

Holstein Association USA, Inc.

***Practical
Applications
of Genomic
Technology***

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Motivation for Progress

“... the function of a competitive market is to drive the economic return to the average producer to breakeven through supply and demand responses in both input and output markets. In equilibrium the top end are profitable and growing, the average are hanging in there, and the bottom end are losing money and exiting the industry. **Business success and survival depend on continuous improvement at a pace necessary to stay out of the back of the pack.**”

Danny Klinefelter, Texas A&M University
and Texas AgriLife Extension

Genomic predictions

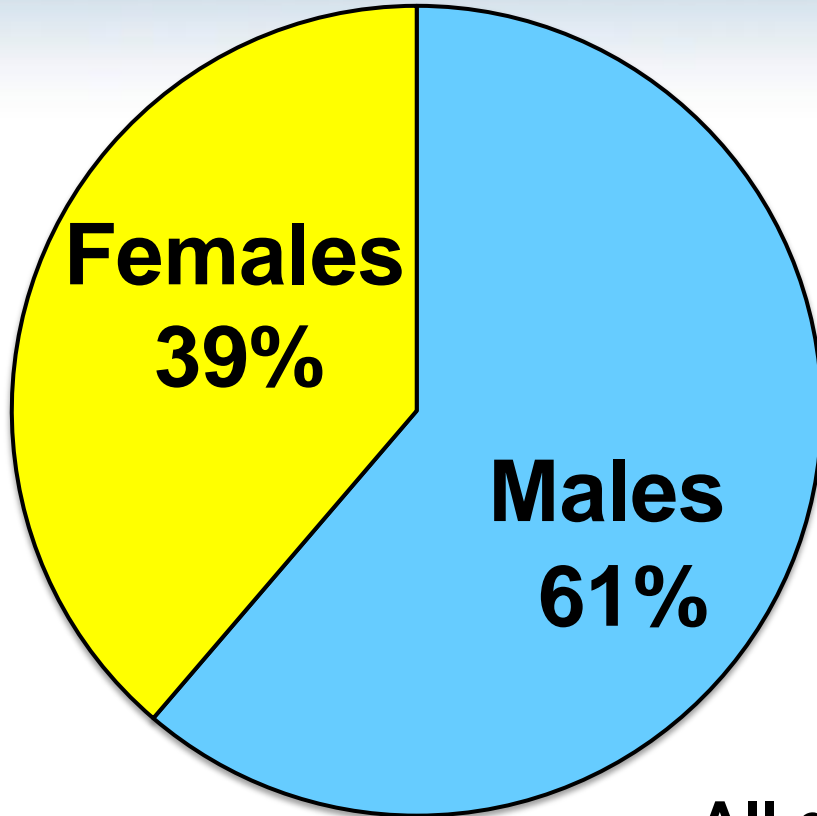
1. First release, April 2008.
2. Blood, hair or semen samples provided by animal owners.
3. DNA extracted from samples.
4. DNA placed on chip.
5. Chip provides 50,000 single nucleotide polymorphisms (SNP).
6. SNP evenly distributed across 30 chromosomes.
7. Results sent to USDA/AIPL

Initial Applications

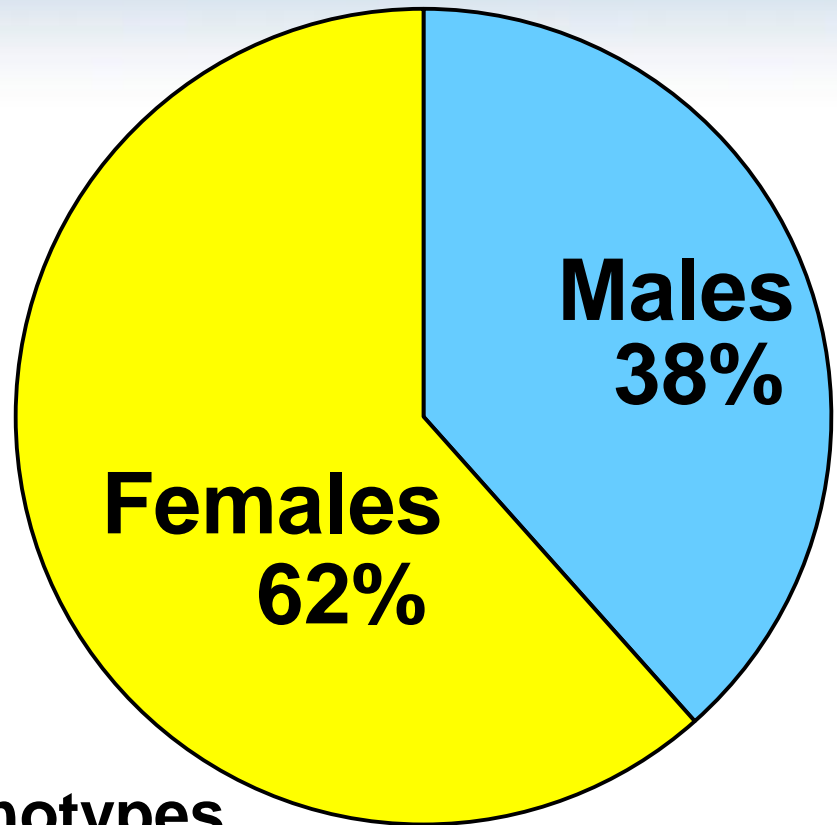
- 50K SNP Chip introduced in Aug. 2008
- Primarily used as a tool to sort males for A.I.
- Some high genetic value females tested
- 3K SNP Chip introduced in June 2010
- Steady increase in female testing, particularly heifers
- 6K replaced 3K in Nov. 2011

Sex Distribution

August 2010



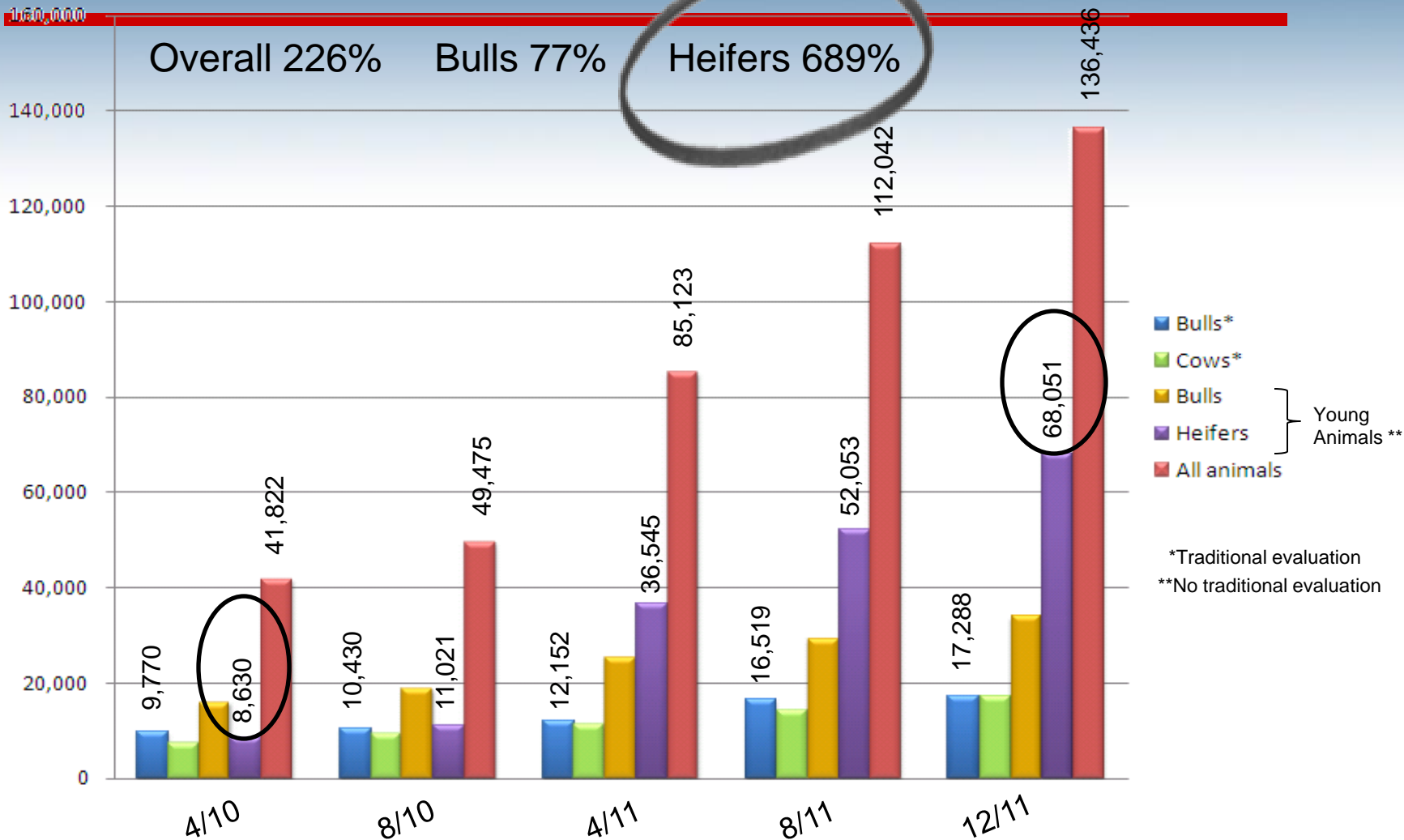
November 2011



All genotypes

Source: George Wiggins USDA/AIPL;
Presentation: Cornell Department of Plant Breeding and
Genetics

Enhancing Genetic Improvement in Commercial Dairies Through Genomic Selection



Source: George Wiggins USDA/AIPL;
 Presentation: Cornell Department of Plant Breeding and Genetics

Broader Application of Genomics

- Component of commercial heifer development programs
- Component of optimizing inventory management
- Component of effective management of whole-herd cost of production



Who are Dairy Customers

Dairy Profile 1

- Medium-sized dairy
- Typically reporting data
- More involved in sire selection
- Can't expand and has excess heifer inventory

Dairy Profile 2

- Large dairy
- Not reporting data
- Data driven
- Limited to no involvement in sire selection
- Aggressive adoption of technology
- Expansion always in play

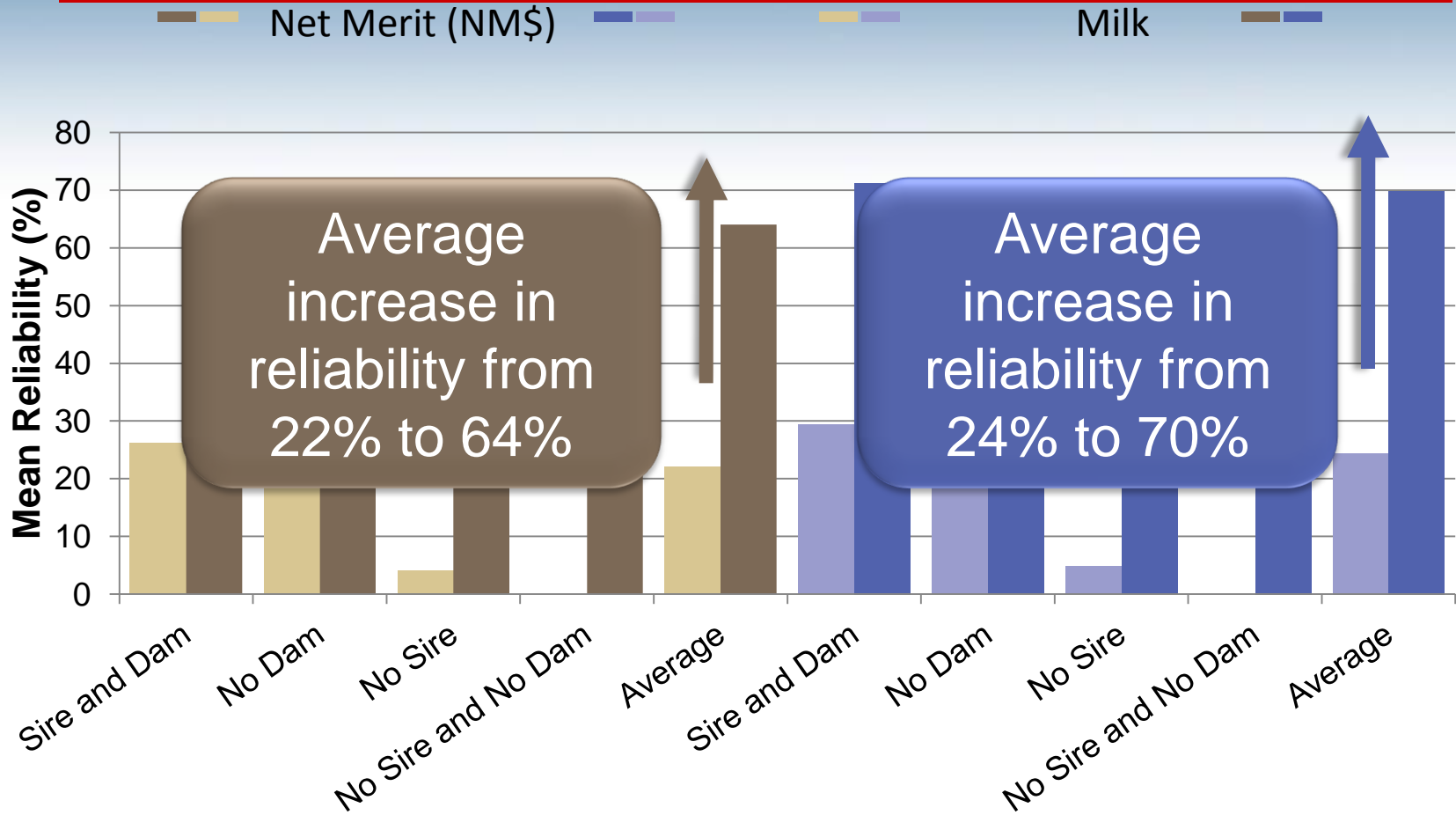
Typical Commercial Dairy Customers

These herds are well managed with low calf mortality, strong reproduction, good nutritional programs, etc.

Their herd may be fully, partially or not registered but most are purebred AI sired.

The quality of their management and performance has given them options.

Increase in Reliability from PA



Exploiting Genetic Variation



Top 20 NM heifers ranked *Gen NM rank* *vs. Trad NM* *rank*

Only three heifers in the Top 20 NM ranked outside the Top 20 Traditional NM rank.

- List includes heifers by 5 different sires
- 14 heifers were on both the Top 20 Genomic TPI and NM lists

Rank Gen NM	NM Gen	Rank Trad NM	NM_Trad
1	751	1	763
2	737	3	735
3	734	7	701
4	733	9	695
5	726	4	732
6	719	2	740
7	711	5	723
8	702	8	697
9	695	6	714
10	677	13	657
11	659	10	666
12	655	93	469
13	652	21	627
14	649	16	640
15	646	24	598
16	640	11	661
17	639	12	658
18	635	20	629
19	628	14	650
20	627	17	640

Top 20 GTPI heifers ranked

GTPI rank vs. Traditional rank

- Only three heifers in the Genomic TPI Top 20 ranked outside the Trad TPI top 20.
- List includes heifers by 8 different sires

Rank Gen TPI	TPI_GenPTA	Rank Trad TPI	TPI_Trad
1	2315	1	2332
2	2193	3	2176
3	2170	6	2167
4	2170	10	2146
5	2158	2	2181
6	2150	7	2163
7	2148	15	2122
8	2146	8	2162
9	2146	127	1858
10	2144	12	2141
11	2141	4	2174
12	2125	17	2121
13	2123	5	2170
14	2120	11	2145
15	2120	30	2053
16	2118	9	2158
17	2112	14	2129
18	2105	22	2080
19	2091	13	2132
20	2091	16	2122

Cumulative Benefits

- Improve dairy profitability for the long-term
- Improve awareness related to genetic improvement including sire selection
- Enable more strategic allocation of complementary technologies
- Increase the number of animals contributing information to the genetic evaluations of the respective breeds

THANKS!

