern |UW Madison Department of Animal and Dairy Sciences
Matt Akins |Scientist | USDA-ARS Dairy Forage Research Center

This project was supported by Agriculture and Food Research Initiative Competitive Grant no. 2021-68008-34110 from the USDA National Institute of Food and Agriculture.

Contributing Extension Educators: Aerica Bjurstrom, Amanda Cauffman, Carolyn Ihde, Tina Kohlman, Matt Lippert, Dan Marzu, Heather Schlesser, and Sandy Stuttgen

Starting in the mid 2010's, the practice of utilizing beef genetics on dairy cattle has rapidly grown. Beef x dairy crossbred calves may provide an opportunity to increase revenue from calf sales and improve feedlot performance and carcass characteristics compared to purebred dairy steers. Conversely, crossbred calves may introduce more variability in performance and carcass characteristics compared to their purebred dairy counterparts.

In 2018, Extension educators in Wisconsin, Michigan, and Iowa surveyed dairy producers and AI service providers on their use and marketing, respectively, of beef genetics on dairy cattle. To our knowledge, this was the first survey of its kind at the time. Results of this survey can be found in the report *Dairy farm use, and criteria for use, of beef genetics on dairy females* (Halfman & Sterry 2019; https://livestock.extension.wisc.edu/articles/dairy-farm-use-and-criteria-for-use-of-beef-genetics-on-dairy-females/).

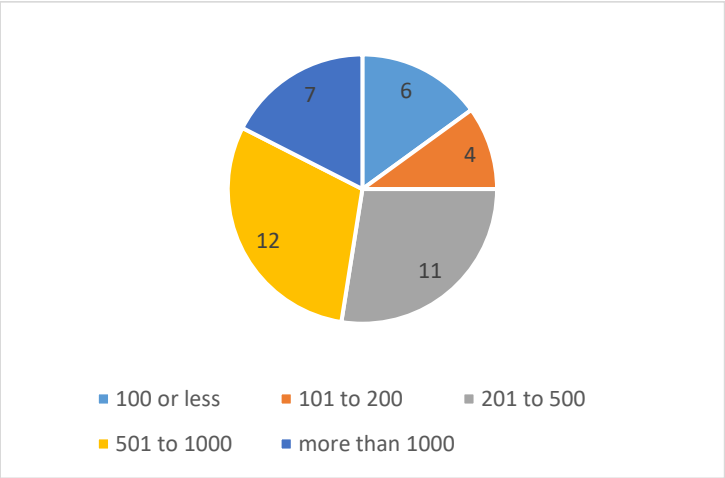
During the summer of 2021, UW Extension educators surveyed 40 dairy farms known to be using beef sires to breed dairy females to assess their beef x dairy sire selection criteria, selection of dairy females to breed to beef sires, newborn calf management, milk feeding practices, and how they market their beef x dairy cattle. The 2021 survey expanded upon the 2018 survey by asking for more information on herd dynamics, calf care, and colostrum management. However, similar questions on sire selection and selection of females to breed to beef from the 2018 survey were used to determine what changes, if any, had occurred since that time.

Percentages reported are based on the number of participants responding to each question. Some participants did not answer every question; the number of participants responding to each question is included in the descriptive summaries.

General Information

Efforts were made to survey a broad range of herd sizes. Figure 1 shows the distribution of responses by herd size.

Figure 1. Participants by Lactating Herd Size (n = 40 farms)



The median herd size was 454 lactating cows (mean =735 cows), with a range of 19 to 7,414 lactating cows. The number of dry cows on farm ranged from 0 to 1,055, with a median of 64 cows (mean = 105 cows). The number of annually weaned dairy heifer calves ranged from 0 to 4,620, with a median of 242 (mean = 486 weaned heifer calves).

Farms also reported their current daily milk production. The median daily milk production was 89 pounds per cow per day (mean = 85 pounds), with a range of 47 to 108 pounds reported. A summary of milk production and component values are reported in Table 1.

Table 1. Farm Response Summary Herd Milk Production *

	Milk Per Cow (lb/day) n=40	**Fat %** n=40	**Protein %** n=39	**MUN (mg/dL)** n=37	**SCC (1000 cells/ml)** n=38	**Mature 305 Milk (lb/305d)** n=27
Mean	85.3	3.97	3.14	10.2	154	29,303
Median	89.0	4.00	3.00	10.0	130	29,757
St Dev	14.3	0.33	0.20	1.5	82	4,453
Min	47.0	3.10	2.85	6.3	14	18,109
Max	108.0	4.96	3.73	14.5	413	36,500

*The number of farms reporting each value is included in the heading title

The number of dairy heifer calves and beef x dairy cross calves born on the 40 farms in the past year was reported, along with the percent of calvings of each compared to the lactating herd size. The average number of

dairy heifer calves born per year was 317, and ranged from 0 to 2,387. The average number of beef x dairy crossbred calves born per year was 454, and ranged from 1 to 6,200. The number of calves born per year is all relative to herd size, but worth noting there are Wisconsin dairy farms producing hundreds to thousands of beef x dairy calves annually, opening up possibilities for single sourcing these calves. The median percent of calvings that were dairy heifer calves was 42.5% (mean = 41.0%), with a range of 0.0 to 74.5%. The median percentage of calvings that were beef x dairy calves was 52.0% (mean = 45.0%) and ranged from 3.0 to 100.0% (Table 2).

Table 2. Reported Annual Dairy Heifer and Beef x Dairy Calvings (n=40 farms)

	Calves Born per Year:		Calves Born as Percent of Lactating Herd:	
	Dairy Heifers	**Beef X Dairy**	**Dairy Heifers**	**Beef X Dairy**
Mean	317	454	41.0	45.0
Median	205	100	42.5	52.0
St Dev	415	1,054	13.4	22.7
Min	0	1	0.0	3.0
Max	2,387	6,200	74.5	100.0

Culling rate is an important factor influencing herd dynamics and replacement heifer needs. Annual culling rates were reported for lactating cows and for heifers any time prior to calving. The median culling rate for the lactating cows was 30.0% (mean = 29.9%) with a reported range of 2.0% to 47.0% and the median culling rate for heifers prior to calving was 5.0% (mean = 7.6%) with a reported range of 0.0% to 60.0% (Table 3).

Table 3. Average Culling Rates for Cows and Heifers (n=40 farms)

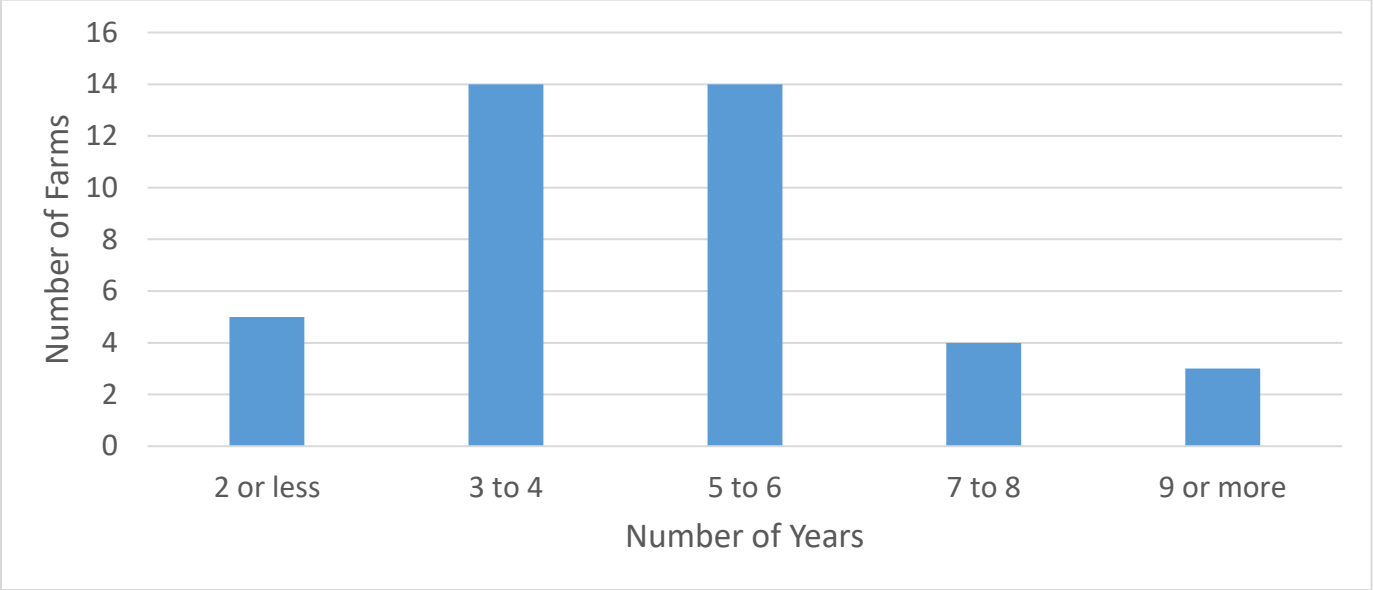
	Average Yearly Culling Rates (% per year):	
	Cows	**Heifers**
Mean	29.9	7.6
Median	30.0	5.0
St Dev	8.7	9.8
Min	2.0	0.0
Max	47.0	60.0*

*One farm with max heifer culling rate was at facility capacity and not expanding

Breeding Information

Surveys were distributed to farms known to be breeding dairy females to beef sires. The 40 participating farms reported varying years of experience and levels of beef sire use in their herds. Figure 2 illustrates the range in years respondents have been breeding dairy females to beef sires. Participating farms reported a wide range (2 to 20 years) of experience using beef sires.

Figure 2. Number of Years Using Beef Sires (n=40 farms)



Participants were asked to identify criteria they used to select the number of cows and heifers bred to beef bulls. Respondents could rank all criteria that apply to their farm. Forty farms identified at least one selection criteria.

Table 4. Farm Response Summary of How the Number of Heifers/Cows Bred to Beef Sires is Calculated (n=40 farms)

	Number of farms	Percent of farms
Dairy Heifer Replacement Needs	28	70.0%
Dairy Calf Prices	3	7.5%
Beef X Dairy Calf Prices	8	20.0%
***Other**	15	37.5%

*"Other" criteria includes (written in by respondents)

Want More Beef X Dairy cross calves

- Number of animals needed for beef (2 farms)
- Own a butcher shop/retail store, so will tend to raise more beef crosses for own use
- Breed all to beef
- Breed 95% of herd to beef

Based on Breeding Cows vs. Heifers

- Only breed cows to beef
- Breed all heifers to sexed female dairy and breed all cows to beef

Service Number and/or Days in Milk (DIM)

- Angus semen on all cattle after 2nd service
- Days in milk and repeat breeding
- Anything 150 DIM+ gets beef no matter what

Other

- Breed A2A1 cows and older cows to beef
- Breed based on crossbred or kind of cow
- Mating Program (2 farms)
- Full Barn!

Replacement heifer needs were identified as the most common factor used to determine how many females were bred to beef sires. Culling rates (cows and heifers) and reproductive efficiency (pregnancy rates) are key factors that impact the number of replacement heifers each farm needs annually. Table 5 reports selection criteria 39 responding farms used to determine their replacement heifer needs. Farms could select all criteria that apply.

Table 5. Farm Response Summary of Data Used to Calculate Dairy Heifers Needed Each Year (n=39 farms)

Criteria for calculating replacement heifer needs	Number of farms	Percentage of farms
Cow culling rates	26	65.0%
Heifer culling rates	20	50.0%
Reproductive Data (Pregnancy Rates)	20	50.0%
Other	22	55.0%
Consultant calculates	6	15.0%

Participants were asked to rank criteria that were used to select which cows and heifers are selected to breed to beef bulls. Respondents could rank all criteria that apply to their farm. Thirty-three farms identified selection criteria, and 28 farms ranked those criteria in order of importance. Number of AI services was the most selected response.

Table 6. Criteria Used for Selecting Which Heifers/Cows to Breed to Beef Sires (n=33 identified criteria; n=28 ranked criteria)

	AI Service # / Poor Fertility	Parent Average PTA	Genomic PTA	Lactation #
# Ranked 1	9	6	9	3
# Ranked 2	9	6	1	5
% Ranked 1 or 2	64.3	42.9	35.7	28.6
# Farms using this criterion	29	21	16	17

"Other" criteria (16 responses):

Production

- Test day data (3 farms)
- Production (3 farms)

Health

- Cow health, mastitis, metritis
- SCC history, relative value
- Health events (mastitis, ketosis, DA)

Type

- Cows with poor feet or legs get bred in order to get one last lactation before they're culled
- Type info (2 farms)

Other

- Number of cows open
- Breed all to beef (3 farms)

- A2 status
- Breed them based on how good or bad they are, not numbers
- Just started using genomics, so that is becoming #1 source. Used to mainly look at NM$.

Forty farms reported the beef breeds used as sires for beef x dairy crosses, as well as the percentage of each beef breed used on their farm. For 37 farms, the percentage of each breed used totaled 100%. Incomplete data was provided by three farms (percent of beef sire use equaled less than 100%). Half the farms (20) reported using sires from only one beef breed while the other half reported using sires from more than one beef breed.

Table 7. Beef Breed Use for Beef X Dairy Crosses (n=40 identified breeds, n=37 reported percent use)

	Angus	Simmental	Simmental x Angus	Limousin	Limousin x Angus	Wagyu
# Farms Using Each Breed	34	7	8	8	1	5
Mean % Use in Herd*	72.0	31.0	83.0	61.0	10.0	7.0
Median % Use in Herd*	99.5	10.0	95.0	65.0	10.0	5.0
St. Dev	35.9	33.3	23.1	24.6	n/a	2.7
Min	8.0	1.0	45.0	10.0	10.0	5.0
Max	100.0	90.0	100.0	85.0	10.0	10.0

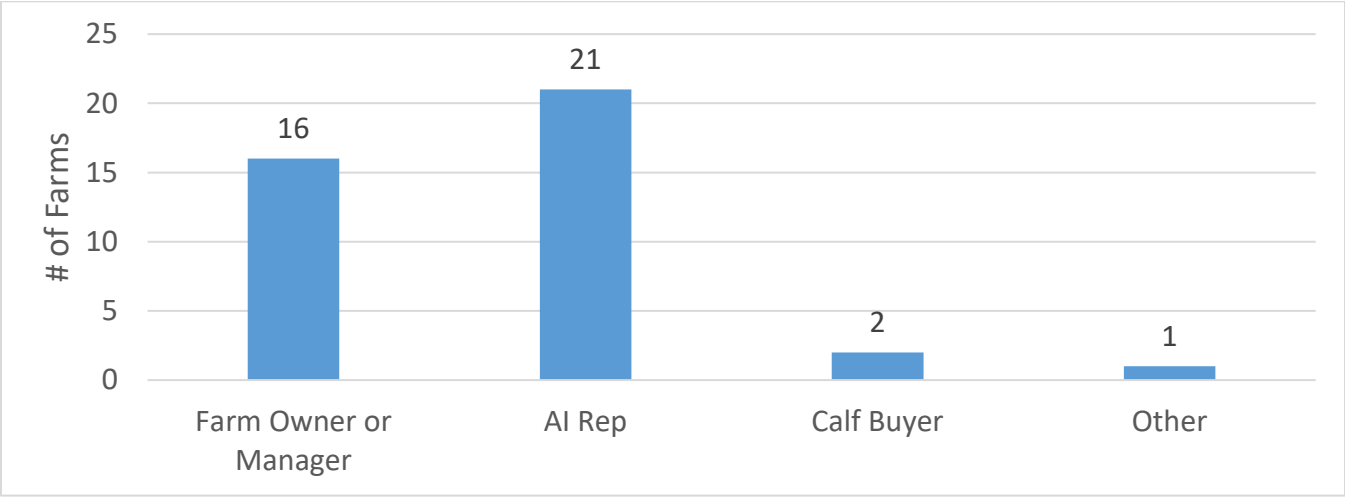
* The mean and median percent use in the herd is calculated only from the herds reporting using that breed.

Other Breeds Used (written in; n=2):

- Charolais
- Hereford

When asked who makes beef sire selection decisions, 21 of the 40 farms reported the AI representative selected the beef sires used on their farm. Sixteen farms reported beef sire selection was done by the farm owner or manager. Two farms indicated their calf buyer selected the beef sires to be used, and one farm indicated a consultant made beef sire decisions. This is similar to responses from the 2018 survey.

Figure 3. Who Makes Beef Sire Selection Decisions (n=40 farms)



Thirty-seven farms shared the average price paid for semen. Semen price was asked for in the following three categories: conventional dairy, gender sorted dairy, and beef. As expected, gender sorted semen costs more on average. A wide range in prices existed for all semen types.

Table 8. Average Price and Range in Price per Unit by Semen Type (n=37 farms)

Conventional Dairy		Gender Sorted Dairy		Beef	
Ave	**Range**	**Ave**	**Range**	**Ave**	**Range**
$18.00	$7.00-30.00	$31.00	$15.00-50.00	$10.00	$1.40-30.00

Participants were asked to rank in order of importance the beef sire selection traits used on their farms. Respondents could rank all criteria that apply to their farm. Thirty-six farms identified traits of importance, and thirty-one farms ranked those traits in order of importance.

The three “C’s” were the leading selection traits: conception rate, calving ease, and cost. While some dairy farms reported including feedlot and carcass performance traits when selecting beef sires, the responses indicate these traits were not priorities to the majority of participating farms. “Other” responses indicated the AI service provider had knowledge of the selection traits, but not the farm owner or manager. This illustrates that opportunities still exist for buyers to communicate and incentivize selection for their desired performance traits.

Table 9. Traits Used to Select Beef Sires (reported in order of importance; n=36 identified criteria; n=31 ranked criteria)

	Conception Rate	Calving Ease	Semen Price	Muscling / Ribeye	Weaning/ Yearling Weight	Index (Terminal or All Purpose)	Frame Score	Marbling	Other
# Ranked 1	11	10	7	0	0	1	1	0	0
# Ranked 2	12	7	4	1	1	2	0	0	0
% Ranked 1 or 2	77	57	37	3	3	10	3	0	0
# Farms using this criterion	28	24	21	8	8	5	5	5	3

Breeding Data

Thirty-eight farms reported the percent of heifers bred by semen type (conventional dairy, gender sorted dairy, and beef). One farm reported all heifers were used as embryo transfer recipients. One farm reported using natural service on all heifers but did not specify the type of bull. One farm reported using natural service on half the heifers but did not specify the type of bull, but did report the percentage of those bred AI. A majority of dairy heifers are bred to gender sorted semen. This follows industry norms, as heifers tend to be higher in fertility, genetic merit, and selecting for heifer calves may also provide calving ease advantages.

Table 10. Percent of Heifers Bred by Semen Type (n=38 farms)

	Conventional dairy	Gender sorted dairy	Beef
Mean	23.0	58.0	18.0
Median	4.5	70.0	10.0
St Dev	34.0	36.0	26.6
Min	0.0	0.0	0.0
Max	100.0	100.0	100.0

* One farm using natural service did not specify breed and is not included here.

Farms were asked the number of times heifers and cows were serviced with dairy semen before switching to beef sires. Thirty farms reported the number of times heifers were serviced to dairy bulls, and 33 farms reported the number of time cows were serviced to dairy bulls, before switching to beef sires.

Table 11. Number of Times Bred with Dairy Semen before Switching to Beef Semen

	Heifers (n = 30)	**Cows** (n = 33)
Mean	2.9	2.3
Median	3.0	2.0
St Dev	0.9	1.2
Min	1.0	0.0
Max	5.0	5.0

Twenty-nine farms reported conception rates for heifers by semen type (conventional dairy, gender sorted dairy, and beef).

Table 12. Heifer Conception Rate by Semen Type (n=29)

	Conventional Dairy Semen	**Gender Sorted Dairy Semen**	**Beef Semen**
Mean	57.3	54.9	60.0
Median	60.0	55.0	60.0
St Dev	15.7	6.9	14.2
Min	48.0	40.0	20.0
Max	73.0	70.0	90.0*

*Two farms reported an 85% or greater conception rate to beef sires. However, these farms bred a small number of heifers to beef sires.

Thirty-nine farms reported the percent of first lactation and second and greater lactation cows bred by semen type (conventional dairy, gender sorted dairy, and beef). Beef semen use was greater on 2nd and greater lactation cows than for 1st lactation cows.

Table 13. Percent of 1st and 2nd and Greater Lactation Cows Bred by Semen Type (n=39 farms)

	Conventional Dairy Semen		**Gender Sorted Dairy Semen**		**Beef Semen**	
	1st Lact.	**2+ Lact.**	**1st Lact.**	**2+ Lact.**	**1st Lact.**	**2+ Lact.**
Mean	31.7	29.5	26.6	10.2	41.6	60.4
Median	10.0	10.0	25.0	5.0	36.0	65.0
St Dev	36.3	34.2	24.3	12.2	30.3	32.9
Min	0.0	0.0	0.0	0.0	0.0	1.0
Max	100.0	99.0	80.0	40.0	100.0	100.0

Thirty-one farms reported conception rates for cows by semen type (conventional dairy, gender sorted dairy, and beef).

Table 14. Conception Rate for Cows Bred by Semen Type (n=31)

	Conventional Dairy Semen	Gender Sorted Dairy Semen	Beef Semen
Mean	46.2	42.8	47.5
Median	47.0	43.5	45.0
St Dev	7.4	9.4	13.1
Min	31.0	25.0	29.0
Max	60.0	64.0	72.0*

*One farm reported only breeding one cow to beef semen in the last year with 100% conception rate.

Newborn Calf Management

Forty farms reported newborn calf management practices, specifically if beef x dairy calves are managed similarly to dairy heifer calves, if the navels of beef x dairy calves are disinfected, and if vaccinations are administered to beef x dairy calves.

Table 15. Newborn Calf Management (n=40 farms)

Newborn Beef X Dairy Calves Managed Similarly to Dairy Heifer Calves?		Disinfect Beef X Dairy Calves Navels After Birth?		Provide Calf Vaccinations to Beef X Dairy Calves (Scours/Respiratory)?	
Yes	**No**	**Yes**	**No**	**Yes**	**No**
87.5%	12.5%	87.5%	12.5%	50%	50%

Based on responses, a clearer report of early life beef x dairy calf care is accomplished by comparing the calf management practices of farms retaining ownership of beef x dairy calves to those marketing young calves. Thirty farms market most of their beef x dairy calves at 2 weeks of age or less. Ten farms marketed the majority at six weeks or greater, with five of the 10 farms retaining ownership to finish. The most notable difference between farms retaining ownership and those marketing young calves was the percent of farms providing vaccinations to young beef x dairy calves.

Interpretation of this difference is complicated. Logically, farms retaining ownership are most likely to realize the benefits of calfhood vaccination. Farms marketing at less than two weeks of age realize the cost but not the benefit. Decisions to vaccinate young calves before leaving the farm are case by case specific based on product used, where the calves will be going, and the calf's age. Some vaccines carry withholding restrictions before slaughter, and sellers need to be conscientious of the possibility that beef x dairy calves may be slaughtered for the bob veal market.

Table 16. Newborn Calf Management – Vaccination Based on Age at Marketing (n=40 farms)

Provide Calf Vaccinations to Beef X Dairy Calves (Scours/Respiratory)?			
Market ≤ 2 weeks		Market at 6 + weeks	
Yes	No	Yes	No
33%	67%	100%	0%

Forty farms reported having enough colostrum (quality not specified) for beef x dairy calves, if beef x dairy calves receive a second colostrum feeding, and if they test colostrum quality. Twenty-two farms reported the method used to test colostrum quality.

Table 17. Colostrum Management for Beef x Dairy Calves (n=40 farms)

Sufficient Colostrum		2nd Feeding of Colostrum		Colostrum Quality Tested		Method Used to Test Colostrum (If tested)	
Yes	No	Yes	No	Yes	No	Colostrometer	Refractometer
100%	0%	50%	50%	52.5%	47.5%	18%	82%

Nineteen out of 20 farms who indicated they tested colostrum quality, and the method of testing used, reported they were feeding high quality colostrum to the beef x dairy calves with high quality being defined as >50 IgG/L Two farms reported feeding high quality colostrum, but did not indicate the method used to test.

Forty farms reported the amount of colostrum fed at first feeding, and how soon after birth beef x dairy calves receive their first feeding. Based upon these results, it appears that farms are feeding colostrum in a timely manner. Results were less clear if sufficient amounts of colostrum were being fed at all times. Nine of the thirteen farms feeding less than 4 quarts of colostrum at first feeding reported more than one colostrum feeding. Four farms reported feeding lower than recommend rates of colostrum, and not providing a second feeding. Without testing calves IgG levels and collecting further information, it is unknown if the farms feeding less than 4 quarts at first feeding are achieving adequate passive transfer of immunity.

Table 18. Colostrum Management for Beef x Dairy Calves (n=40 farms)

Amount of Colostrum Provided at 1st Feeding					How Soon After Birth is Colostrum Fed?		
None	1 Quart	2 Quarts	3 Quarts	4 Quarts	Within 6 Hours	Within 12 Hours	After 12 Hours
0%	2.5%	17.5%	12.5%	67.5%	95%	5%	0%

When the calf's dam's colostrum was not of satisfactory quality and not used for the first feeding, five farms reported on what is fed instead (some farms selected more than one response). Two farms reported feeding high quality colostrum from other cows, two farms fed lower quality colostrum, two farms fed a colostrum replacement. One farm also reported feeding transition milk.

Milk Feeding Practices

Thirty-nine farms provided details on what type of milk is fed after colostrum (whole milk, transition milk, or milk replacer) and if feeding whole milk if it is pasteurized or unpasteurized. One farm reported using both whole milk and milk replacer for feeding.

Table 19. Milk Feeding Practices for Beef x Dairy Calves (reported as number of farms; n=40 farms)

What Type of Milk is Offered After Colostrum Feeding?			
Whole Milk		**Transition Milk**	**Milk Replacer**
16 pasteurized	5 unpasteurized	4	15

Fifteen farms feeding milk replacer reported the percent fat and protein composition of their milk replacer, and the ounces fed per feeding. Based on average feedings per day and average ounces of milk replacer fed, this equates to 1.25-1.50 pounds of milk replacer powder per day.

Table 20. Milk Replacer Composition Fed to Beef x Dairy Calves (n=15 farms)

	% Protein	% Fat	Ounces Milk Replacer per Feeding
Mean	23.1	20.1	11.7
Median	22.0	20.0	10.0
St Dev	2.7	1.5	4.1
Min	20.0	18.0	8.0
Max	28.0	25.0	24.0

Thirty-eight farms reported the amount of liquid feed fed, and the number of feedings per day.

Table 21. How Much Liquid Feed is Given to Beef x Dairy Calves? (n=38 farms)

	# Quarts per Feeding	# Feedings per Day
Mean	2.7	2.1
Median	3.0	2.0
St Dev	0.8	0.3
Min	1.5	2.0
Max	4.5	3.0

Marketing

Forty farms reported the age the majority of their beef x dairy calves are marketed. The majority reported marketing at less than one or two weeks of age. However, a wide range of ages was reported.

Table 22. Age the Majority of Beef x Dairy Calves are Marketed (n=40 farms)

	Number of farms	Percent of farms
< 1 Week	26	65.0%
1-2 Weeks	4	10.0%
2-8 Weeks	1	2.5%
8 Weeks – 1 yr	4	10.0%
Finished	5	12.5%

Forty farms reported the marketing channels they use to sell beef x dairy calves. Farms could select more than one response. Eleven farms reported using more than one marketing channel, eight of which used a combination of auction and direct sales.

The number of farms using direct sales and contract programs shows potential for enhancing communication between beef x dairy calf producers and sellers by forwarding the calf's genetics and health records on the dairy to their new homes at growers and feedlots. The survey did not ask what information was passed along with the calves at sale time.

Table 23. Marketing Channels Used to Sell Beef x Dairy Calves (n=40 farms)

	Number of farms	Percent of farms
Auction	24	60.0%
Direct Private Sale	22	57.5%
Contract Program	4	10.0%
Other	1	2.5%

Other

- Own butcher shop / retail store

Summary Statement

During the summer of 2021, UW Extension educators surveyed 40 dairy farms known to be using beef sires to breed dairy females to gain knowledge of their beef x dairy sire selection criteria, selection of dairy females to breed to beef sires, newborn calf management, milk feeding practices, and how they market their beef x dairy cattle. The 2021 survey expanded upon the 2018 survey by asking for more information on herd dynamics, calf care, and colostrum management. However, similar questions on sire selection and selection of females to breed to beef from the 2018 survey were used to determine what, if any, changes had occurred since that time. Sire selection criteria reported by the farms in 2021 was similar to that in 2018, with an emphasis on conception, calving ease, and cost, leaving room for improvement on performance trait selection. Selection of dairy females to breed to beef sires was also similar.