INTERIM REPORT – BEEF ON DAIRY PROJECT

SUBMITTED SEPTEMBER 9, 2022

FISCAL SPONSOR: VERMONT SUSTAINABLE JOBS FUND AND VERMONT FARM TO PLATE PROGRAM, ELLEN KAHLER AND JAKE CLARO

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CONSULTANTS:

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Summary:

There are approximately 125,000 dairy cows in Vermont. Each year this number of animals will be bred in order to continue producing milk for markets. However, farms only need to replace about 30-40% of their milking herd replace aging or sick animals. This leaves nearly 60-70% of the gestations on a dairy farm open for producing calves for other markets. This project is designed to help dairy farms capture optimal value from the calves produced on their farm that are not being used as replacements.

The beef on dairy program is a specific sire program that dairy farms can use to breed animals for the beef market. The project will demonstrate the economic impact on farms who participate in the program and will therefore serve as a model for scaling a cooperative value-added beef supply chain here in VT.

Background:

Vermont's dairy industry remains a critical component of our agricultural economy. (see Addendum 5, Vermont's Milk Matters Report) Vermont's dairy industry is also an indirect contributor to the tourism and hospitality industry, making it even more essential to our state's overall economy. Yet there has been a well-documented, precipitous decline in the number of dairy farms in our state. Consequently, much of the infrastructure and many of the people previously involved in the industry are no longer utilized for the ag industry. However, the idle infrastructure still has useful life and could be re-purposed for this program. Additionally, there is a wealth of talented human resources latent in the industry that could be re-engaged for this project. The project aims to bring back idle land or infrastructure and employ latent talent to produce high quality feed, house and feed cattle, and manage land/facilities. This in turn will help keep our working lands active and well-utilized for a sustainable future.

Additionally, many dairy farms lack the personnel to develop, maintain and grow markets for value-added calves, finished beef cattle or meat products. Most individual farms are also unable to access certain markets because of the low or inconsistent supply for bulk buyers. This project aims to coordinate a cooperative supply chain among dairy and beef farmers and access markets collectively that are often unattainable by individual operations.

Review of Existing Research

Several university extension services have developed support research for dairy farms who are producing beef-on-dairy terminal animals. Some of this research compares sire performance and tracks the ability for one generation of crossbreeding to reduce dairy conformity for optimal beef production. (see Addendum 5, PSU report). Beef sires cannot completely breed out dairy phenotypes in the first generation on all of their progeny. This study notes that half to three-quarters of progeny are suitable for beef production while a quarter of crossbred dairy animals are certainly unsuitable.

Other studies make the case for beef on dairy from an economic and environmental standpoint. (see Addendum 5, WWWF case study) Here there is a strong case that dairy farms can be taking advantage of the economic opportunity by breeding for the beef industry and that merging beef and dairy industries creates efficiencies that benefit the environment.

Still other research advises various advantages of using genomic testing of sires using algorithms generated by Big Data collection at IGS. This careful data-based genetic selection has proven to increase profitability for crossbreeding in the beef industry. (see Addendum 5, Cooperative Extension articles)

Wagyu genetics present a particularly strong first generation benefit to the marbling quality in terminal crossbred beef animals when crossbred with any breed. (see Addendum 5, IA State study on Wagyu/Angus Crossbreeding). There is documented a 65% probability that crossbreeding Wagyu on any breed will result in prime or above grade beef making this breed an exceptional choice for niche meat markets. (see Addendum 5, Dairymen Article on Crossbreeding Wagyu into Holstein) This article demonstrates the market penetration for Wagyu x Holstein crossbred animals in Japan and suggests it may be optimal for the project for the highest value-added for markets in the beef and meat industries.

Several breeding companies have developed beef-on-dairy programs for dairy farmers to subscribe to and integrate into their breeding program for replacements. (see Addendum 3, Sire Programs) Most of these programs boast of the ability for one generation of sire influence to breed out dairy conformity resulting in higher yield (higher dressing percentage results in more saleable meat from an individual carcass – less bone/frame/fat on the scale). Improving the grade of beef is more challenging and is not promoted as heavily as yield improvement (USDA grades beef as Prime, Choice and Select). Additionally, very little has been done to research and develop value-added markets for these animals at all stages of development. As a result, most excess calves on Vermont's farms are still sold early in their life cycle as day old to week old calves and shipped out of state. They either become "kill calves" processed immediately for non-human consumption or they are raised up for beef markets in western or southern US cattle states.

Currently pay prices at auction are strong for day to week old calves that are crossed with beef breeds. Presumably this is due to the extended and severe drought conditions in the western and southern U.S. The news is consistently reporting the large sell offs happening in states like Texas and Kansas due to extreme drought conditions and high costs of feed. These sell offs are often breeding stock, which indicates there will be low calf numbers in years ahead. (see Addendum 5, Beef Sell-off Trends)

Reports of prices at $200-300/calf are consistent at local and regional cattle auctions. Reports of direct sales on-farm to cattle buyers are even higher than $300/calf. But just recently in 2019-2020, it was difficult to fetch over $125/calf at local auctions. (see Addendum 6, Market Reports) When contrasting these reports, it is easy to see there is a "bullish" market for beef x dairy animals currently. But the market is inconsistent. Many farms are hesitant to invest in additional infrastructure and labor to increase production for these calf markets due in part to this inconsistency. At later stages of growth, beef markets are more consistent. And meat markets are even more consistent than live finished cattle markets. As of late, the cost of meat at retail has increased between 12-18% year over year according to some reports, and is holding. (see Addendum 6, Price Increases) This begs the question: how can buyers pay these widely varying prices for calves and still make a profit? Why would they pay these prices if it was not profitable in the end (at finish stage)? Are our dairy and beef farmers missing an opportunity to hold and feed these animals and collectively access stronger finished beef markets at scale?

To answer these questions, we have delved into the value-added calf markets across the country. Value-added calf programs are well-developed in stronger beef cattle states like Texas and Missouri. These auctions allow breeders to build programs and market their programs through the local auction house. However, local and regional auctions near Vermont do not offer this market development

service. Vermont and NY sale barns will present calves at auction as “black calves” which are presumably crossed with beef breeds such as Angus. But they do not certify the genetic background or the vaccination packages like they do at more developed beef auctions. (see Addendum 6, Superior Auction Value-Added programs)

Therefore it remains difficult for dairy farms to develop a beef on dairy terminal calf program and be rewarded for it in the calf market locally or regionally on a consistent basis. It is great that calf prices are high right now, but it is not likely to last because the calf programs are not certifiable. Dairy farmers are subject to a narrow group of buyers direct from the farm or at auction who often corner them as “the only game in town.” Many of our dairy farms are constrained by these market forces and will continue to be “price takers” at auction instead of “price makers” when actively marketing their value-added calves. Vermont’s dairy farmers will benefit from the leverage a cooperative value-added program will afford to them over the long term. They are more likely to invest in a program if it regularly and consistently rewards them. Until this is developed we should expect that our dairy farmers will likely miss out on economic opportunities in the beef on dairy terminal cattle markets for calves and finished cattle. These markets are developing quickly and now is the time for our dairy farmers to get poised for long term market access and attaining their market share. This project aims to solve for this gap through developing a cooperative supply chain and marketing through collective bargaining to add a more substantive, consistent revenue stream for dairy farmers and beef farmers in Vermont.

Progress Report YTD 2022:

Click Here to View a Brief Video Summary of Activity

May

- finalized contract with VSJF for year one of the project with WLEB
- Held meetings with all stakeholders who provided letters of support for the project in Fall 2021
- Secured verbal commitments for participation from the farms
- Drafted breeding contracts for dairy farms breeding cattle for the program
- Began sire selection process with consultants

June

- Secured semen supply from Bar R Wagyu and finalized sire selections for the program (see Addendum 2, Sire EPD’s)
- Met with calf-raising farm to determine fit for project
- Consulted with Cooperative Development Institute to assist with entity formation and contracting
- Consulted with Vermont food broker to deepen market awareness for meat markets
- Cold chain consultation for distributing direct to grocery distribution centers

July

- Finalized breeding contracts with participating farms
- Shipped semen doses to breeding farms
- Finalized commitment from calf-raising farm

- Finalized SOW with CDI for entity formation and contract assistance (see Addendum 4, Draft SOW and Contract with CDI)
- Secured slaughter dates at Vermont Packinghouse for 2025

August

- Consulted with Veterinarian to finalize breeding and calf-raising protocols (see Addendum 1, Health Protocols)
- Consulted with Nutritionist to developed feed/nutrition program for various stages of growth (in process)
- Finalized live cattle buyers for 2025
- Researched additional meat and cattle brokers
- Held meetings with retailers for finished beef animals
- Located and secured portable handling equipment and scales for data collection during the project
- Finished breeding for spring calf crop 2023

Project Financials YTD 2022:

Total Grant Amount	**$101,870.00**
Principal Contractor Service Exp	$13,472.50
Sub Contractors and Consulting Exp	$2,847.40
Project Overhead Exp	$1,785.58
Total Project Expenses	**$18,105.48**
VSJF Personnel Exp	$6,600.00
Remaining Budget	**$77,164.52**

Profiles and Plans for Farms and Businesses Participating in the Project

1. Daona Farm, Shoreham, VT - Marc and Elaine Brisson
    - Dairy Farm milking 1700 cows
    - Cropping over 2000 acres
    - Agri-Mark Members
    - Addison County
    - *Breeding Beef x Dairy calves for the project*

2. Spring Brook Organic Dairy, Westfield, VT - Spud and Kitty Edwards and Sebastien LaTraverse
    - Organic Dairy Farm milking 50 cows
    - Cropping over 80 Acres
    - Organic Valley Members
    - Orleans County
    - *Breeding Beef x Dairy calves for the project*

3. Green Dream Farm, Enosburg Falls, VT – Chris and Annie Wagner
    - Former Dairy Farm
    - Currently Custom Boarding up to 600 cattle
    - Cropping over 400 acres
    - Franklin County
    - *Raising Beef x Dairy calves to weaning age, growing and finishing cattle for the project*

4. Rhomanwai Farm, Chester, VT - Roy Homan and Travis Whitcomb
    - Dairy Farm milking 800 cows
    - Cropping over 600 acres
    - Agri-Mark Members
    - Windsor County
    - *Breeding Beef x Dairy calves, raising to weaning age and growing cattle for the project*

5. Stickney Farm, Bellows Falls, VT – Robert Stickney
    - Former Dairy Farm
    - Currently custom boarding up to 150 beef cattle
    - Cropping over 200 acres
    - Windham County
    - *Growing and Finishing beef x dairy cattle for the project*

6. Almanack Farm, Chelsea, VT – Justin Sauerwein
    - Operating Beef operation on Former Dairy Farm
    - Currently grazing and boarding up to 150 animals
    - Grazing up to 400 acres
    - Orange County
    - *Growing beef x dairy cattle for the project on grass*
    - *Processing live animals for meat sales for the project (Justin is owner of The Royal Butcher in Randolph, VT)*

7. Vermont Packinghouse – Henry Mapes, G.M.
    - Larger commercial slaughterhouse in N. Springfield, VT
    - *Processing live beef on dairy animals for meat sales for the project – Will Mitchell, Plant Manager*
    - *Hosting producer grading event in the hanging room at VPH – Chad Pecor, Cutting Floor Manager*

8. Manning Livestock Trucking – Brett Manning
    - Local/regional livestock hauler based in Poultney, VT
    - *Trucking calves and livestock between farms for the project*

9. Renew Livestock Co. – Jim Skartvedt

- Midwest livestock broker
- Value-added programs
- www.renewlivestockcompany.com
- *Buying live finished beef x dairy cattle from the project producers*

10. Woodstock Farmers Market – Patrick Crowl
    - Mid-sized local foods grocery with two locations
    - www.woodstockfarmersmarket.com
    - *Buying finished and processed beef x dairy meat from project producers*

11. Co-op Foodstore – Alan Reeves
    - Large co-operative grocery with multiple stores
    - www.coopfoodstore.coop
    - *Buying finished and processed beef x dairy meat from project producers*

Growth Trajectory

This project is the seed for the development of a beef cooperative specializing in breeding, raising and marketing value-added beef animals and meat products to regional markets. Long-term this program aims to more fully utilize idle infrastructure and the latent talent pool in Vermont. If other northern New England farmers outside of Vermont would like to participate, this program may be available to them as well. States like NY, ME and NH are in mind here because of similar trends in the dairy industry.

The project will breed, raise and finish 100 animals. It is not unreasonable to expect this will quickly increase to 1000 animals and then 10,000 animals in annual production. It is unclear how many will be raised to weaning age and sold as feeder calves, and how many will be held and finished for fat cattle and meat markets. We anticipate that the percentage of animals sold at various classes (weanlings, yearlings, finished fat cattle) will depend heavily on beef market conditions, variable costs of inputs, climate conditions in the western and southern US, and legislation on labeling laws in the U.S. for beef markets (Country of Origin Labeling in particular).

This scale is possible here in Vermont with a concerted campaign among dairy farmers and former dairy farmers. It will require close cooperation among producers to ensure consistency and best practices. And it will require strong collaboration with stakeholders at many levels. Expected outcomes long-term past initial project completion include:

- Refined feed/health protocols
- Forum for self-auditing, developmental cooperative member/producers www.vtcattlemensco-op.com
- Establishing consistent growth curves for various sires and using data to continually improve cattle performance on feed and on the rail
- Strengthened demand for value-added calves and finished beef coming from Vermont
- Online platform for brokering cattle at all stages of growth to various markets in New England, the Mid-Atlantic states and Florida

- Vertical integration and/or strategic partnership integration into processing and/or distribution of live cattle and/or beef products
- Block chain brand development (Click here for example of block chain in Wyoming)
- Replacing foreign and western US beef that is on the shelves in New England with beef x dairy cattle bred and fed exclusively in Vermont
- Strengthening the economy in the ag sector in Vermont through diversification, asset and talent utilization and cooperative market development and access.
- Strong co-branding campaign with various grocery chains and the VT cooperative brand.

VERMONT
CATTLEMEN'S CO-OP

Conclusion:

We are excited to get this project started and appreciative of the funding support and fiscal sponsorship. Producers are engaged and committed to see this grow and willing even to continue breeding on spec knowing that the funding will become the seed for the future of the program at scale. The markets for beef are established and stable. We aim to develop a very high quality beef worthy of the Vermont brand using optimal genetics and best management practices. We look forward to continuing this relationship with the Working Lands grant program to get this program established and markets developed that are stable for the long term. Our aim is nothing less than becoming the "Cabot" of beef with a view toward optimizing returns to our producer members and having long term economic impact at the farmgate level.

Addendum 1: **Beef on Dairy Health Management Protocols**

Developed in partnership with Roger Osinchuk, DVM

Newborn calves (Days 1-3)

a. Dairy farm to provide adequate colostrum in days 1-3
b. Dairy farm to weigh calves at day old and provide EID ear tag
c. Dairy farm to provide First Defense in bolus form in first 12 hrs of life
d. Feed to be "Waste" milk at calf ration 1 G/day
e. Feeding should happen twice daily (morning and afternoon)
f. Space requirements shall be 20 sq. ft mininimum per animal in group pens or individual hutches
g. Farmers shall always provide shade and fresh water to calves
h. Bedding to be fresh straw or shavings
i. Ear notch or blood sample shall be collected prior to shipping for parent verification

Week old to One Month of Age

a. At 1 week of age calves shall receive a once PMH intranasal vaccine and Inforce 3 (viral protection)
b. Feed to be "Waste" milk at calf ration 1 G/day
c. Feeding should happen twice daily (morning and afternoon)
d. Space requirements shall be 20 sq. ft mininimum per animal in group pens or individual hutches
e. Farmers shall always provide shade and fresh water to calves
f. Bedding shall be fresh straw or shavings
g. At one month of age, calves shall receive a shot of Multi-Min (Vitamins A, D, and E)
h. At one month of age, calves shall receive a PMH booster and Inforce 3 booster

At Weaning Age and Transition period (8-10 weeks of Age)

a. Calves shall remain on milk ration 8 weeks minimum
b. At 8 weeks, calves shall receive 2 #/day starter grains per head during transition
c. At 8 weeks calves shall have free choice dry hay; leafy 2nd cut, high protein, palatable hay during transition feeding
d. Male calves shall be castrated using bands at 6-8 weeks before transition feeding (Use of Calicrate bander or equivalent is required)
e. Calves shall receive Covexin 8 for tetanus immunization when banded
f. Calves shall receive Ivermectin at weaning and every 6 months thereafter
g. Weaned calves shall be weighed at weaning and growth curve established birth to weaning age.

Growing Stage 2-12 months

a. All calves shall receive Bovashield Gold One Shot at 2 months of age
b. All calves shall receive Covexin 8 booster 3-4 weeks after first immunization
c. Calves shall remain on transition feed for 2 weeks and then be transitioned to grower ration (TMR to be formulated by nutritionist/consultant)
d. A TMR shall be mixed daily for growing calves and pushed up to the bunks at minimum 2 times per day

e. All calves shall be weighed every 30 days to establish gain rates and feed conversion rates
f. Outliers shall be identified and/or rations adjusted to suit

Yearling Stage to finish stage 12-24 months

a. Additional Covexin and Bovashield boosters shall be administered at yearling stage
b. Yearling weights shall be established and matched to sire
c. Yearlings shall have hooves trimmed only if needed
d. Space requirements for yearlings up to 1000# shall be 60 sq. ft. per yearling
e. At or above 1000# each animal shall have 80 sq. ft per 1000 AU
f. Yearlings and finished animals shall have dry bedding and be housed in open pens on a bedded pack, or in a free stall, along with access to a loafing area and/or pasture
g. Weights shall be measured every 30 days, outliers identified and rations adjusted to suit.
h. Contemporary groups shall be segmented to ensure reasonable competition at the feed bunk.
i. Male and female animals shall comingle or be segmented based on growth performance.
j. A TMR shall be mixed daily and pushed up to the feed bunk at minimum 3 times per day to ensure regular access to feed for all animals.
k. TMR to be formulated by nutritionist/consultant and measured daily at farm to establish growth rates for all animals

Addendum 2: Sire EPD's for Beef on Dairy Project

Genomic enhanced Wagyu EPDs for Bar R Shigeshigetani 30T and Bar R AB 6125

Bull ID	bw ac %	ww ac %	adg ac %	rfi ac %	hcw ac %	bf ac %	rea ac %	mar ac %
6125	1.2/.4 99	7.8/.4 2	.1/.3 1	.19/.3 99	13/.3 1	.04/.7 80	.6/.6 1	.8/.7 2
30T	-2.4/.7 4	-8.9/.7 85	.03/.65 3	-.36/.73 1	5.35/.5 10	-.09/.8 15	.9/.8 1	.2/.8 30

The abbreviations above are defined below:

1. BW – birth weight
2. WW – Weaning weight
3. ADG – Average daily gain rate
4. RFI – feed conversion rate
5. HCW – Hot carcass weight
6. BF – back fat
7. REA – Ribeye area
8. MAR – Intramuscular Marbling

Sires were chosen to optimize calving ease (low birth weights), rapid growth (high average daily gains and feed conversion), and strong finish grades (high marbling, low back fat, high ribeye area).

Addendum 3: A Sample of Beef on Dairy Sire Programs in the Market

1. Genex “Shift” - https://genex.coop/dairy/shift/
2. Select Sires “LimFlex” - https://selectsiresbeef.com/bulls/limflex/
3. Holstein USA’s HolSim program - https://www.holsteinusa.com/holsim/

Addendum 4: Draft Contract with Cooperative Development Institute

COOPERATIVE DEVELOPMENT INSTITUTE
P.O. Box 1051, Northampton, Massachusetts 01061-1051
PH 413-665-1271 • FX 413-541-8300 • www.cdi.coop • info@cdi.coop

MEMORANDUM OF AGREEMENT

Between

COOPERATIVE DEVELOPMENT INSTITUTE (CDI)
and

THE CLIENT: Vermont Meat Co-op Startup (Fiscal Sponsor: Vermont Farm to Plate)

OVERVIEW OF WHAT IS IN THE AGREEMENT:
This AGREEMENT outlines the ways CDI will provide THE CLIENT with Technical Assistance towards their business goals, and the ways THE CLIENT will agree to make time for the training and Technical Assistance sessions. THE CLIENT can end the AGREEMENT if need be within 30 days notice.

THE AGREEMENT:
This AGREEMENT is between the Cooperative Development Institute (CDI) and Vermont Meat Co-op Startup henceforth referred to as THE CLIENT to demonstrate a two-way commitment to the Scope of Work (attached). This AGREEMENT will start August 1, 2022, through June 30, 2023.

I. Changing or Ending the AGREEMENT

THE CLIENT can decide that they do not want to proceed with organizing a co-op or working with CDI. CDI can decide that the co-op is not following through on its agreements. In either case, a meeting will be organized with CDI and THE CLIENT to discuss and review changes that could be made to the agreement, or if the agreement needs to end. If the Agreement ends, both parties have 30 days notice to wrap up the work.

Signatures below indicate acceptance of this AGREEMENT. Any changes, additions, or deletions must be accepted in writing by both parties to this AGREEMENT.

COOPERATIVE DEVELOPMENT INSTITUTE, INC. (CDI)

7/15/2022

Katherine Bessey,
Coordinating Director and Cooperative Food Systems Specialist Date

CLIENT: Vermont Meat Co-op Startup

Date

Vermont Meat Cooperative Startup

(Fiscal Sponsor: Vermont Farm to Plate)

SCOPE OF WORK 2022/23

Goals:

- CDI will support the team through the Explore, Assess, Structure, and Implement phases of cooperative development in a light touch capacity, including engaging a steering committee, supporting networking with similar/synergetic entities, discussions with farmers/members, technical assistance (TA), legal and financial analysis.

Effective Timeline: 8/1/22-6/30/23

- **20 hours upfront pro bono support provided by CDI**
- **Fee for service basis by the hour at a rate of $75/hr**

CDI Team:

- **Katherine Bessey** brings over 12 years experience in program development, research and evaluation systems as well as 5 years of developing cooperative start-ups. She has a Masters in Sustainable Development and a degree in mathematics.
- **Andrew Danforth, CPA** has over 20 years of experience in cooperative business finance, specializing in housing and real estate transactions.
- **Patrick Deluhery, Attorney** has over 20 years of experience supporting cooperatives in the farming sector with bylaws, incorporation, lease agreements and general legal advising.
- **Chris Lepre, Assistant Project Manager** has 2 years of experience on a food co-op board and organizational system design.

Work Plan:

PHASE	TASKS AND DESCRIPTION	HOURS	RATE	COST
EXPLORE	Steering Committee Visioning Session #1 and #2 -- 5 hours per session including planning.	15	$75	$1,125.00
	EXPLORE TOTAL:			**$1,125.00**
ASSESS	Networking discussions with other New England food systems cooperators to assess potential for collaboration (Maine farmers, markets, etc) Workshops (3) for Steering Committee- Business and Financial Planning parts 1 and 2, and Marketing Planning -- 7 hours per session including planning	21	$75	$1,575.00
	TA Support developing a Business Plan and Financial Pro-Forma -- 15 hours	15	$100	$1,500.00
	ASSESS TOTAL:			**$3,075.00**
STRUCTURE	10 Biweekly TA Sessions with Steering Committee - 1 hour each plus logistics and outreach	15	$75	$1,125.00
	Legal and Financial Advising - Incorporation (Bylaws and Articles) and Accounting --10 hours	10	$250	$2,500.00

	STRUCTURE TOTAL:			**$3,625.00**
	PRO BONO SUPPORT from CDI via: USDA Rural Cooperatives	20	$75	$1,500.00
			Grand Total:	**$6,325.00**

Addendum 5: A Sample of Research Articles

Dairy Herd Management

BUSINESS

Dairy Semen Sales hit 17-Year-Low: What Will the Trend be Going Forward?

With the cost of inflation impacting every corner of a dairy, including the costs to feed heifers, the producer's breeding strategy has been forced to become finetuned. More and more producers are keeping just enough replacements to fill the pipeline, so it is not surprising that the market for dairy semen sales has hit a 17-year-low, with year-over-year sales dropping nearly 7%, according to the National Association of Animal Breeders (NAAB) data.

With beef-cross calves creating a value-added revenue stream for producers, Beef x Dairy numbers have indeed skyrocketed. The 2021 NAAB year-end report showed that Beef x Dairy sales totaled 8.5 million units, an increase of more than 30% over 2020.

According to Lyle Kruse, Vice President of U.S. market development for Select Sires, Inc., Holstein dairy owners will continue to prioritize strategic use of sexed and Beef x Dairy due to the increased costs of rearing replacements.

"We could still see some growth in Beef x Dairy in the U.S.," Kruse says. "Most Jersey dairy owners are already intensively using sexed semen and Beef x Dairy, as well as pure-beef embryos."

Kruse reports that Select Sires has seen a decline in the U.S. on conventional semen sales over the last 4-5 years, while sexed semen sales continue to increase.

"Total dairy semen sales have also declined," he notes. "Some of this is from the improvement in dairy reproductive efficiency (fewer units needed per

With Beef x Dairy ramped up, the question begs to ask, 'Will we have enough dairy replacements?' Kruse says he already sees some herds with a 30% or less culling rate.

Kruse shares that based on research from Dr. Albert DeVries and Dr. Chad Dechow, the optimal herd turnover rate to optimize production and not hinder genetic progress is between 25-30%.

"We are not there yet but heading that direction," he notes. "To get there, dairies will need productive, healthy and reproductively fit older cows."

However, he remarks that the trend in declining culling levels has occurred for several years, and he expects that to continue. Kruse also states going forward, this will lead to producers honing their genetic selection focus by using indexes that consider more factors affecting longevity, like Select Sires' Herd Health Profit$™ (HHP$™) or Zoetis Dairy Wellness Profit$® (DWP$®).

Kruse says that dairy owners will start focusing on increasing the percentage of older lactation cows (third lactation and up) to eventually be equal to or more than 40% of total lactating cows.

"Herd management, cow comfort and utilization of technology, such as

Most U.S. dairy owners want to continue to reduce herd replacement costs and harvest additional income by generating excess beef calves from uteruses not needed to gestate replacements," he says.

With record inflation felt from every angle of the dairy, fine-tuning management must continue, and Kruse says he believes strategic breeding and smart replacement planning is here to stay.

"This includes planning for the most profitable outcome for every pregnancy generated based on the specifics of every individual cow and heifer in the operation," Kruse notes. "This will include a mix of dairy conventional, dairy sexed and beef conventional and sexed semen and embryos."

Based on estimates from the USDA-NASS, Chuck Sattler, vice president of the genetic program for Select Sires, shares with his team that the number of replacements is relatively low.

"We only have enough replacements to cull 31-32% of the current dairy cows and this will likely drive herd life and lead to less forced culling of older cows," Sattler states.

Kruse believes the Beef x Dairy market for semen sales will continue to increase to eventually level off at around 10-11 million units sold per year.

"Some of this decision process is going to be driven by changes in the availability of native beef cattle, replacement dairy heifer prices and the Holstein bull calf prices as well as the level of adaptation for pure-beef embryos," he says.

Minnesota Producer Perspective

“We used to cull a lot more, but that has really changed,” one of the owners, Carl Carlson, shares.

Before, cows were culled for mastitis or low production and now cows are only leaving for low production. Carlson’s culling rate hovers between 31-32%.

“We want to keep older lactation cows in the herd longer because obviously we're getting more milk out of them,” he notes.

Understanding their ultimate goals, the Carlson’s began utilizing Beef x Dairy a couple of years ago on both heifers and mature cows.

“Right away we went with using beef, as well as some conventional semen,” Carlson shares. “And now we’re strictly using either beef or sexed.”

The Carlson family milks 2,000 cows and basically raises all replacements on the home site, except for the 15% that are raised by a nearby family member. In addition, they farm 2,500 acres, including 1,000 acres of alfalfa and 1,500 acres of corn, all of which goes back to the dairy to feed cattle.

“We weren't getting the money back that we were putting into them,” Carlson shares. “We don't want to raise more heifers than we need because obviously it costs a lot of money to raise a heifer today.”

While the prices for bred heifers have increased with rising milk prices, Carlson says they don’t plan to raise more heifers than they need.

The focus for this Minnesota dairy is to produce 60 heifer calves a month, and their breeding plan has become strategic to reach this goal. Today, 10% of cows are bred to sexed semen while the rest are bred to beef. For the heifers, 50% are bred to sexed while the other half is bred to beef.

An increase in conception rate is proof that the improved management is working. Carlson shares that their current conception rate is 51%. Additionally, the farm relies on a shot program, along with CowScout sensor collars from GEA for heat detection.

Limousine is the breed of choice for Carlson, and he shares that currently he has two buyers for his crossbred calves who pick up calves weekly. Fine-tuned breeding protocols that have introduced Beef x Dairy breeding now generate an additional revenue stream for the operation. Carlson gets $200 per crossbred calf and shares that in 2021 he sold approximately 150 crossbreds a month.

Creating just enough replacements has not only helped Carlson Dairy maintain its herd size, but also generate efficiencies throughout the operation to cushion their bottom line.

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.

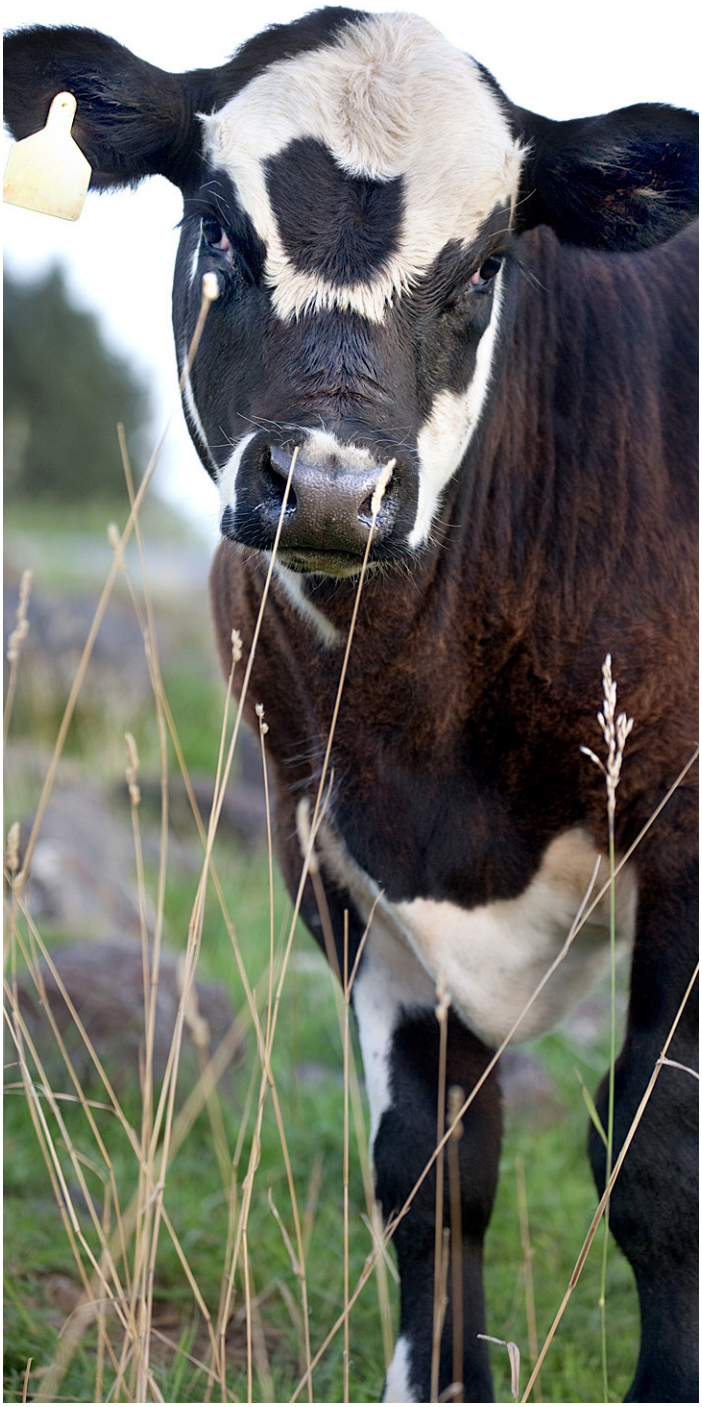
[2]Conception rate improvement from ABS InFocus program for Holsteins; improvement rates for Jersey are higher but the same rate was applied for the nationwide herd for a more conservative estimate.

	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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Page 3: Holstein- Aberdeen Angus cross calf, ©DaydreamsGirl/Getty

PennState Extension

Beef on Dairy Genetics

Selecting the right traits when crossing your dairy cows with beef is important to maintain a marketable product.

ARTICLES | UPDATED: NOVEMBER 18, 2020

Photo Credit: Andrew Sandeen, Penn State Extension

The use of beef sires in dairy herds has increased dramatically in recent years. McWhorter et al. (2020) noted that the number of matings of beef breed sires to dairy cows more than doubled from 2015 to 2019. On a similar note, Geiger (2020) reported a 128% increase in domestic semen sales of beef breeds in just two years, totaling 5.8 million units in 2019. Much, if not all, of the increase has been attributed to use in the dairy industry.

McWhorter et al. (2020) also observed that 87% of the beef on dairy matings were Angus bulls crossed with Holstein cows. Included in their research article is a list of the specific Angus bulls that met their research criteria and were used most frequently for AI service of dairy females from 2016 through 2019. The table below shows the top ten Angus bulls, along with associated genetic characteristics of each one as of November 2020.

EPDs of Top Ten Angus Bulls Used for AI Service in Dairy Herds From 2016 Through 2019

	CED	BW	WW	YW	RADG	YH	CW	Marb	RE	$AxH	$AxJ	$B
Konza	+13	-.9	+63	+118	+.28	+.2	+58	+.33	+.93	+155	+146	+156
Thunder	+12	-1.6	+40	+77	+.19	+0	+23	+.59	+.35	+72	+34	+114
Walker	-3	+1.0	+61	+114	+.27	+.5	+35	+.55	+.24	+31	+2	+117
Profit Driven	+13	-.5	+63	+114	+.27	+.7	+51	+.77	+1.32	+154	+161	+163
Horizon	+11	-.9	+65	+114	+.29	+.7	+41	+.71	+.65	+114	+102	+137
Empire	+16	-1.1	+69	+125	+.25	+1.0	+51	-.95	+.77	+124	+139	+153
Irish	+9	-.7	+47	+96	+.27	+.5	+45	+.53	+.73	+97	+68	+153
Gold Rush	+12	-.5	+60	+106	+.26	+.3	+22	+.37	+.46	+72	+47	+100
Right Answer	+11	-.3	+61	+113	+.29	+.2	+34	+.32	+.06	+22	-10	+109
Comrade	+17	-3.5	+46	+91	+.26	-.4	+20	+.59	+.64	+117	+83	+120

Data source: American Angus Association. Red (negative) and green (positive) highlights selected by the author.

Expected Progeny Difference (EPD) values, such as the ones in the table above, are commonly used to predict how the future progeny of an individual beef bull will perform relative to progeny of other bulls within the same breed. Some of the most useful EPDs for selecting a beef bull to use with dairy females are as follows:

Calving Ease Direct (**CED**) – percentage of unassisted births; a higher value is usually preferable
Birth Weight (**BW**) – in pounds
Weaning Weight (**WW**) – in pounds
Yearling Weight (**YW**) – in pounds
Residual Average Daily Gain (**RADG**) – pounds of gain per day, given a constant amount of feed consumed
Yearling Height (**YH**) – in inches
Carcass Weight (**CW**) – hot carcass weight in pounds
Marbling (**Marb**) – a fraction of the difference in USDA marbling score; higher is better
Ribeye Area (**RE**) – in square inches

Do particular traits really matter if you are just trying to get a black-colored cross to sell? The short answer – yes. A standard marketing concept applies to this situation. Dairy producers who hope to have a long-term outlet for crosses need to ensure they are providing the best products possible in order to keep customers coming

back for more. If there are too many disappointing outcomes with beef on dairy crosses, there is risk that the market may dry up.

Looking at the bulls in the table above, a Holstein producer might choose not to use Empire to avoid crosses that are too tall (long), while a Jersey producer might avoid Thunder because his growth characteristics are not as good as the other choices. Both producers might want to use Profit Driven because of the expected improvement he provides for ribeye area (i.e. muscle development).

Specific to the Angus breed, there is a Beef Value ($B) terminal index that considers multiple traits for meat production. However, this index was created with beef on beef matings in mind, not dairy females. In the summer of 2020, two new Angus indexes were introduced, the $Angus x Holstein (**$AxH**) index and the $Angus x Jersey (**$AxJ**) index, to target a combination of genetics that will produce what the meat industry is looking for. Growth, muscle development (e.g. RE), and calving ease are emphasized for both indexes, and there is less emphasis on marbling, since dairy breeds already tend to have good marbling. With the $AxH index, there is a negative emphasis on YH to help moderate carcass length. Though the real impact of these new indexes has not yet been seen, it is expected that they will be a helpful tool for selection of Angus sires. They do not, however, apply to other breeds which could just as well be considered for producing good beef on dairy crosses.

Though a survey by Halfman and Sterry (2019) revealed that beef semen cost was the number one selection criterium for dairy producers, using whatever is cheapest and most readily available is not recommended. Consider the EPD makeup for any bull candidates. Consider different breed options, since excellent growth and muscle development can be achieved with breeds such as Limousin or Simmental, while not sacrificing meat quality. Consider how a particular bull might impact calving ease. Consider the resulting calf and how marketable it will be. Consider the long-term customer and what they need.

For more information on evaluating trait information, see this article: " Understanding EPDs and Genomic Testing in Beef Cattle ." There are already some good tools to help make educated beef on dairy decisions, and there are surely more to come as we learn more about what is going to work well for both the dairy and beef industries. The use of beef sires for producing crossbred calves for the beef market will likely continue; we just need to learn the important lessons along the way and make sure to keep as many happy customers as possible.

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2018 - 2



2017 Across-Breed EPD Table & Improvements

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Across-Breed EPD (ABEPD) Adjustment Factors: National Cattle Evaluation (NCE), and the resulting Expected Progeny Differences (EPDs), have resulted in substantial genetic change since their inception in the 1970s. However, because breed associations often use different national evaluation programs, EPDs are generally only comparable within breed because of differences in the genetic base. Since 1993, the U.S. Meat Animal Research Center (USMARC) has produced a table of factors to adjust the EPDs of cattle so that the merit of individuals can be compared across breeds. Adjustment factors for carcass traits have been calculated since 2009 and carcass weight was added in 2015; to be included, breeds must have carcass data in the U.S. Meat Animal Research Center (USMARC) database and report their carcass EPDs on an actual carcass basis using an age-adjusted endpoint.

Bulls of different breeds can be compared on the same EPD scale by adding the appropriate adjustment factor to the EPDs produced in the most recent genetic evaluations for each of the eighteen breeds. Normally, the EPDs of animals from different breeds cannot be compared because most breed associations compute their EPDs in separate analyses and each breed has a different base point. The across-breed adjustment factors allow producers to compare the EPDs for animals from different breeds for these traits; these factors reflect both the current breed difference (for animals born in 2014) and differences in the breed base point. The AB-EPDs are most useful to commercial producers purchasing bulls of more than one breed to use in cross-breeding programs. For example, in terminal cross-breeding systems, AB-EPDs can be used to identify bulls in different breeds with high growth potential or favorable carcass characteristics.

The ABEPD factors have traditionally been derived and released during the annual Beef Improvement Federation conference each year. However, starting this year, we are updating the factors late in the year to make the factors more accurate during spring bull buying season. The factors are derived by estimating breed differences from the USMARC germplasm evaluation program and adjusting these differences for the EPDs of the sires that were sampled in the system. The traits for which factors are estimated are birth weight, weaning weight, yearling weight, maternal weaning weight (milk), marbling score, ribeye area, backfat depth, and carcass weight (Table 1). These factors adjust the EPDs to an Angus base (chosen arbitrarily).

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Table 1. Adjustment factors to add to EPDs of eighteen different breeds to estimate across breed EPDs.

Breed	Birth Wt. (lb)	Weaning Wt. (lb)	Yearling Wt. (lb)	Maternal Milk (lb)	Marbling Score[a]	Ribeye Area (in^2)	Fat Thickness (in)	Carcass Wt.(lb)
Angus	0.0	0.0	0.0	0.0	0.00	0.00	0.000	0.0
Hereford	1.6	-18.2	-42.1	-14.1	-0.29	-0.06	-0.075	-72.4
Red Angus	2.3	-28.3	-35.4	5.5	-0.13	0.06	-0.017	-16.6
Shorthorn	4.2	-39.8	-32.8	3.6	-0.13	0.60	-0.103	-18.3
South Devon	2.3	-32.5	-55.2	14.1	-0.47	0.66	-0.220	-67.2
Beefmaster	4.5	21.9	-0.3	9.9				
Brahman	10.6	49.5	15.8	19.4	-0.64	0.10	-0.169	-33.9
Brangus	3.3	13.9	4.5	12.3				
Santa Gertrudis	4.8	38.3	38.4	17.7	-0.46	0.04	-0.086	-8.8
Braunvieh	2.4	-24.0	-43.3	4.7	-0.58	1.11	-0.107	-48.9
Charolais	6.9	32.5	23.2	5.5	-0.26	1.21	-0.204	8.1
Chiangus	2.8	-19.3	-29.9	0.9	-0.16	0.57	-0.095	-18.5
Gelbvieh	2.8	-22.3	-32.1	6.5	-0.25	0.86	-0.103	-20.2
Limousin	1.7	-21.5	-46.9	-7.4	-0.22	1.13	-0.101	-21.6
Maine-Anjou	2.4	-33.3	-52.4	-7.0	-0.44	0.93	-0.184	-33.0
Salers	0.9	-16.5	-46.3	8.1	0.06	1.03	-0.179	-46.7
Simmental	2.9	-8.9	-14.9	3.8	-0.21	0.51	-0.105	-2.9
Tarentaise	3.4	18.5	-11.6	20.8				

[a]Marbling score units: 4.00 = Sl^{00}; 5.00 = Sm^{00}

As an example, suppose a Charolais bull has a weaning weight EPD of + 25.0 lb and a Hereford bull has a weaning weight EPD of + 70.0 lb. The across-breed adjustment factors for weaning weight (see Table 1) are 32.5 lb for Charolais and -18.2 lb for Hereford. The AB-EPD is 25.0 lb + 32.5 lb = 57.5 lb for the Charolais bull and 70.0 – 18.2 = 51.8 lb for the Hereford bull. The expected weaning weight difference of offspring when both are mated to cows of another breed (e.g., Angus) would be 57.5 lb – 51.8 lb = 5.7 lb.

It is important to note that the table factors (Table 1) do not represent a direct comparison among the different breeds because of base differences between the breeds. They should only be used to compare the EPDs (AB-EPDs) of animals in different breeds. To reduce confusion, breed of sire means (i.e. one half of full breed effect; breed of sire means predict differences when bulls from two different breeds are mated to cows of a third, unrelated breed) for animals born in 2015 under conditions similar to USMARC are presented in Table 2.

The adjustment factors in Table 1 were updated using EPDs from the most recent national cattle evaluations conducted by each of the eighteen breed associations (current as of December 2017). The breed differences used to calculate the factors are based on comparisons of progeny of sires from each of these breeds in the Germplasm Evaluation Program at USMARC in Clay Center, Nebraska. These

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USDA NIFA United States Department of Agriculture National Institute of Food and Agriculture

Table 2. Breed of sire means for 2015 born animals under conditions similar to USMARC

Breed	Birth Wt. (lb)	Weaning Wt. (lb)	Yearling Wt. (lb)	Maternal Milk (lb)	Marbling Score[a]	Ribeye Area (in^2)	Fat Thickness (in)	Carcass Wt.(lb)
Angus	86.1	567.2	1061.4	553.9	5.66	13.65	0.657	931.4
Hereford	89.6	548.5	1011.1	539.1	4.90	13.43	0.577	885.0
Red Angus	85.7	546.3	1025.5	557.3	5.40	13.36	0.623	899.8
Shorthorn	91.0	528.6	1000.5	551.6	5.04	13.77	0.500	886.1
South Devon	89.2	529.7	1001.2	570.1	5.04	14.05	0.437	858.2
Beefmaster	89.7	562.1	1014.1	549.8				
Brahman	97.2	583.7	1016.1	555.7	4.48	13.27	0.477	864.5
Brangus	89.0	556.9	1027.0	552.1				
Santa Gertrudis	89.7	559.7	1018.0	549.4	4.64	13.24	0.562	891.7
Braunvieh	89.7	537.3	998.1	570.3	5.13	14.62	0.451	870.1
Charolais	92.0	576.5	1045.8	545.3	4.90	14.70	0.448	921.3
Chiangus	89.8	539.9	1004.2	547.2	5.02	14.09	0.501	887.7
Gelbvieh	88.0	559.9	1036.3	562.9	4.93	14.45	0.496	902.9
Limousin	88.5	556.8	1011.3	549.8	4.65	14.77	0.476	897.7
Maine-Anjou	88.8	528.7	978.9	542.4	4.68	14.40	0.414	870.0
Salers	87.2	544.5	1010.5	558.8	5.33	14.23	0.468	872.6
Simmental	89.6	570.4	1049.5	555.7	5.04	14.47	0.482	920.5
Tarentaise	88.7	550.3	988.7	552.0				

[a]Marbling score units: 4.00 = SI^{00}; 5.00 = Sm^{00}

analyses were conducted by USMARC geneticists Larry Kuehn (email: Larry.Kuehn@ars.usda.gov; ph: 402-762-4352) and Mark Thallman (email: Mark.Thallman@ars.usda.gov; ph: 402-762-4261).

Improvements to the ABEPD system

In 2016, the Beef Improvement Federation formed a working group of scientists, extension specialists, and breed association representatives to evaluate the ABEPD system. Their main objectives were to discuss the ABEPD system in relation to the multibreed NCE performed by International Genetic Solutions (IGS) and to set targets for future releases and implementation of the ABEPD factors.

Multibreed National Cattle Evaluation: Multibreed evaluation has long been a goal of the animal breeding community in the United States. The aim of such an analysis is to produce sets of EPDs that are directly comparable across breeds participating in the system without the need for ABEPD adjustment factors. An additional important benefit is producing EPDs for a large network of seedstock breeders (from multiple breeds) in a single evaluation.

However, even when using multibreed evaluation models, producing EPDs that are comparable across breeds is only possible if sires from the breeds are either directly compared to one another (e.g., progeny in the same contemporary group) or indirectly compared (e.g., sires are compared through a common reference sire).

The current multibreed evaluation, facilitated by IGS, involves several of the

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breeds in the ABEPD system. While most sires in the system are not directly compared to one another through progeny in the same contemporary group, they are tied together through common use of Angus bulls in several of the breeds. As of this writing, we still show differences in ABEPD factors of the breeds that participate in the IGS multibreed, indicating that they may not be on the same base. The BIF working group recommended continuing to produce separate, breed-based, ABEPD factors rather than one factor for all breeds in the system.

Future Release of ABEPD Factors: The traditional time scale of ABEPD factor release during the late spring/early summer Beef Improvement Federation meeting is not ideal for commercial producers buying bulls in the spring or fall season. The BIF working group recommended a plan to begin releasing the ABEPD factors near the end of each year to facilitate the use of these tools during spring bull buying. Additional updates may be released throughout the year, particularly if breeds are aware of significant changes to their evaluations, such as base adjustments.

From summer of 2017 through early 2018, we are aware of several changes to NCE that have or will be taking place. For instance, the American Angus Association has begun using a single-step procedure to incorporate genomic information into their NCE as of July 2017 and the American Hereford Association began incorporating genomic information using a different single-step model (BOLT software, Theta Solutions, LLC.). In addition, both of these breeds made other changes to the variance components used in their respective NCE. Based on these changes, we began examining methods to reduce the impact of genetic trend on the breed estimates from the ABEPD system. These new factors are based on breed differences from USMARC data recorded since 1999 (hence progeny from a more 'current' set of industry bulls). In addition, the NCE produced by IGS will also be changing how genomic information is incorporated in the near future with the use of BOLT software. Because of these changes, we delayed the release of these factors until this point in the year. We expect to have another release in 2018 once the new EPDs from IGS using BOLT have been released.

Future changes to the ABEPD system involve the production of a dedicated web-based system where breeds and USMARC can independently update EPDs/data to make changes in these factors in real time. Ideally this web-based system could be part of a larger decision support system to aid commercial producers in their bull buying decisions.

*Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the USDA. The USDA is an equal opportunity employer.

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Growth and Development of Angus-Wagyu Crossbred Steers

2000

Growth and Development of Angus-Wagyu Crossbred Steers

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Growth and Development of Angus-Wagyu Crossbred Steers

A. S. Leaflet R1635

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Summary

Serially scanning Angus-Wagyu crossbred steers with real-time ultrasound suggests the following conclusions:

- **Comparing real-time ultrasound measurements, including fat cover, percent intramuscular fat and rib eye area, with carcass measurements at harvest time suggests ultrasound measurements are accurate enough to be used as a body composition evaluation tool.**
- **Serial ultrasound measurements indicate that muscle deposition based on rib eye area occurred linearly from 772 to 1,406 pounds, and perhaps to a heavier weight than expected.**
- **Subcutaneous fat ultrasonic measurements suggest a slow linear increase in fat cover until the cattle weighed 1,100 lbs., and then fat cover increased at a much faster rate.**
- **Percent intramuscular fat in these unique Angus-Wagyu steers was equivalent to low choice at 772 pounds and continued at the same linear rate until the cattle were harvested.**
- **It is possible to produce cattle that have the genetic potential to produce carcasses with high levels of intramuscular fat while remaining relatively lean.**

Introduction

Value-based marketing and branded beef programs suggest the need to better understand and be able to predict body compositional changes and tissue deposition endpoints of feedlot cattle. The objective of this study was to evaluate the use of real-time ultrasound to serially scan and ultimately predict compositional differences in fat and lean deposition on a unique group of Angus-Wagyu steer calves. Rib eye area, fat cover and percent intramuscular fat measurements were predicted serially with real-time ultrasound during the feeding period and compared at harvest with carcass measurements and percent intramuscular fat determined chemically.

Materials and Methods

Nine Wagyu-Angus crossbred steer calves were fed for the Prima Corporation at the ISU Teaching Farm. The calves averaged 499 lbs. on November 20, 1996. The calves were started on a 50% concentrate diet and increased gradually up to an 80% concentrate corn-corn silage diet after being on feed 40 days. They were then increased to 85% concentrate over the next 30 days and remained on this diet until the last 75 days when the corn was increased to provide an 89% concentrate diet. Protein supplement was fed to meet the metabolizable protein requirement.

These steers were scanned serially with an Aloka 500V real-time ultrasound machine fitted with a 17 cm, 3.5 MHg transducer. Scanning began after the steers had been on feed 97 days and weighed 772 lbs. (February 25, 1997) and continued at 50-60 day intervals until a week before harvest when they weighed 1,502 lbs. (December 5, 1998). The cattle were scanned and weighed seven times during the feeding period; live weights and days on feed at each of the seven scanning dates are shown in Figure 1. The steers gained 2.65 lbs/day during the total 380 days on feed. They gained faster (2.81 pounds/day) during the first 190 days than they did the remaining 190 days (2.46 lbs/day).

At harvest, routine carcass measurements were obtained; hot carcass weight, fat cover and ribeye area were measured at the 12^{th} rib, and percent kidney, heart and pelvic fat and marbling score was determined to the nearest 10^{th} of a degree (i.e., Moderate^{20}). In addition a one-fourth inch thick facing of the rib eye muscle from each steer was collected and returned to the ISU Meat Laboratory for hexane extraction to determine percent intramuscular fat.

Results and Discussion

Table 1 relates the final ultrasound scan to the corresponding carcass measurements at harvest. The mean values and rank for fat cover and rib eye area indicate that the real-time ultrasound measurements were similar to carcass measurements. Fat cover measured on the carcass was 0.07 inches fatter than the ultrasound prediction, similar results have been observed in earlier studies, suggesting that on fatter cattle, ultrasound, usually underestimates the carcass measurement. Mean values for rib eye area were 15.1 and 15.0 for carcass and ultrasound respectively. Percent intramuscular fat ultrasound predictions are within parameters established in model development and reflect accurately an intramuscular fat level higher than most of the rib samples from cattle utilized in model development.

Figure 2 relates rib eye area development during the feeding period. Rib eye muscle growth was nearly linear when measured from 97 days until 344 days on feed, then reduced dramatically during the last 36 days. Perhaps the most interesting aspect of muscle growth was that it continued until the cattle weighed 1,400 pounds, considering these steers were neither heavy muscled nor large framed.

Figures 3 and 4 reflect fat deposition for two different fat depots on Angus-Wagyu cross steers. Figure 3 indicates

subcutaneous fat deposition evaluated by fat cover at the 12th rib; Figure 4 relates the level of intramuscular fat.

Subcutaneous fat increased at a rather slow linear rate during the first 272 days on feed (increasing from 0.20 inches to 0.37 inches from 97-272 days, respectively). During the remaining 108 days on feed fat deposition nearly doubled (increasing from 0.37 in. to 0.66). A very dramatic increase in the rate of subcutaneous fat deposition is depicted graphically by the change in slope in Figure 3.

Percent intramuscular fat shown in Figure 4 relates a rather linear increase in fat deposition after the steers had been on feed 139 days. It is also interesting to note that these steers had more than 4.00% intramuscular fat (equivalent to the low choice grade) in their rib eyes after 97 days on feed and only 0.2 inches of subcutaneous fat. This result would suggest that these cattle had the genetic potential to deposit high levels of intramuscular fat while remaining relatively lean (i.e., 6.84% intramuscular fat and 0.37 inches of subcutaneous fat).

Implications

Real-time ultrasound has the potential to be used as a tool to serially predict muscle and fat deposition changes during the feedlot phase of cattle production. Genetically these are cattle that had the potential to deposit intramuscular fat at a faster rate and at higher levels than typical feedlot cattle, while remaining relatively lean.

Table 1. Final ultrasound scan and corresponding carcass measurements.

Steer ID	Live Wt. lbs.	Carcass Wt. lbs.	[a]C-fat cover, in	[b]U-fat cover	C-REA, in^2	U-REA, in^2	C-% IMFat	U-% IMFat	Marbling Score	Quality Grade
6097	1495	976	0.85	0.70	14.8	13.1	09.08	07.79	SLAB 1330	Pr-
6111	1410	889	1.00	0.77	15.2	15.4	12.49	10.60	SLAB 1300	Pr-
6114	1450	942	0.65	0.66	13.8	15.9	06.92	07.18	SLAB 1300	Pr-
6121	1460	1003	0.40	0.42	15.5	14.3	09.28	08.91	SLAB 1330	Pr-
6127	1425	950	0.90	0.87	15.7	15.1	10.49	08.45	SLAB 1320	Pr-
6137	1440	915	0.65	0.59	14.9	14.8	08.79	06.85	MD 1290	Ch+
6146	1475	931	0.75	0.67	14.7	14.6	12.04	08.49	SLAB 1350	Pr-
6180	1420	921	0.80	0.54	14.3	15.2	07.80	07.93	SLAB 1310	Pr-
6246	1745	1117	0.60	0.72	17.4	16.3	07.48	07.49	MD 1280	Ch+
Means	1491	960	0.73	0.66	15.1	15.0	09.37	08.19	1312	

Figure 1. Mean weight of Angus-Wagyu cross steers at each scanning date.

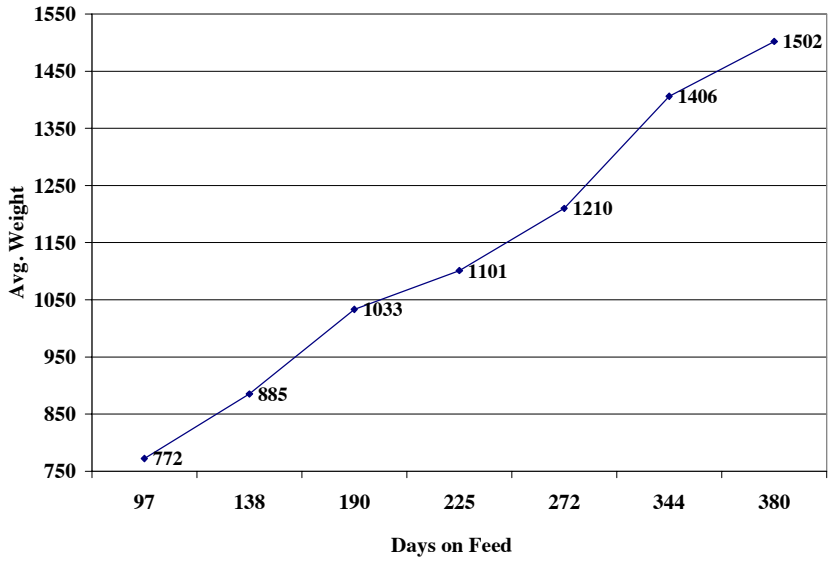


Figure 2. Ultrasound serial scan measurements for rib eye area.

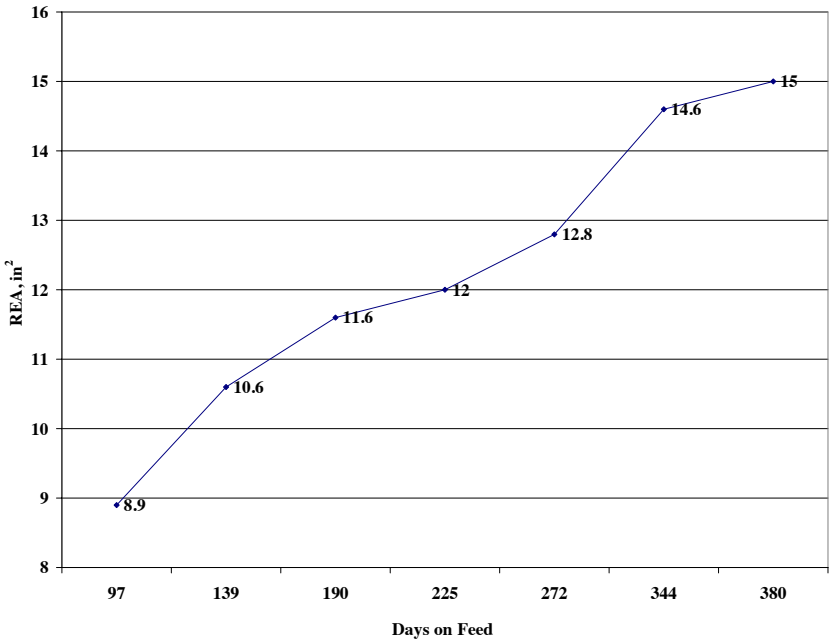


Figure 3. Ultrasound serial scan measurements for fat cover.

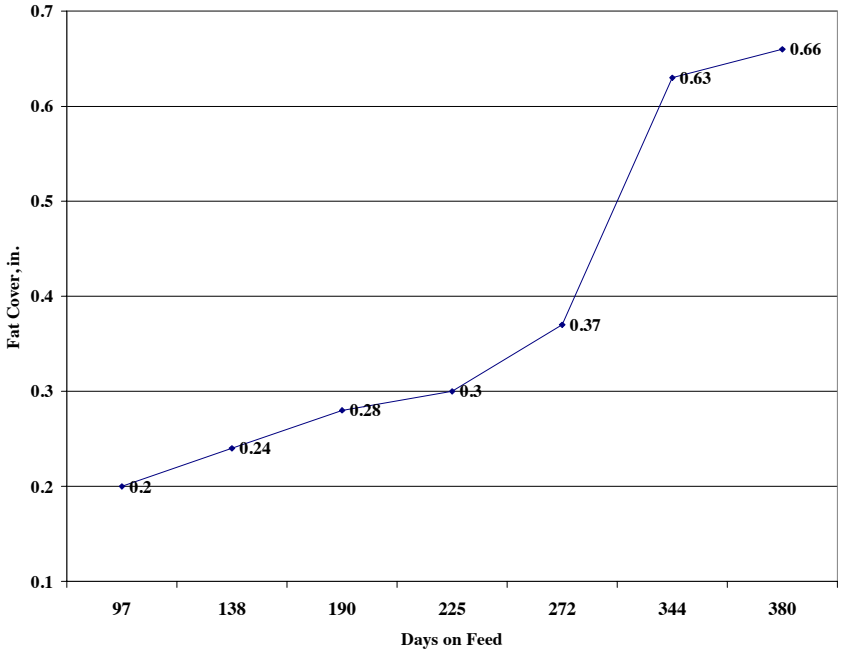
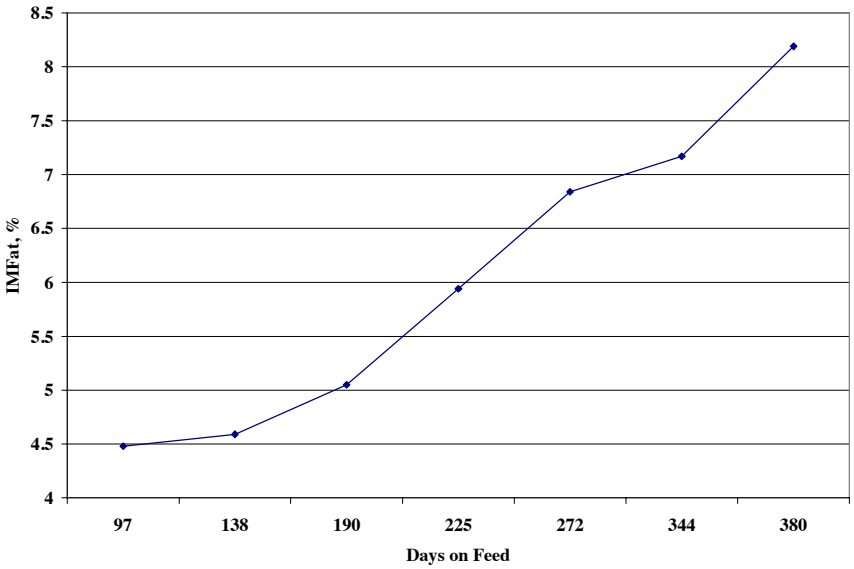


Figure 4. Ultrasound serial scan measurements for % intramuscular fat.



2018 - 3



Recent Changes to National Cattle Evaluation

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Single-step genetic evaluations have become a reality for several beef breed associations, with the expectation that more will adopt single-step predictions in the near future. Single-step refers to the incorporation of genomic data in the form of genotypes, along with pedigree and phenotypes, into a genetic evaluation to produce EPD. This differs from the way genomic data were historically incorporated into EPD. In the past, breed association either used a correlated trait approach or blending. In both of these cases, marker effects were estimated in a training set, evaluated in another set of animals, and the resulting prediction equation was applied to newly genotyped animals. This was the process used to calculate the Molecular Breeding Value (MBV) that was then either fitted in multiple-trait models (correlated trait approach) or used to blend together with the traditional, pedigree-based EPD to create genomic-enhanced (GE)-EPD.

The benefit of having moved to a single-step implementation for genomic selection is that it results in a more accurate accounting for the influence of genomic data on the resulting EPD. Research has shown that single-step methods reduce the bias that was observed using the two historical MBV-based approaches detailed above. The improvement in EPD accuracy from utilizing genomic data in a single-step evaluation is a result of the ability to better estimate the relationship between individuals. For example, based on pedigree information alone, the expectation of the relationship between an individual and its grandparent is 0.25. However, in reality this relationship is represented by a bell-shaped curve centered at 0.25 but with a range between 0 and 0.5. Using genomic data, a more accurate estimate of this relationship can be obtained. This refinement in estimating relationships is a result of better capturing of the similarities between animals at the genomic level and results in more accurate estimates of genetic merit.

Currently, two general statistical methods for single-step evaluations are used. One is single-step genomic best linear unbiased prediction (ssGBLUP) and the other is a super hybrid model (sHybrid). The former is currently employed by Angus Genetics Inc. (Angus and Charolais evaluations) and several American breeds (Santa Gertrudis Breeders International, Beefmaster Breeders United, International Brangus Breeders Association) utilizing software from the University of Georgia, and the latter is implemented by the American Hereford

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Association (AHA) and International Genetics Solutions (IGS) with the BOLT software from Theta Solutions, LLC. IGS is a collaboration between the American Simmental Association, Red Angus Association of America, American Gelbvieh Association, North American Limousin Foundation, American Shorthorn Association, American Chianina Association, and Canadian counterparts to these U.S. organizations.

Although the American breeds were the first among U.S. beef breed associations to utilize a 'single-step' evaluation, for the other breed associations the adoption of this method is a substantial change. Single-step GBLUP, as currently implemented, uses approximately 50,000 SNP and assumes that each SNP is equally informative relative to estimating relationships between individuals. The hybrid model, as implemented, selects approximately 2,500 SNP that are estimated to be the most informative from the full 50K assay and then uses only this selected subset in national cattle evaluation (NCE), allowing for some markers to have more influence on the genetic merit estimates of animals compared to other markers.

As beef breed associations implemented these changes, they also changed other components of their NCE including updates to genetic parameters (e.g., heritability), changes to economic selection indices (e.g., AHA), changes to the statistical models used to estimate EPD for several traits. In the case of multi-breed evaluations (IGS), changes were made to the way breed effects are estimated.

Below are some key changes that were made in addition to the change to single-step incorporation of genomic data.

Numerically lower accuracy—For breeds using the BOLT software (AHA, IGS) the accuracy values associated with EPD will go down in many cases. This seems counterintuitive given that the EPD are actually more reliable. Lower accuracies occur because the methods previously used to approximate accuracy led to over-estimates and the new method to calculate accuracy provides more accurate values (think of it as more accurate accuracy).

Stayability (IGS)— IGS has published a multi-breed stayability via single-step for over a year. However, it is important to realize that there are differences between the "new" and "old" stayability EPD. The new improved version uses a model that enables more data to enter the genetic evaluation and defines contemporary groups in a more sensible way. This leads to re-ranking of animals, but also to more accurate estimates of the genetic potential for the most economically relevant trait of importance to producers who retain replacement heifers.

Sustained Cow Fertility (AHA)—New EPD for AHA that is very similar to Stayability discussed above.

Carcass—The carcass EPD take advantage of true carcass data, ultrasound data, and growth traits measured early in life. The addition of growth traits measured earlier in life to the carcass models has been made to multiple breed associations' NCE including Angus, Hereford, and the IGS breeds to mitigate the issue of bias from sequential culling (culling only the "bad" animals that later have carcass data).

Weekly genetic evaluations—The American Angus Association has published weekly evaluations for some time and other breeds are now doing the same.

Economic indices—As the components of the indexes change (i.e., the EPD) the economic indexes also change. The American Hereford Association also revised their indices to include EPD for more economically relevant traits, and updated the economic parameters. These changes

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will result in more accurate predictors of net profit differences between the offspring of sires.

Reduced range of EPD—For some traits, the range of EPD has been reduced. This is particularly evident in the AHA and the IGS genetic evaluations. If you are comparing an animal's EPD for a given trait before and after the new evaluation, be sure to also compare the percentile rank. The EPD may have changed, but the relative rank in the breed may have remained very similar.

Breed effects—Given IGS performs a multi-breed evaluation, there was a need to correctly adjust phenotypic records for breed effects, and for the effects of heterosis with the goal of allowing the resulting EPD to be directly comparable across breeds. This also produces EPD that estimate only the additive genetic merit (i.e. heritable component) of an animal as a parent. Currently, IGS estimates breed differences for most traits from their multi-breed database. The exception to this approach is for carcass traits. In this case, the breed effect estimates for carcass traits are obtained from the U.S. Meat Animal Research Center's Germplasm Evaluation Project.

There is a continued need for more records in order to continuously improve NCE. Breeders can help by submitting carcass data and female fertility records; this will improve the accuracy of EPD for these two suites of traits. Additionally, animals with records for these traits should also be genotyped. Genetic evaluations for several beef breeds currently suffer from a general lack of genotypes on female animals. Consequently, genomic predictions for sex-limited traits become problematic. And yet another reminder, even in the era of genomic selection, phenotypes (observed performance records) are still king and producers must not stop or limit phenotypic data collection.

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WAGYU: The Most Profitable Beef Cross for U.S. Dairy Producers

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By Jimmy L. Horner, Ph.D., P.A.S., President/CEO Protocol Technologies, Inc.

and Michael Beattie, Executive Director, American Wagyu Association

Wagyu cattle are native to Japan. The breed is known for highly marbled, healthy beef along with low birthweight calves and very docile temperaments. Though many in the U.S. are unfamiliar with this unique breed, the American Wagyu Association is currently the fastest growing beef breed association in the U.S. and those who have joined the Wagyu ranks are still on the ground floor of a breed ready to explode onto the American beef scene.

Most U.S. Wagyu beef, whether from fullbloods or crosses, grades Prime or above. The Japanese BMS beef grading system actually includes 8 levels above our USDA Prime to accommodate the high degree of marbling in the Wagyu breed. With less than 2% of U.S. beef grading Prime, the U.S. Wagyu industry is poised for the opportunity to make a significant impact on the overall quality of U.S. beef and provide Americans beef with eating quality and health benefits second to none.

Many commercial dairies in the U.S. are now utilizing crossbreeding programs with beef breeds since there is a significant incremental value opportunity by marketing crossbred beef x dairy over dairy calves. The adoption of sexed semen is often used to breed the dairy herd's best females to provide replacement heifers with other females, particularly 1st calf heifers, bred to beef bulls.

One area of great economic potential for U.S. dairy producers is the use of Wagyu genetics to produce a calf which is significantly more valuable than a dairy calf and often more valuable than other beef x dairy cross calves in many markets. There are numerous U.S. buyers willing to pay $0.20-0.30 per lb premiums above CBT or local market beef prices for Wagyu F1 calves.

Some U.S. dairy producers are receiving a $100 premium for their day old Wagyu F1 crosses compared to Holstein calves.

Breeding Holstein females to Wagyu bulls is already commonplace in both Japan and Australia with Wagyu x Holstein deemed as the ultimate cross in Japan because Holsteins are the next highest marbling cattle breed behind Wagyus, producing meat superior in quality to Wagyu crossed with any other breed.

Most Japanese consumers prefer Wagyu x Holstein F1 cross beef when Wagyu is not available. Wagyu x Holstein F1 cattle currently comprise approximately 25% of the cattle slaughtered for beef in Japan with fed steers bringing 2-3 times more than a Holstein steer.

The Wagyu breed has already revolutionized the Australian beef industry and is well on its way in doing the same in the U.S. The Wagyu breed provides an excellent alternative for dairy producers looking to increase profitability through crossbreeding and diversifying their operations to help supply the demands of an ever-increasing market for beef which is truly in a league of its own.

Tags: WAGYU, U.S. Dairy, Producers, Beef, USDA, Japanese, Holstein, F1

Article Category: Miscellaneous

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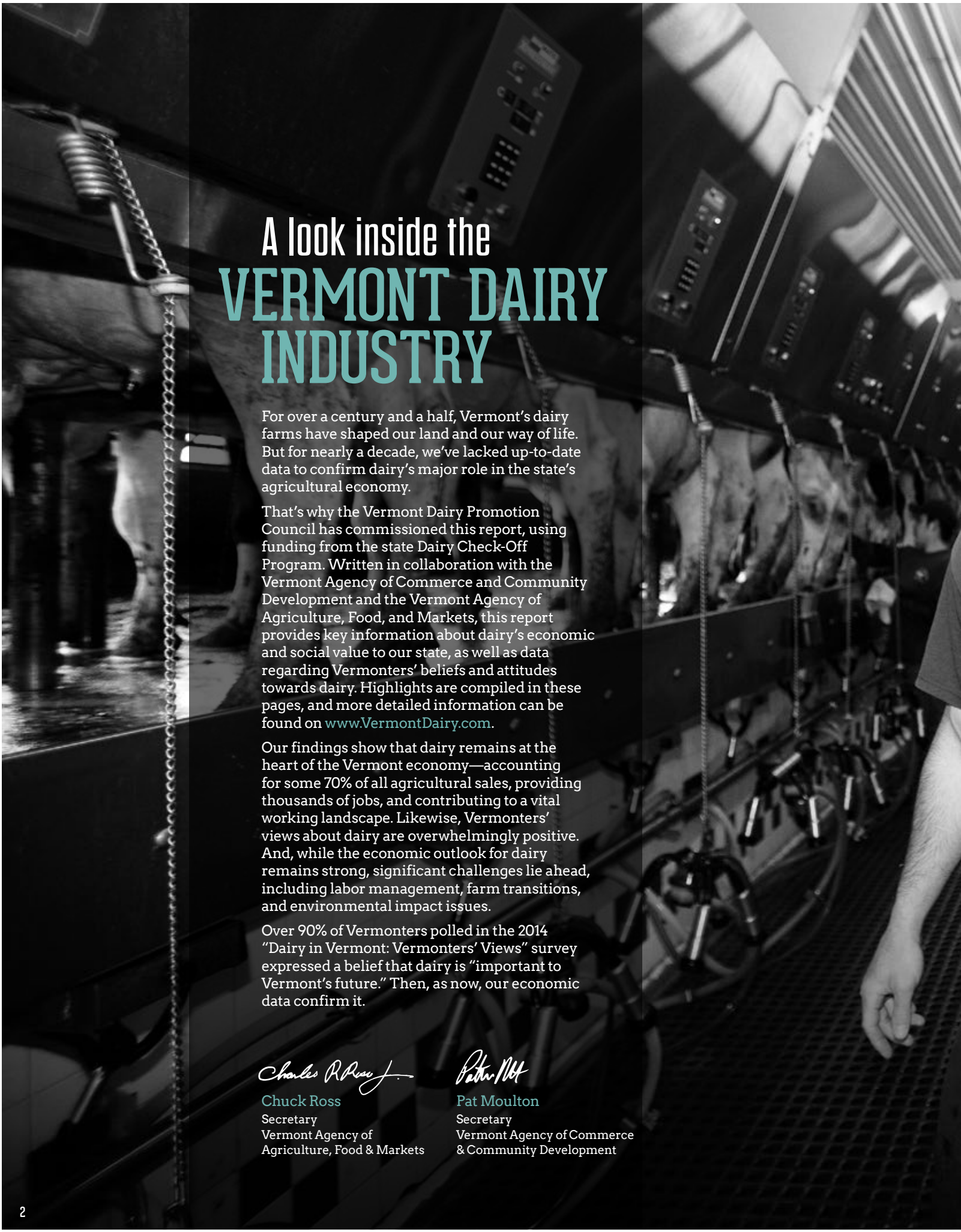
THE ROLE OF DAIRY IN VERMONT

AN ECONOMIC ASSESSMENT

Brought to you by the Vermont Dairy Promotion Council



A look inside the VERMONT DAIRY INDUSTRY

For over a century and a half, Vermont's dairy farms have shaped our land and our way of life. But for nearly a decade, we've lacked up-to-date data to confirm dairy's major role in the state's agricultural economy.

That's why the Vermont Dairy Promotion Council has commissioned this report, using funding from the state Dairy Check-Off Program. Written in collaboration with the Vermont Agency of Commerce and Community Development and the Vermont Agency of Agriculture, Food, and Markets, this report provides key information about dairy's economic and social value to our state, as well as data regarding Vermonters' beliefs and attitudes towards dairy. Highlights are compiled in these pages, and more detailed information can be found on www.VermontDairy.com.

Our findings show that dairy remains at the heart of the Vermont economy—accounting for some 70% of all agricultural sales, providing thousands of jobs, and contributing to a vital working landscape. Likewise, Vermonters' views about dairy are overwhelmingly positive. And, while the economic outlook for dairy remains strong, significant challenges lie ahead, including labor management, farm transitions, and environmental impact issues.

Over 90% of Vermonters polled in the 2014 "Dairy in Vermont: Vermonters' Views" survey expressed a belief that dairy is "important to Vermont's future." Then, as now, our economic data confirm it.

Chuck Ross
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Vermont Agency of
Agriculture, Food & Markets

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Vermont Agency of Commerce
& Community Development

advisory team:

Tom Bivins,
Vermont Cheese Council

Jane Clifford
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Jackie Folsom
Dairy Vision Vermont

Bob Foster
Foster Brothers Dairy

Tom Gates
St. Albans Cooperative

Jim Harrison
Vermont Retail & Grocers Association

Bob Parsons
University of Vermont

Bob Wellington
Agrimark

data cited in this report are drawn from:

Jones, K. *The Value of Dairy in Vermont: An Economic Assessment*, Vermont Agency of Commerce and Community Development, December, 2014.

"Dairy in Vermont: Vermonters' Views" a survey conducted by the Castleton Polling Institute on behalf of the Vermont Dairy Promotion Council in 2014. Data were collected on interviews drawn from a random sample of 271 registered voters in Vermont. Interviews were conducted by phone from November 5 through 12, 2014.

Other data are compiled from the following sources: Vermont Sustainable Jobs Fund: *Farm to Plate Strategic Plan, Executive Summary* (2009) and *Farm to Plate Atlas* (2014); USDA Census of Agriculture, *2012 Census Volume 1, Chapter 1 State Level Data/Vermont*; US Census data, *Profile of General Population and Housing Characteristics: 2010; US Census data, State and County QuickFacts: Vermont;* Vermont Tourism Research Center: *The Vermont Travel and Tourism Industry—2011*, Vermont Business Magazine: *Largest Employers—2014*; Vermont Agency of Agriculture, Food & Markets 2014 Data.

Photo: Cabot Creamery Cooperative

What Vermont Dairy LOOKS LIKE TODAY

134,132
Dairy Cows in Vermont[1]
[mostly Holstein & Jerseys]

868
Dairy Farms[2] in Vermont

321.25 MILLION
gallons of Vermont milk sold each year
[or 2.57 billion pounds]

5%
of milk produced in Vermont is Certified Organic

< 1%
of Vermont dairy farms produce non-bovine milk[3]
[goat, sheep]

Data compiled from the 2012 Census of Agriculture, with 1/2015 updates from the Vermont Agency of Agriculture, Food, and Markets

Meet our dairy farmers

Almost all of Vermont's dairy farms are family owned. Of the state's 868 dairy farms:[4]

749 [82%]
ARE SMALL [<200 cows]

Farr Family Farm | Richmond

Ashley Farr, a third-generation farmer, and his wife Erin, milk 60 cows at their farm in Richmond. The Farrs are one of a growing number of Vermont farms to embrace new robotic milking technology. In 2012, they purchased a Lely A3 Robotic Milker, which allows their cows to determine their own milking schedules. The robots are fully automated. Cows walk into the machine on their own, and once inside lasers guide the suction apparatus to their teats. Each cow wears a transponder around its neck, which syncs with the robot and monitors the cow's milk production.

The Farrs say the robot has provided them with a more flexible schedule, which is helpful because their growing family keeps them very busy with 4-H, school sports, and activities.

130 [15.1%]
ARE MEDIUM [200-699 cows]

Gingue Brothers Dairy | Fairfax & Westford

Working with their father Paul, brothers Dan, Shawn, Jeff and James Gingue currently milk 550 dairy cows, raise 450 replacement heifers, and crop-farm 1,100 acres of land. Recently they received the "Top Quality Award" from their milk cooperative, Dairy Farmers of America.

As the Gingues grow and harvest high-quality feed for their herd in two counties, they've adapted many conservation practices to better ensure the long-term health of the Lake Champlain and Connecticut River watersheds near their farms. They use cover cropping strategies on all corn fields and no-till planting practices to reduce soil erosion, as well as manure injection applications that greatly reduce the chance of phosphorus runoff.

25 [2.8%]
ARE LARGE [700+ cows]

Blue Spruce Farm | Bridport

Blue Spruce Farm is the Audet family's third generation dairy farm whose herd of 1,500 cows (mostly registered Holsteins) produced over 4.3 million gallons of milk in 2014. The family is one of the 1,200 dairy farm owners of the Agri-mark Cooperative, makers of internationally recognized Cabot cheddar cheese. Blue Spruce was the first Green Mountain Power Cow Power farm project in Vermont, and currently turns manure and other agricultural products into methane gas to produce enough renewable electricity to power more than 400 homes.

Recently the Audets worked with GMP to add a 100-kilowatt wind turbine to their renewable energy portfolio. The turbine, manufactured in Vermont by Northern Power Systems, generates enough electricity to power more than 20 homes.

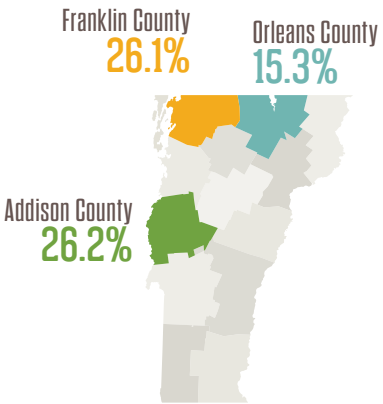
Each year, Vermont dairy cows supply enough milk to fill 16,000 standard size swimming pools

Vermont's Dairy Farms in a snapshot

Dairy farms touch every county in the state—**at least 10 farms in every county.** Most (2/3) are concentrated in Addison, Franklin and Orleans counties.

	# of farms	# of dairy cows	% of dairy cows	milk sales ($ millions)	% of milk sales
Addison	**124**	**32,498**	**24.2%**	**132.1**	**26.2%**
Bennington	16	1,429	1.1%	5.3	1.0%
Caledonia	73	6,739	5.0%	25.7	5.1%
Chittenden	39	5,065	3.8%	18.1	3.6%
Essex	11	1,841	1.4%	6.7	1.3%
Franklin	**184**	**35,736**	**26.6%**	**132.0**	**26.1%**
Grand Isle	14	3,330	2.5%	11.5	2.3%
Lamoille	34	2,856	2.1%	9.2	1.8%
Orange	84	8,618	6.4%	33.6	6.7%
Orleans	**131**	**21,081**	**15.7%**	**77.5**	**15.3%**
Rutland	67	4,687	3.5%	15.3	3.0%
Washington	35	4,368	3.3%	15.9	3.1%
Windham	20	3,069	2.3%	12.7	2.5%
Windsor	36	2,826	2.1%	9.1	1.8%
State Total:	868	134,132	100%	$504.9	100%

Concentration of dairy farms:



"No other state has a single commodity that accounts for such a high percentage of its agricultural sales."

Vermont Council on Rural Development: "Vermont in Transition" report [5]

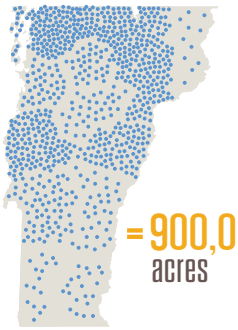
THE ROLE OF DAIRY
in Vermont Agriculture

According to the 2012 agricultural census, 12% of Vermont's 7,338 farms are dairy farms,[6] but their impact on Vermont's agriculture is much greater. Roughly 80% of Vermont's farmland is devoted to supporting milk production, as farmers use their land to grow corn as grain and silage, and to grow grass for pasturing. This keeps feed purchasing dollars local, and reduces transportation costs and energy associated with purchasing feed elsewhere.

Small State, Big Impact[3]

63% of milk produced in New England **COMES FROM VERMONT**[7]

15% OF THE STATE is covered by dairy farms and the fields that provide their feed



= 900,000 acres

OVER 80% of Vermont's farmland is devoted to dairy and crops for dairy feed

DAIRY IS 70% of Vermont's Agricultural Sales

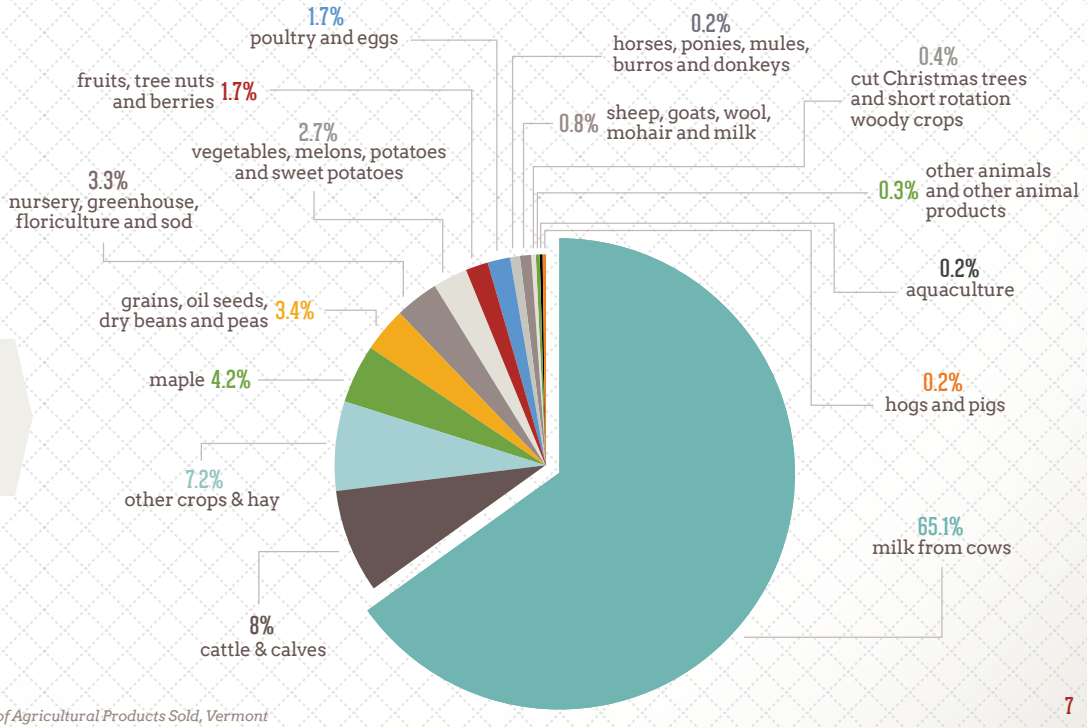
this figure is based on direct sales from farms, including milk and (partially) cattle and calves.

Vermont's economy is small—just 0.2% of the US economy. But we produce more than 1% of the nation's dairy products.

that's **5x** our "economic share"

Share of Agricultural Products Sold in Vermont

[based on market value]



Milk generates more sales than any other Vermont agricultural product...

US Census of Agriculture 2012: Ranking of Market Value of Agricultural Products Sold, Vermont

AT THE HEART
of the Vermont Economy[3]

Dairy helps keep our dollars local. Dairy provides "working land" jobs that keep families here in Vermont, supporting our uniquely rural way of life and contributing to local tax bases. Much of dairy-related wages and salaries help support the local economy, as dairy employees buy local goods and services and pay taxes.

Dairy businesses invest $500 million+ to support Vermont's agricultural economy every year

Dairy helps provide the infrastructure other Vermont farms rely on. Dairy businesses spend some **$500 million** to support Vermont's "agricultural web" of goods and services needed for all types of farming—like competitive pricing for farming equipment and machinery, hay and feed, veterinarians, etc.

Each year

VERMONT DAIRY BRINGS
$2.2 BILLION
in economic activity to the state of Vermont

$2.2 Billion in economic activity includes:

- VALUE OF PRODUCTS SOLD
- INDUCED IMPACTS
  [dairy business' wages and profits effects on the local economy]
- SECONDARY IMPACTS
  [benefits to local agriculture, tourism, real estate, and more]

For more information and to read the full economic report, please visit www.vermontdairy.com

Every day:

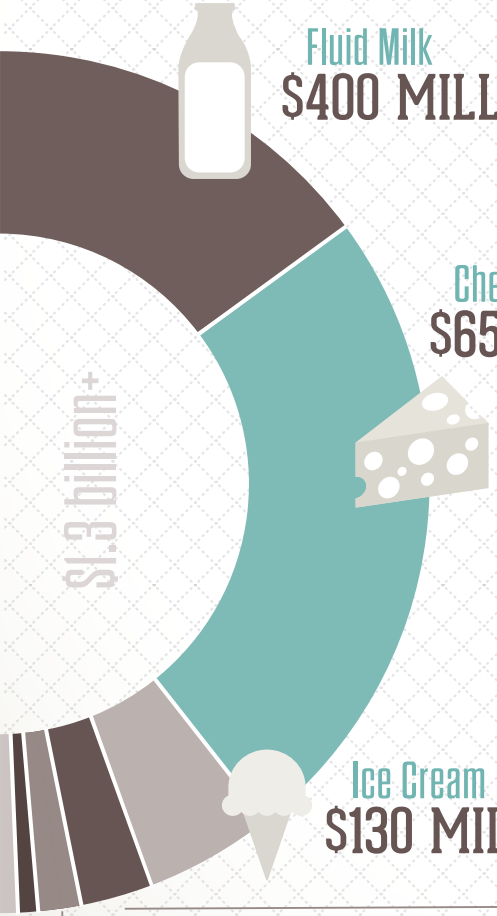
Dairy brings approximately
$3 MILLION
in circulating cash to the state of Vermont

It's not just cows:

The Vermont sheep and goat-based dairy business is small but growing steadily.

In 2012, the revenue from sheep & goat farming (including wool and mohair production) was
$5 MILLION+

Every Vermont dairy cow provides **$12,500** in economic activity to the state annually[8]



Fluid Milk
$400 MILLION

Cheese
$650 MILLION

Ice Cream
$130 MILLION

Yogurt, Butter, etc.
<$100 MILLION

Byproducts
[whey concentrate, lactose]
>$50 MILLION

Manure as soil amendment
$2 MILLION

Manure for bio-solid electricity generation
$2 MILLION

Annual Sales of Vermont Dairy Products & By-Products = **$1.3 BILLION+**

Photo: Cabot Creamery Cooperative

dairy =

6,000-7,000

VERMONT JOBS

PROVIDES

$360 MILLION

in wages & salaries

A GOOD LIVING
Quality jobs with a sense of place[3]

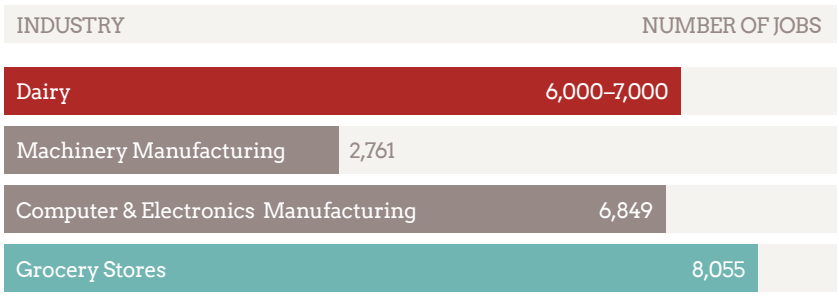
From yogurt makers to farmers to ice cream scoopers to dairy equipment purveyors, some 6,000- 7,000 jobs—**a full 2.5% of the state's workforce**—are connected to Vermont dairy. This figure, based on Department of Labor and Census of Agriculture reports, includes approximately 1,400–3,200 people employed by dairies, 1,700 employees in dairy food production, 1,700 dairy operators, and 1,000 employees in indirect, supporting occupations.

Dairy is one of the state's top job providers
and produces some $360 million in Vermont wages and salaries each year

This estimate compiles wage and salary income from dairy farmers, dairy farm workers, contract labor, food production workers, professional and technical support, agricultural supply retailers, machinery, equipment and supplies, and transportation workers.

Vermont's dairy industry employs a diverse workforce with a broad range of skills, providing opportunities for individuals with varied backgrounds and experiences.

Vermont's Dairy Workforce vs Other Vermont Industries



Vermont's Key Private Employers:
[a sample]

employer	employees
University of Vermont Health Center *(formerly Fletcher Allen Health Care)*	5,383
UVM	3,446
Keurig Green Mountain	2,196
Shaw's Supermarket	1,600
Dealer.com	817
Burton Snowboards	375

Vermont Business Magazine, November 2014[9]

"The dairy industry is integral to our way of life in Vermont—it is essential to our economy, our landscape, and our identity. I am proud of the hard working farmers who make this possible."

Governor Peter Shumlin

Dairy is vital to the VERMONT WAY OF LIFE...

What do Vermonters think about dairy?

In November 2014, the Vermont Agency of Agriculture, Food, and Markets and the Castleton Polling Institute conducted a telephone poll of a representative sample of 271 Vermonters. The resulting report, *Dairy in Vermont: Vermonters' Views*, provides a fascinating snapshot of how Vermonters view the dairy business that so defines our state.

A polling of Vermonters shows that:

97% say dairy farms are important to the state

93% agree that dairy is important to Vermont's economy

92% say dairy farms add to the beauty of Vermont

91% say it's important to Vermont's quality of life

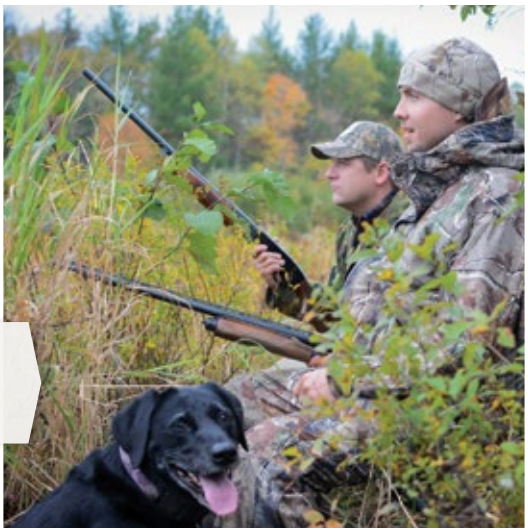
91% say dairy is important to Vermont's future

91% believe buying locally-produced products is important

85% are willing to pay a little more to insure their dairy products are sourced from Vermont

For more information and to read the full "Dairy in Vermont: Vermonters' Views" Poll, please visit www.vermontdairy.com

66% of Vermonters use farmland for recreation



Orb Weaver Farm | New Haven

Pioneering artisan cheesemakers and organic farmers Marjorie Susman and Marian Pollack have been producing outstanding farmhouse cheeses from their herd of seven Jersey cows since 1982. They produce just 7,000 pounds of their hand-crafted waxed and cave-aged cheeses each winter, and run a thriving organic vegetable farm every summer.

Recently, they worked with the Vermont Land Trust to sell a conservation easement that permanently protected their land from development and enabled them to conserve their 19th-century barn—a decision they believe will "make sure future generations are able to farm here too."

...and essential to "THE VERMONT BRAND"

Dairy farms are key to attracting over 13.5 million visitors[10] to Vermont every year

The physical beauty of Vermont is, in part, defined by its farms. Vermont's landscape is a distinctive mix of farms and forests, with rolling hills and open spaces. Our statewide patchwork of dairy farms helps make that possible, and provides a powerful draw for tourism.

84% of Vermonters agree Dairy is important to Vermont's Tourism Industry

from the *"Vermonters' Views on Dairy"* poll

Vermont is a food destination

Reflecting the nation's growing appreciation for locally produced, high-quality food, more and more visitors are coming to Vermont to sample Vermont fare, whether it's visiting artisanal cheesemaking facilities along the Vermont Cheese Trail, attending dozens of nationally-acclaimed food festivals, or enjoying a maple creemee at our ever-popular dairy bars. This, along with Vermont's growing reputation as a center for agritourism, is bringing more and more dairy-related tourism dollars to our state.

The Vermont restaurant business accounted for more than $800 million in taxable sales in 2012. Dairy currently represents 11% of food dollars spent for in-home consumption. If milk, cheese, yogurt and ice cream play the same role in restaurant food preparation as in home food use, then some **$100 million in restaurant activity can be attributed to dairy production**.[3]

Vermonter Cheesemakers Festival

Fodor's Travel called the Vermont Cheesemakers Festival one of the "Top 10 Summer Food Festivals in the Nation."

Each year, more than 2,000 visitors from across the country descend on Shelburne Farms to enjoy the event, which has also been featured in the *New York Times*, *The Boston Globe*, and *USA Today*.

[vtcheesefest.com]

Ben & Jerry's

The Ben & Jerry's Ice Cream Factory is the #1 Tourist Destination in Vermont. The world-famous ice cream, which originated in Vermont, is sold in more 30 than countries across the globe.

[benjerry.com]

LOOKING FORWARD
The future of Vermont dairy

Technology & Sustainability

Vermont farmers are increasingly embracing new technologies to become more efficient and sustainable. These innovations are creating new opportunities for the next generation. Methane digesters, for example, are turning manure into renewable energy. At last count, there were 16 operational digesters in the state, generating 18,000 MWh of "cow power" in 2013, with a retail value of more than $2 million. Interest in wind and solar energy also continues to grow.

A small but growing number of farmers across the state are using robotic milkers, which allow cows to milk "on-demand." These automatic milkers replace the farmer's daily milking routine, allowing unprecedented schedule flexibility. Farms are also adopting energy-efficient technologies to conserve resources and improve their operations, from LED lighting, to energy-efficient fans, to variable speed milk pumps, and more.

Challenges & Opportunities

Vermont's dairy industry faces formidable challenges. Although many farmers are working hard to minimize their environmental impact, significant water quality challenges remain. Farmers need to increase their efforts and work with state, federal, and non-profit partners in order to protect our waterways. The Ag community has a big role to play in restoring the health of Lake Champlain.

Generational farm transitions also present challenges. The average age Vermont farmer is 55 years old, so engaging the next generation is imperative. Some farms are also navigating complex labor and immigration issues. Vermont's congressional delegates have been working with the dairy industry to advocate for sensible immigration reform at the Federal level, but progress is slow. And the price of milk continues to be volatile. New tools, like the Margin Protection Program, are enabling farmers to mitigate their risk, but uncertainty remains.

Worth the Effort

There's hard work ahead. But in light of the many ways dairy enriches our state, working together to find solutions is clearly worth the effort.

Photo: Aegis Renewable Energy

Photo: Blue Spruce Farm

Today more than ever
MILK MATTERS

As an important supplier of milk to New England and a key economic engine in the Vermont economy, dairy supplies thousands of jobs and significant income from wages and salaries--along with secondary benefits to local agriculture, real estate, and tourism.

Just as the open pastures and rolling hills of Vermont's dairy farms help define its landscape, dairy remains inextricably tied to Vermonters' image of their state.

Vermont certainly would look very different without it.

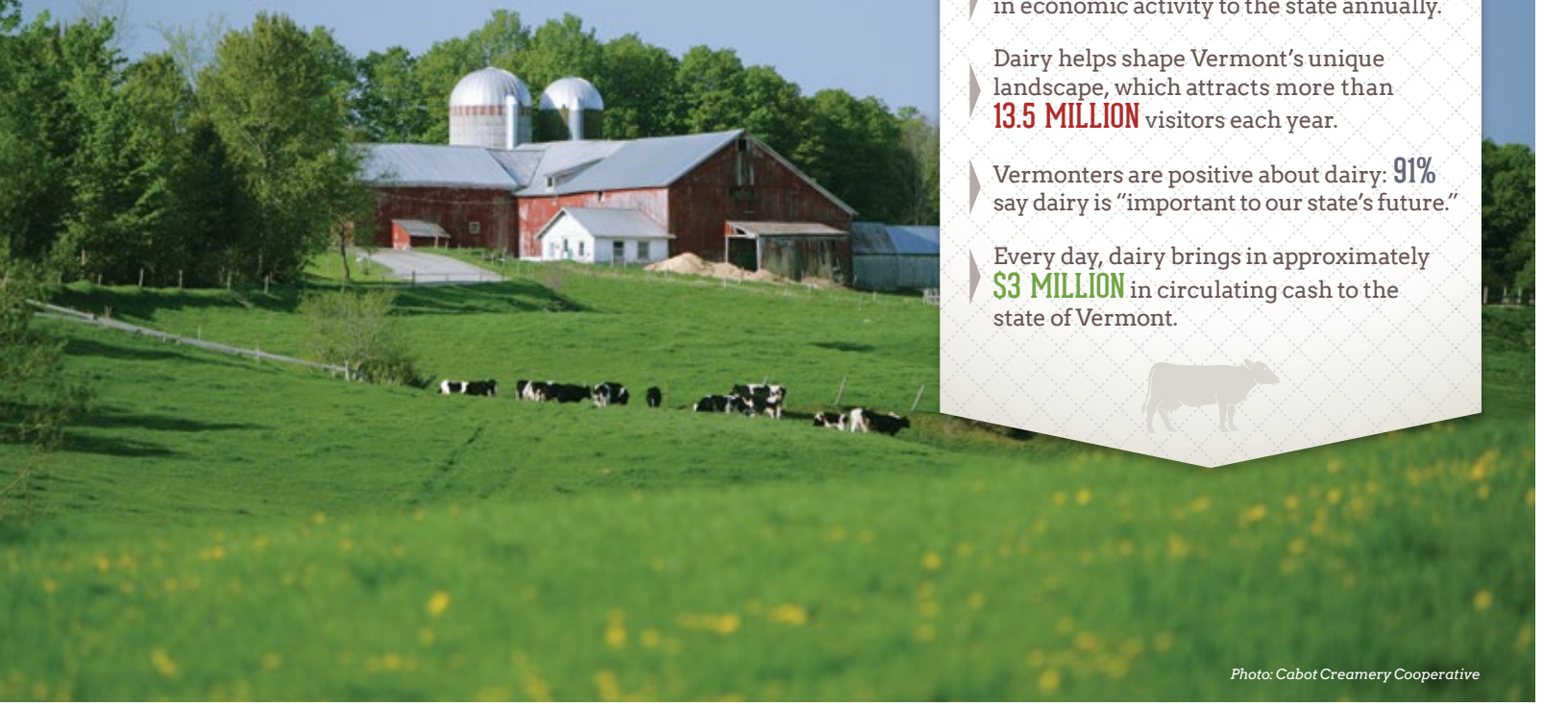


Photo: Cabot Creamery Cooperative

KEY FACTS & FIGURES
DAIRY AT A GLANCE:

- **63%** of milk produced in New England comes from Vermont.
- Dairy brings **$2.2 BILLION** in economic activity each year.
- Dairy represents **70%** of the state's agricultural sales.
- Over **80%** of Vermont farmland is devoted to dairy and crops for dairy feed.
- Dairy is one of Vermont's top private employers, providing **6,000–7,000** jobs (and $360 million in wages and salaries).
- Every Vermont dairy cow provides **$12,500** in economic activity to the state annually.
- Dairy helps shape Vermont's unique landscape, which attracts more than **13.5 MILLION** visitors each year.
- Vermonters are positive about dairy: **91%** say dairy is "important to our state's future."
- Every day, dairy brings in approximately **$3 MILLION** in circulating cash to the state of Vermont.

endnotes:

[1] US Census of Agriculture Table 12. Cattle and Calves – Inventory: 2012 and 2007. http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Vermont/st50_1_012_013.pdf

[2] Vermont Agency of Agriculture 2014 updates to the US Census of Agriculture Table 17. Milk Cow Herd Size by Inventory and Sales: 2012. http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Vermont/st50_1_017_019.pdf

[3] Jones, K. The Value of Dairy in Vermont: An Economic Assessment. Vermont Agency of Commerce and Community Development, December, 2014.

[4] Vermont Agency of Agriculture 2014 updates to the US Census of Agriculture Table 17, op.cit. Farm size categorizations (Small, Medium, and Large) as defined by the Vermont Agency of Agriculture Food and Markets.

[5] Vermont in Transition: A Summary of Social Economic and Environmental Trends, Chapter 6: Agriculture. Vermont Council on Rural Development, 2008. http://vtrural.org/sites/default/files/content/futureofvermont/documents/VTTransitions_Ch6.pdf

[6] US Census of Agriculture Table 9. Land in Farms, Harvested Cropland, and Irrigated Land. http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_State_Level/Vermont/st50_1_009_010.pdf

[7] O'Hara JK, Parsons, RL. The economic value of organic dairy farms in Vermont and Minnesota. Journal of Dairy Science 2014; 96 :6117–6126. http://www.journalofdairyscience.org/article/S0022-0302%2813%2900494-3/pdf

[8] K. Jones, op.cit. Calculated as value of goods sold (including indirect impacts related to producing those goods), and the induced effects resulting from worker payrolls, totaling over $1.7 billion. This was divided by the number of cows (135,000) to arrive at the 12,500 figure.

[9] "Largest Employers Ranking," Vermont Business Magazine 2014: 42(13):53-59.

[10] Vermont Tourism Data Research Center, "The Vermont Travel and Tourism Industry—2011." http://www.uvm.edu/tourismresearch/publications/Tourism_Industry_Fact_Sheet_2011.pdf

Produced in collaboration with

VERMONT

AGENCY OF COMMERCE & COMMUNITY DEVELOPMENT
AGENCY OF AGRICULTURE, FOOD & MARKETS

Addendum 6: Market Research for Beef and Meat Markets

1. Prices of Meat going Up - https://foodinstitute.com/focus/amid-inflation-consumers-have-a-beef-with-beef-prices/#:~:text=Beef%20lovers%20have%20a%20tough,%245.40%20a%20pound%20in%20June

2. Value- Added Calf Program - http://www.superiorlivestock.com/value-added-programs

3. Live Cattle Market Reports –

    a. Addison County Commission Sales – 8-2020
    b. Cambridge NY Auction – 6-2021
    c. Addison County Commission Sales – 8-2022

When will U.S. beef herd sell-off end?

SPARE A PAIR: Beef cattle producers across much of the Southwest are dealing with drought. Pastures are drying up with cow-calf pairs struggling to find forage. It's a tough decision to liquidate a cow herd, but some farmers with adequate cash and feed may be able to build back their numbers.

Beef Outlook: Farmers continue to liquidate the cow herd; is now the time to expand your operation?

Scott Brown | Aug 01, 2022

The July cattle report from USDA largely met analyst expectations, confirming further liquidation in the U.S. beef cow herd.

Beef cow numbers for July 1 came in at 30.35 million head, 2.4% below one year ago and down 6.3% versus the recent July inventory peak in 2018.

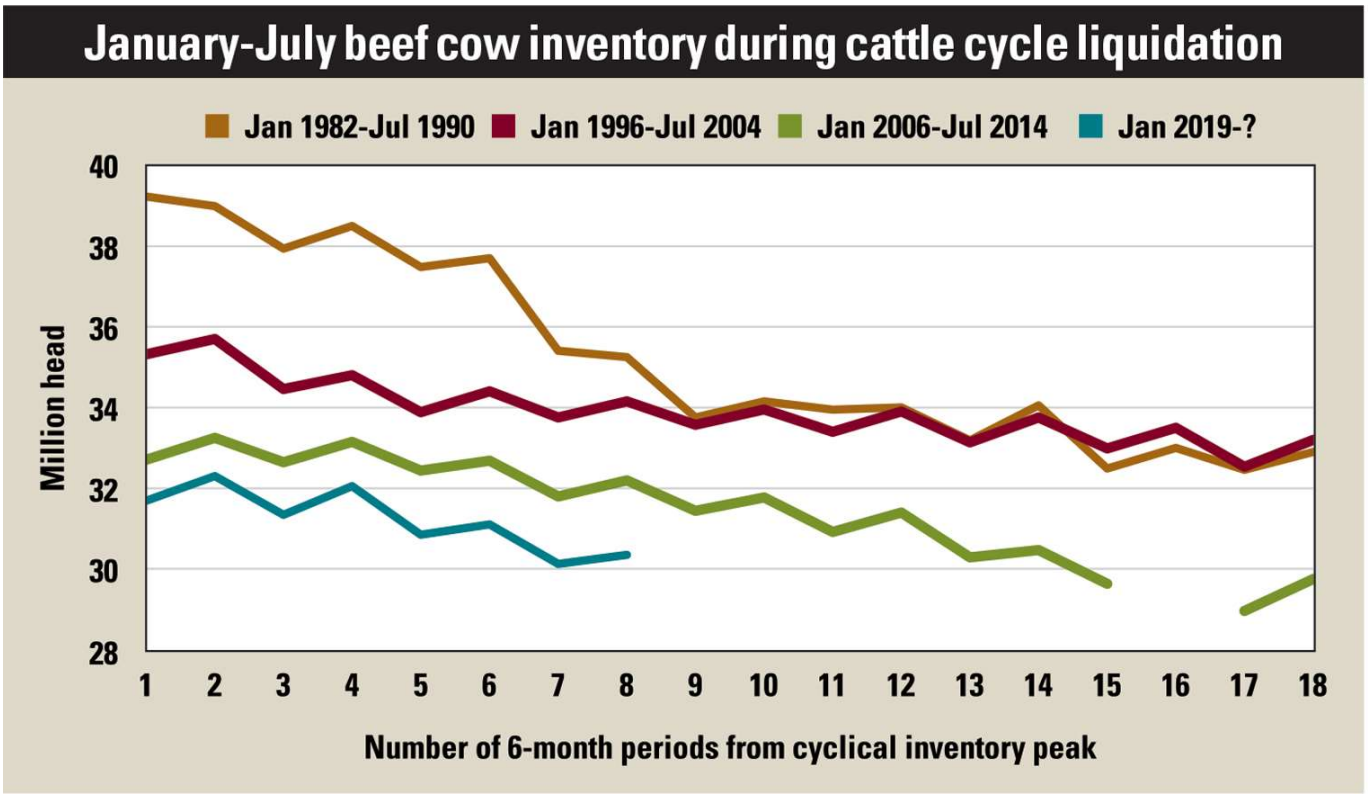
Although no two cattle cycles are the same, the inventory reduction that is currently being experienced is quite similar in magnitude to the initial liquidation phase of the previous three cattle cycles.

And if the cycles of the recent past continue to be a guide for how this one will play out, we have a way to go in terms of time and declines before the situation reverses.

Past points to future

In the previous three cycles, the beef cow inventory fell an average of 7.1% after this many periods of liquidation, with the largest decline of 12% occurring in the early to mid-1980s. It was followed by more modest declines in the late 1990s (5.4%) and the late 2000s (3.9%).

The duration of the liquidation phase of the previous three cycles lasted for eight or nine years, although there were a couple of observations of modest growth in years six and seven of the 1980s cycle before declines resumed. If you use previous cycles as a gauge, the beef cattle industry is near the halfway point of liquidation.



In the 1980s and 1990s, nearly 60% of the cyclical herd liquidation took place by this point in the cycle, but in the most recently completed downturn, about two-thirds of the liquidation occurred after the point that we find ourselves in today. USDA did not publish a July cattle report in 2013.

Time to buy

Financial returns to cow-calf production and pasture and range conditions tend to be two important indicators for beef cow inventory movements.

Projections for cow-calf returns are quite positive for the next two or three years, but dry

Projections for cow-calf returns are quite positive for the next two or three years, but dry conditions remain a constraining factor. Although USDA does not provide state inventory data in the July report, a glance at the most recent drought monitor clearly shows that pressure remains for many producers to source adequate forage, especially through the southwestern part of the country.

Just as no two cattle cycles are the same, nor are two cow-calf operations. Whether your operation is in position to take advantage of a situation in which national inventory liquidation is likely to take place for a few more years not only depends on your feed availability situation, but also factors that are unique to your operation.

Considering the likely price implications of a tighter calf and feeder animal supply in the years ahead can help you set some revenue expectations that will guide future herd decisions.

Growing your herd when others are unwilling (or unable) often can be a lucrative proposition, but only you can decide if that makes sense for your operation at this time.

Brown is a livestock economist with the University of Missouri. He grew up on a diversified farm in northwest Missouri.

TAGS: MARKETING

RELATED