COUNCIL ON DAIRY CATTLE BREEDING

ACTIVITY REPORT

January to September 2015

Council on Dairy Cattle Breeding
4201 Northview Drive, Suite 302
Bowie, MD 20716
www.cdcb.us
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Contents

Introduction.....1

Personnel 1

Word from the Chairman 2

Word from the CEO..... 2

Treasurer's Report..... 3

Board of Directors..... 4

CDCB Data Suppliers..... 5

CDCB Working Groups 5

Status of Transition from ARS/USDA..... 6

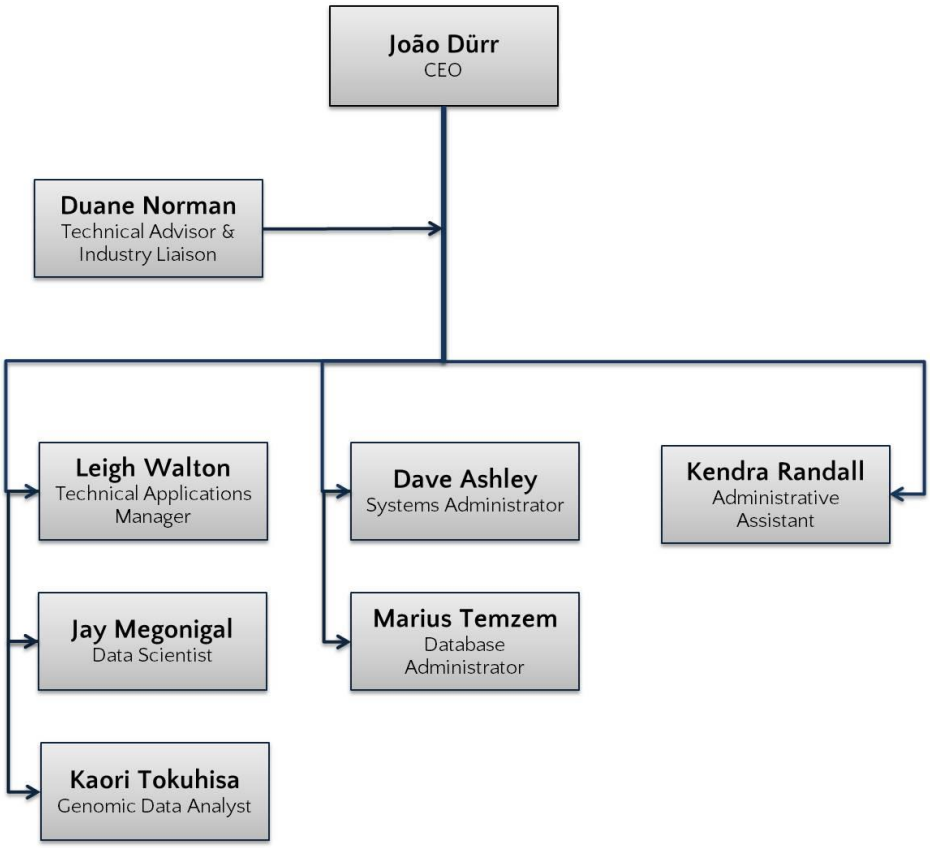
Service Report 8

Introduction

The Council on Dairy Cattle Breeding (CDCB) is a non-profit organization which recently assumed the service responsibilities for calculating and distributing the genetic evaluations and genomic predictions, for managing data storage, and for analyzing and distributing dairy cattle data, tasks that previously were performed by the United States Department of Agriculture – Agricultural Research Service – Animal Genomics and Improvement Laboratory (USDA-ARS-AGIL). The CDCB allied partners cooperator database is the largest in the world devoted to dairy animals with over 70 million female phenotypic records, over 1 million animals genotyped and over 300,000 males receiving genetic evaluations or genomic predictions.

This report was prepared for the 2015 CDCB Industry Meeting held at the Madison Marriott West Hotel & Conference Center, Middleton, WI, on September 29, 2015. An overview of the organization is presented followed by a progress report covering the period between January and September 2015. Special attention is dedicated to the transition of the cooperator database and the genetic evaluation services from USDA-ARS-AGIL to the CDCB.

Personnel



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Word from the Chair

Jay Mattison

The Council on Dairy Cattle Breeding efforts to date have been a journey that started in the 1980s and evolved to the operation and organization it is today. In this report there are updates and reports about the status of programs, financial results, and direction for the future. The greatest achievements are the people and synergies that have come together in the effort to provide genetic or genomic and management information for decision making by the dairy industry. This is all for the goals of dairy cattle care and handling while producing dairy protein and other nutrients to feed an expanding human population.

Opening Doors: Opening doors moves us to ACTION. In a changing world, an open door that is inviting, including and welcoming allows us to sharpen our focus together. Dairy cattle breeding and management in the USA and North America might have been on a track for a bleak future with little hope and opportunity in late 2009. But the CDCB and some key members pushed for a venue that established the CDCB Dairy Data Working Group. This Dairy Data Working Group, the CDCB Business Plan Working Group, the negotiations with USDA-Agricultural Research Service for a Non-Funded Cooperative Agreement, the Effective Date and Implementation Working Group and then the CEO Search Task Force all worked towards the establishment and re-launch of the CDCB. It was a brave and unknown situation to open doors and take action. This new effort happened because individuals and organizations opened their doors of expertise, time and money to support and develop the CDCB and CDCB operations.

People and Relationships: The CDCB is establishing a staff to do the work and programs in the coming years. The next key steps are to develop and implement a strategic business plan, determine access and use of data that protects confidentiality, and invigorate research efforts for the benefit of dairy farmers and consumers. CDCB results to date are the product of the many organizations and staff working together and becoming better door openers. Thank you to all the individual and organizational efforts that have occurred in this initial phase of the CDCB startup. It is exciting to look toward CDCB's future.

Word from the CEO

João Dürr

The CDCB reinvented itself to become an essential service component of the U.S. dairy industry. Developing an operation to follow the footsteps of the successful USDA-AIPL genetic evaluation system took vision, leadership and determination from the stakeholders. The effective collaboration between these diverse organizations forming the CDCB is in itself a sign of engagement as a whole.

Many details are involved in starting a new operation and the contributions of member organizations have been extremely important, particularly of the American Jersey Cattle Association managing the finances and accounts and of the National Dairy Herd Information Association (NDHIA) providing logistical support.

The past twelve months were dedicated to put in motion the plans carefully made by the CDCB Board of Directors and working groups. Employees were hired to join forces with Duane Norman and Leigh Walton, who bravely carried the torch during the first year and a half. This made it possible for the CDCB to take over the routine genetic evaluations, always counting on the unconditional support of the AGIL team.

The Non-Funded Cooperative Agreement with USDA-ARS establishes that the transition of services to the CDCB is targeted to be completed by December 17, 2015. Therefore securing and developing the necessary capacities, establishing the required infrastructure and advancing on institutional policies without disrupting the provision of services to the industry became the high priorities. Improvements to the evaluation system continue to be made by AGIL staff and adopted by CDCB for the benefit of the users. Significant progress has been made, indicating that the initial goals are on schedule to be met as planned.

The CDCB six employees and two contractors are working out of the CDCB offices in Bowie, MD. The computer and software infrastructure is being established with the CDCB servers soon hosting the Cooperator Database and process all U.S. genetic and genomic evaluations and management data analysis. The CDCB is fulfilling its mandate of serving and empowering dairy farmers and their organizations on their quest for efficiency, profitability and sustainability.

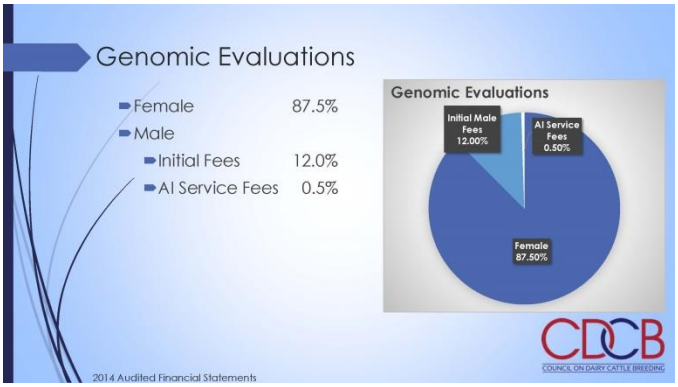
Treasurer's Report

Neal Smith, Treasurer CDCB

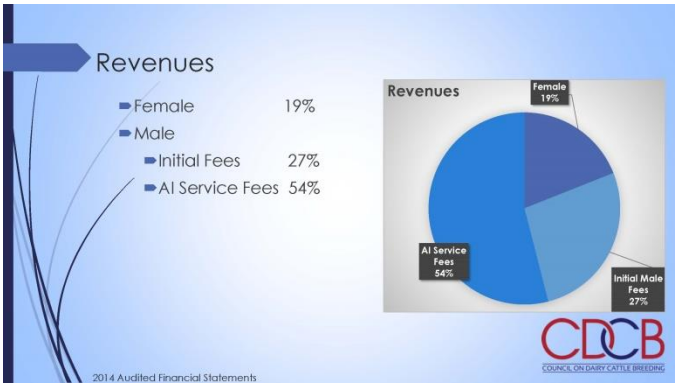
The CDCB audited results for FY 2014 (which is the 2014 calendar year) follow with some notes. The CDCB is in a solid financial position, but is still establishing operating expenses which will include payroll and benefits and some one time capital expenditures. Monthly financial statements are prepared and reviewed by the CDCB Board and the accounting firm of Clark, Schaefer and Hackett CPAs conducted the FY 2014 audit. The audit documented a solid set of processes and financial statements for the CDCB. It is a pleasure to serve as the CDCB Treasurer and acknowledge the efforts of Vickie White of the American Jersey Cattle Association for her professional expertise and experience in working with the CDCB accounts and funds. The CDCB has a solid financial standing for a starting organization.

The assets of the financial standing of the CDCB for FY 2014, have unrestricted Net Assets of $4,380,861 with accounts payable of $200,467 and Notes Payable of $241,197 (which are the member stakeholder capitalization payments).

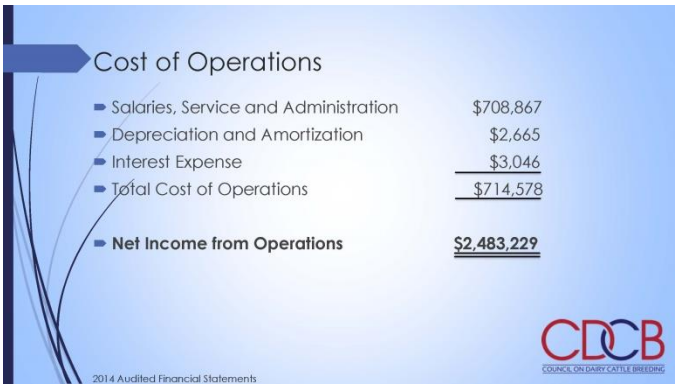
The FY 2014 CDCB revenues split by female and male had results of $3,197,807.



The percentage breakout by female and male number of animals receiving genomic evaluations is 87.5% female and 12.5% male. This trend is continuing in year to date for FY 2015.

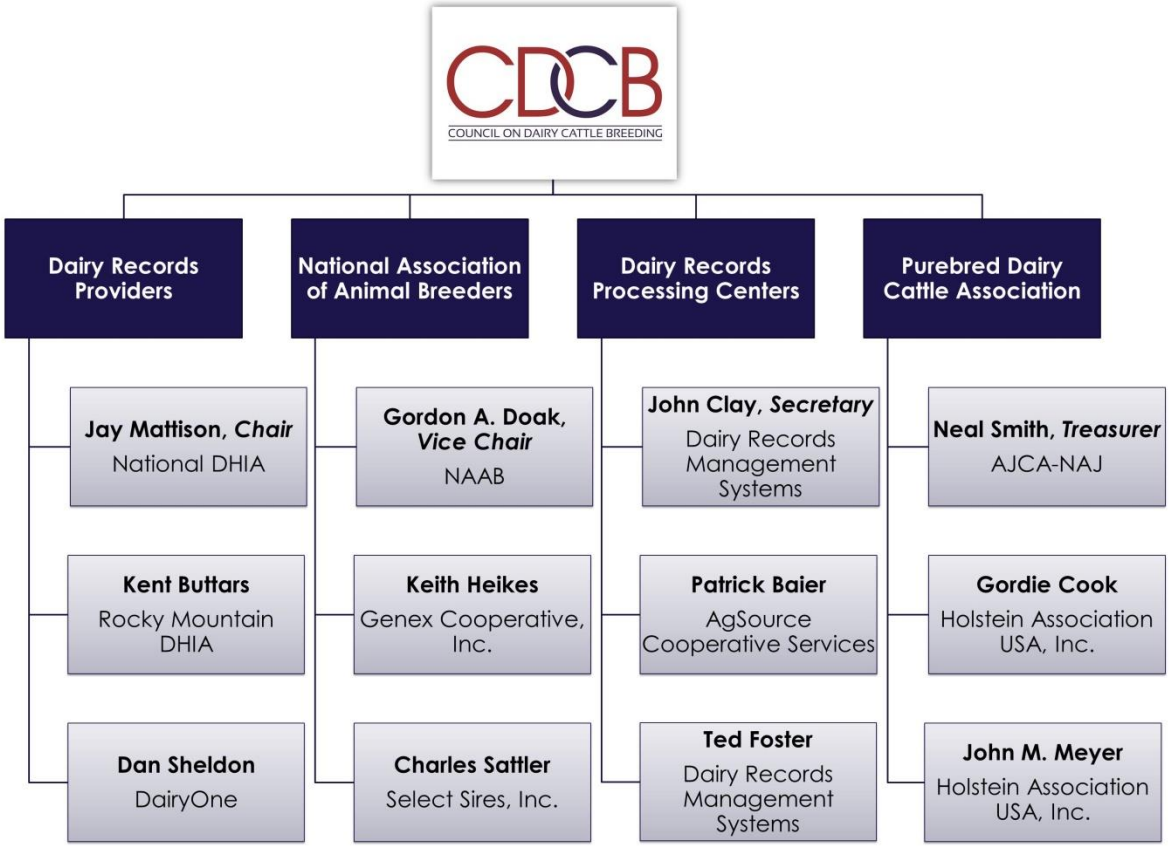


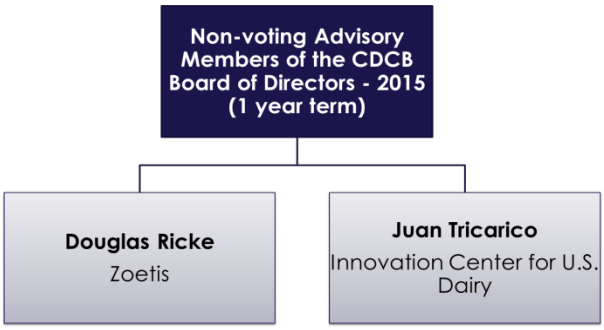
The percentage breakout by female and male revenue receiving genomic evaluations is 19% female and 21% male. This trend is influenced by the number of male AI Service fees that are paid.

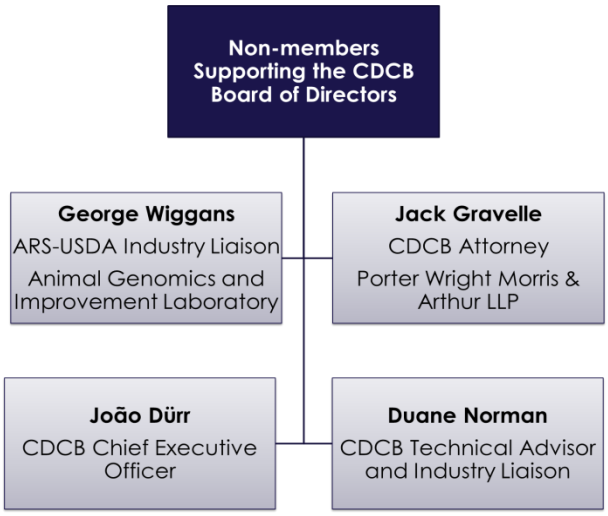


The CDCB is still building staff capacity in FY 2015 which will result in greater payroll and benefit expense. There will also be capital expenditures for hardware and software as the CDCB computing resources are deployed for the effective in December 2015. There was an operational margin of $2,483,229 reported for FY 2014.

Board of Directors







CDCB Data Suppliers

National Dairy Herd Information Association, Quality Certification Services

AgSource Cooperative Services
Arizona DHIA
Dairy Lab Services
Dairy One Cooperative Inc.
DHI Cooperative Inc.
DHIA West
Idaho DHIA
Gallenberger Dairy Records
Heart of America DHIA
Idaho DHIA
Indiana State Dairy Association
Integrated Dairy Herd Improvement
Jim Sousa Testing
Lancaster DHIA
Mid-South Dairy Records
Minnesota DHIA
NorthStar Cooperative DHI Services
Puerto Rico DHIA
Rocky Mountain DHIA
San Joaquin DHIA
Southern DHIA Affiliates
Tennessee DHIA
Texas DHIA
Tulare DHIA
United Federation of DHIA's
Washington State DHIA

Dairy Records Processing Centers

AgriTech Analytics
AgSource Cooperative Services
Dairy Records Management Systems
DHI-Provo

Purebred Dairy Cattle Association Members

American Guernsey Association
American Jersey Cattle Association
American Milking Shorthorn Society
Brown Swiss Cattle Breeders' Association
Holstein Association USA, Inc.
Red and White Dairy Cattle Association
U.S. Ayrshire Breeders' Association

Genomic laboratories

Bio-Genesys Ltd.
Genetic Visions, Inc.
Neogen Corporation dba GeneSeek
Weatherbys Ireland DNA Laboratory
Zoetis Genetics

Genomic Nominators

ABS Global, Inc.
Alta Genetics USA
American Jersey Cattle Association
Brown Swiss Cattle Breeders' Association
Genetic Visions, Inc.
Genex Cooperative, Inc.
Holstein Association USA, Inc.
Holstein Canada
National Association of Animal Breeders, Inc.
Neogen Corporation dba GeneSeek
New Generation Genetics, Inc.
Select Sires Inc.
Semex Alliance
Tri-State Breeders Cooperative dba Accelerated Genetics
Zoetis Genetics

CDCB Working Groups

Research Advisory Working Group

Robert Fourdraine, Chair
Don Bennink
Mark Rodgers
Steven Sievert
Bill VerBoort
Ryan Starkenburg
Bob Welper
Tom Lawlor
Cari Wolfe
Chad Dechow
Kent Weigel
Duane Norman
George Wiggans
João Dürr

Effective Date Working Group

John Clay, Chair
George Wiggans
João Dürr

Data Flow Working Group

John Clay
John Meyer
Charles Sattler
Bruce Dokkebakken
João Dürr, Convener

Finance Committee

Pat Baier
John Clay
Dan Sheldon
Neal Smith

Status of Transition from ARS/USDA

A Non-funded Cooperative Agreement (NFCA) was developed and signed on March 27th, 2013 between the United States Department of Agriculture-Agricultural Research Service-Animal Genomics and Improvement Laboratory (USDA-ARS-AGIL) and CDCB. This agreement provides for the transition of the genetic and genomic evaluations from AGIL to CDCB. This transition started with CDCB delivering the April 2013 official genetic evaluation results for production traits and delivering all genetic evaluations in December 2013 forward.

The NFCA ensures that AGIL will continue having full access to the Cooperator database and performing research and development of methods, procedures and algorithms to compute estimates of genetic merit of dairy animals.

CDCB and USDA-ARS announced on December 17th, 2013, the effective date of the NFCA was starting. This started the two year countdown to CDCB being self-sufficient in computer resources and staffing with the capacity to run the genetic evaluations, provide the dairy management benchmarks and maintain the industry cooperator database.

The CDCB Board of Directors appointed working groups to define what needed to be covered during the transition period and to harmonize the industry expectations. Three basic areas had to be addressed: the startup of a completely new business, the maintenance of the existing service operations without interruptions and the refinement of some organizational processes and policies.

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Startup

- The CDCB Board of Directors recruited and hired João Dürr for the CDCB CEO position starting mid-September 2014. Dürr has a PhD in Animal Breeding and Genetics from McGill University, Canada, and his professional experience includes the Interbull Centre Director in Uppsala, Sweden, manager of a DHI laboratory along with a professorship in a university in Southern Brazil.
- Key qualified staff to carry out the transition has been secured, including a Systems Administrator (Dave Ashley), a Data Scientist (Jay Megonigal), a Genomic Data Analyst (Kaori Tokuhisa), an Administrative Assistant (Kendra Randall) and a Database Administrator (Marius Temzem).
- The service fee schedule based on genomic evaluations has been generating sufficient funds to fund the necessary startup investments and create reserves for future development. The American Jersey Cattle Association provides accounting and payroll services.
- The implementation of the initial administrative and human resources infrastructure was outsourced to Ray Bacchus on a consultant basis. A competitive benefits package for employees has been established to attract and retain key talent.
- After operating out of rented offices at the USDA-ARS-AGIL facilities in Beltsville, MD, for over two years, CDCB has established its offices in Bowie, MD, starting in April 2015. This location facilitates constant interaction with AGIL.
- Investments in internet connectivity, hardware and software have been completed and the transferring of the database and genetic evaluation programs is advancing according to plans. Following the transferring, comprehensive acceptance tests will be performed prior to the definitive migration of the production environment to CDCB.

Operations

- Duane Norman and Leigh Walton were brought to the CDCB as contractors in February 2013 to take over the responsibility of running the genetic evaluations and set the stage for the staff to be hired. Given their knowledge of the system and relentless commitment to the dairy industry services continued to be provided without interruptions or efficiency losses, always supported by the AGIL team.
- Besides the three official evaluations and the monthly genomic runs, since November 2014 CDCB offers preliminary weekly genomic predictions, intensifying significantly the interaction with service users.
- AGIL continues performing research and delivering methods and algorithms for the improvement of the evaluations.

Organization

- Material License Agreements (MLAs) have been finalized between CDCB and all data providers in June 2015 and a significant number of the MLAs have been signed.
- Steve Lauck and Jon Otsuki, from the Otsuki Group, Inc., acted as facilitators for the CDCB Board of Directors on their initial step to define a strategic business model during a workshop in Rosemont, IL, in August 2015. The effort resulted in the definition of the CDCB core value "Providing premier dairy genetic information services and industry collaboration," as well as beneficiaries, values and benefits, core capabilities and operating infrastructure. The next steps will be building a strategic roadmap and implementing the strategic action plan.
- CDCB visual identity has been created by Quintain Marketing, of Annapolis, MD.
- A Request For Proposals (RFP) for the administration of the CDCB quality certification for genomic nominators and genotyping laboratories is being developed.

Overall Status

The transition of services from AGIL to CDCB is on schedule and all responsibilities are on target to be transferred by December 17, 2015.

Service Report

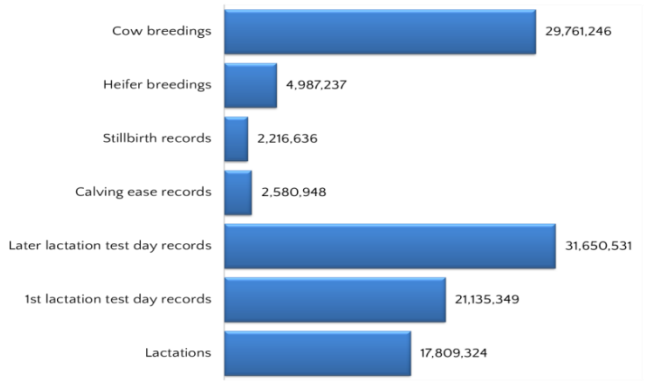
The first responsibility of CDCB is to host and administrate the CDCB database, which is the most valuable repository of dairy records in the world thanks to the cooperative efforts of all stakeholders. The following table provides an overview of the types of data provided by different suppliers and the respective frequency of data submission.

INCOMING DATA FILES BY SOURCE AND FREQUENCY OF SUBMISSION

Data Type (Format)	Frequency of Submission: Daily	Weekly	Monthly	Triannual
Pedigree (1)	DRPCs, Holstein, Jersey, Genomic Nominators	Brown Swiss	Milking Shorthorn	Ayrshire, Guernsey
Lactation (4)	DRPCs			
Reproductive (5)	DRPCs			
Calving Ease				DRPCs
Conformation (7)				Ayrshire, Brown Swiss, Guernsey, Jersey, Milking Shorthorn
Genotype	Genomic Labs			

Updated phenotypic records are added to the predictions three times a year, during the official genetic evaluations procedures. As of September 14, 2015, the CDCB database total historical data included 648,760,399 test day records, 89,845,460 lactation records, 36,234,142 cows from 76,537 herds. In the past three runs, over 50 million new test day records (after edits) were added to the system. Other descriptive metrics are shown below.

NUMBER OF PHENOTYPIC RECORDS ADDED TO THE OFFICIAL EVALUATION RUNS SINCE AUGUST 2014



Likewise, genomic data stored in the CDCB database has grown immensely in the past year since the CDCB genomic predictions became not only the most used selection criteria for young elite animals around the world, but also a widely adopted tool at the farm level. In July 2015 the number of genotyped animals in the CDCB database surpassed one million, which is a significant achievement for the industry as a whole. Genotype exchanges with different partners contributed significantly to the pool and are greatly appreciated. Farmers and companies from more than 48 countries from 6 continents have been taking advantage of the CDCB fee schedule that is open to provide genomic predictions to any interested party.

SOURCES OF GENOTYPES USED BY THE CDCB

Sex	Predictor F	Predictor M	Predicted F	Predicted M	Total
Africa	2	-	306	7	***315***
Asia	11	-	721	477	***1,209***
Eastern Europe	21	341	1,591	411	***2,364***
Europe	167	13,071	46,571	32,633	***92,442***
Latin America	338	7	8,487	596	***9,428***
North America	199,870	26,139	561,445	108,622	***896,076***
Oceania	35	388	4,540	1,953	***6,916***
Total	***200,444***	***39,946***	***623,661***	***144,699***	***1,008,750***

The CDCB genetic evaluations follow the schedule below. Including the weekly genomic predictions, this means that updated genetic merit predictions are made available to the industry 70 times per year.

GENETIC EVALUATION RELEASE SCHEDULE

	Official Evaluations[1]	Genomic Evaluations[1,3]	Interim Summaries[1,2]
January		1st Tuesday	1st or 2nd Wednesday
February		1st Tuesday	
March		1st Tuesday	
April	1st Tuesday	1st Tuesday	
May		1st Tuesday	1st or 2nd Wednesday
June		1st Tuesday	
July		1st Tuesday	
August	2nd Tuesday	2nd Tuesday	
September		1st Tuesday	1st or 2nd Wednesday
October		1st Tuesday	
November		1st Tuesday	
December	1st Tuesday	1st Tuesday	

[1] Weekday within month of release
[2] For 2016, the January release is the 1st Wednesday, the May and September releases are the 2nd Wednesday
[3] Preliminary genomic evaluations are distributed each Tuesday

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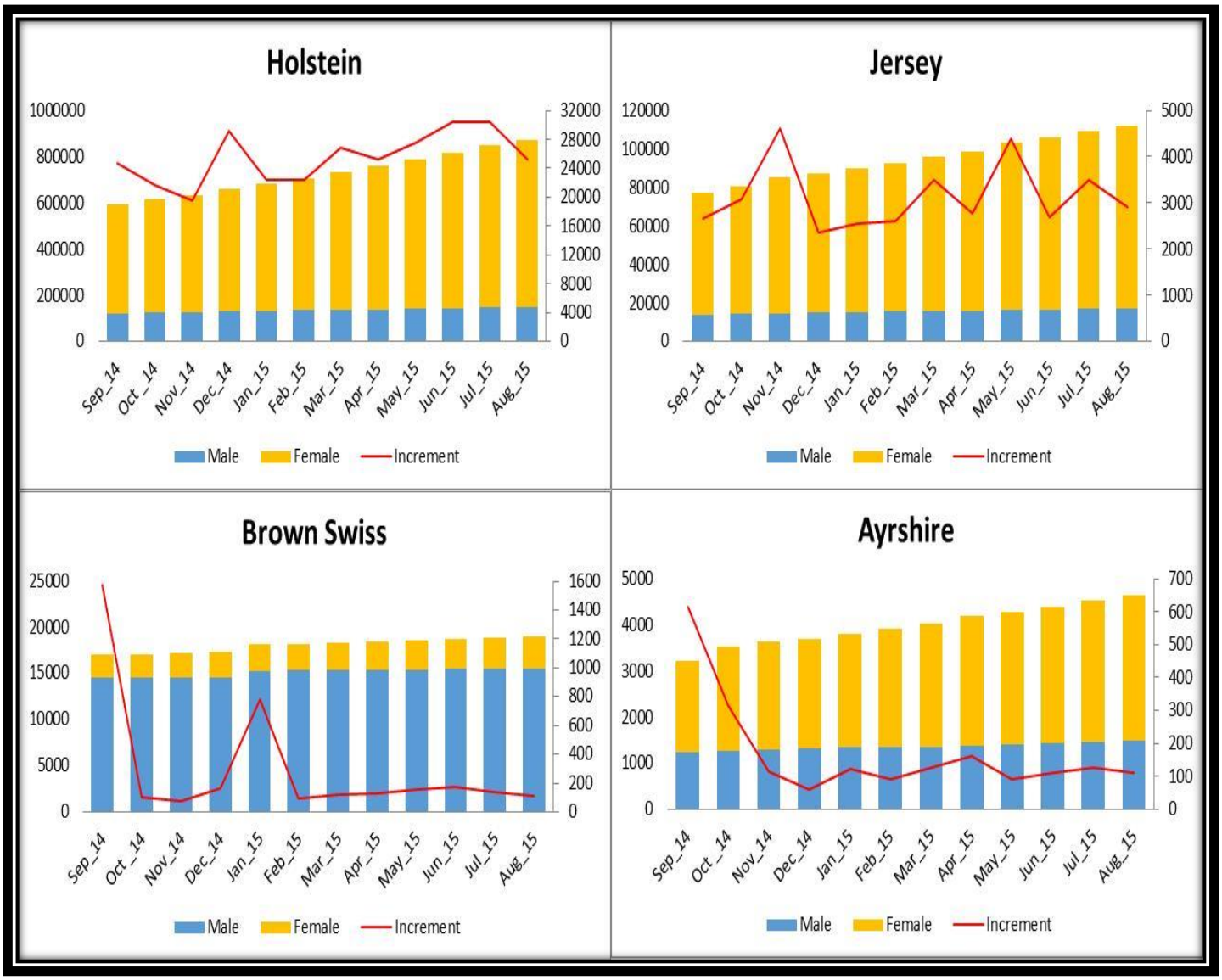
The charts below show the evolution in the number of genotypes included in the CDCB genomic evaluations as well as the monthly incremental occurrance from September 2014 to August 2015 for the different breeds. Blue bars = total number of males; Yellow bars = total number of females; Red line = number of genotypes added in the period.



Changes in Genetic Evaluations[1]

NOVEMBER 2014:

Preliminary genomic evaluations delivered weekly

In November 2014 CDCB started to process genotypes each week to generate approximate genomic evaluations for new animals. Now files are posted each Tuesday at 8:00 a.m. The files include preliminary genomic evaluations for newly tested animals and others whose genotypes became usable after the previous weekly evaluation. This action was possible by minimizing processing time through not calculating reliability and by relying on approximations, which contributes to small differences between the preliminary and the following month's evaluations. Enabling evaluations sooner allowed earlier sale or culling of calves to minimize rearing costs.

DECEMBER 2014 OFFICIAL EVALUATIONS:

Genetic base changed for traits

The US dairy herd continues to be more productive each year, thereby delivering quality dairy products to consumers at a low cost. Rapid genetic improvement is being made in U.S. cattle as a result of selection programs being supported by dairy organizations and embraced by producers. The bases for genetic evaluations were updated for all animals to compensate for the progress that has been made since 2010. Updated bases provide a means to show how much each animal is superior or inferior to the current population. This keeps Predicted Transmitting Abilities (**PTA**) from becoming inflated across time, and thus helps deliver the genetic improvement users expect. The average PTAs for sire-identified cows born in 2010 in each breed were set to zero, except for calving ease and stillbirth rate (set to breed average) and somatic cell score (set to 3.0). The mean PTAs for most traits decreases (when genetic trend is positive) with a base change, then remain fairly stable until the next base change.

[1]Changes implemented in the last 12 months are based on material located at https://www.cdcb.us/reference/changes/HCD_inheritance.pdfs. The original material was authored by 8 AGIL and 4 industry personnel and summarized by H.D. Norman.

Lifetime merit indexes revised and grazing merit introduced

Genetic indexes have been provided to breeders since 1971 so that selection can be directed to several traits simultaneously according to the economic value of each trait. The weights used in lifetime merit indexes were updated by the Animal Genomics and Improvement Laboratory (**AGIL**) considering input from academic and industry personnel. Revisions are needed to merit indexes when sources of income or production costs change or when evaluations for new traits become available. In addition to lifetime net merit (**NM$**), cheese merit (**CM$**) and fluid merit (**FM$**), indexes for herds with differing milk markets, a 4th index called grazing merit (**GM$**) was introduced for herds on pasture systems or needing to maintain a seasonal calving cycles. Two additional fertility traits were added into the 2014 indexes, heifer conception rate (**HCR**) and cow conception rate (**CCR**). The revised merit indexes places more relative emphasis on milk component traits than before and less on somatic cell score, body size, and productive life.

New genetic evaluation software implemented

New software was developed by the AGIL under the direction of Dr. Paul VanRaden which will allow more efficient changes to the future genetic models and facilitate multi-trait processing. Genetic evaluations from the new and previous software were very similar, producing correlations exceeding 0.995 for progeny-tested bulls. Multi-trait results were nearly identical to single-trait for milk, fat, and somatic cell score (**SCS**) but improved for protein because of missing data in early years and its high correlations with milk and fat. The new software was implemented for yield, SCS, single-trait productive life (**PL**), and daughter pregnancy rate (**DPR**) replacing the animal model evaluation programs used for official evaluations since 1989.

Evaluation of DPR revised

A new, multi-trait DPR evaluation replaced the single-trait evaluation provided since 2003. Even though DPR is nonlinearly related to days open, previously a linear approximation was used to convert from days open to DPR. Individual

pregnancy rate observations are a series of "no" or "yes" events at 21-day intervals between 50 and 250 days in milk (**DIM**). The lactation record for pregnancy rate is the percentage of opportunity periods with a yes (0 or 1), ignoring all periods after pregnancy. Cows still open at 250 DIM are no longer recorded pregnant at 250 DIM but instead are assigned a pregnancy rate of 0. Now the evaluations and definitions of DPR and conception rate are more similar, providing more stable multi-trait evaluations. The new definition increased the standard deviation of DPR.

APRIL 2015 OFFICIAL EVALUATIONS:

Sire conception rate and calving trait evaluations available for more bulls

The CDCB agreed to cover various data flow payments to the dairy records processing centers (**DRPC**) previously covered by the National Association of Animal Breeders. These payments were for records in progress (**RIP**), calving ease (**CE**), stillbirth (**SB**), and Sire Conception Rate (**SCR**). Evaluations for SCR were published in April 2015 for bulls from organizations not previously participating in SCR if they met the other qualifying criteria. Some bulls from organizations not previously participating in CE had their evaluations published in April 2015, and even more were published in August 2015.

Haplotype for polled documented for Brown Swiss

A Brown Swiss haplotype for polled (**BHP**) was developed. Animals known to be heterozygous or homozygous polled and progeny tested bulls not reported to be polled allow polled status for all other animals to be imputed by tracing haplotypes. Most polled Brown Swiss probably contain the Celtic mutation, differing from that in the Holstein and Jersey breeds which credit their polled inheritance to both the Celtic and Friesian haplotypes.

AUGUST 2015 OFFICIAL EVALUATIONS:

Haplotype for cholesterol deficiency documented for Holsteins

A new haplotype (**HCD**) was reported in Holsteins that causes young heterozygous calves to have low cholesterol and homozygous calves to have no cholesterol, frequently causing death at a young age. Discovered originally in Germany, the results were collaborated by scientists from AGIL and Canadian Data Network. The particular haplotype carrying the defect is difficult to track because a normal version and a recently mutated version are both frequent. Five codes were defined to show versions of non-carrier, suspected carrier, or confirmed carrier status.

Council on Dairy Cattle Breeding
4201 Northview Drive, Suite 302
Bowie, MD 20716
www.cdcb.us
240 334 7744

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