The use of beef semen in Italian Holstein cows

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Technical Head, FedANA
Full professor, University of PADOVA

Special Thanks: to Maurizio Marusi, Raffaella Finocchiaro, Chiara Franzoni, Mariasole Caccin, Mauro Penasa e Ferdinando Galluzzo, Gloria Manighetti
1. Italian beef market circumstances
2. *The skyline* of dairy cattle in Italy
3. Beef breeds used in Italian Holstein cows
4. Factors affect beef semen use
5. Breed effect on Stillbirth, Calving easy and Gestation length
6. Conclusions
In Italy we produce 52% of beef

In Italy we import 48% of beef from abroad

Unicarve - Triveneto Beef Producers Association, 2023
Italian beef cattle breeders take more abroad every year

1 billion euro
to buy young cattle (broutard/ristalli/weaned calves) to fatten

<table>
<thead>
<tr>
<th>Slaughtering year 2021 - Vitellone/Scottona (12-24 months of age)</th>
<th>N. of animals</th>
<th>Animals in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Born in Italy</td>
<td>479,973</td>
<td>33.54</td>
</tr>
<tr>
<td><strong>Imported abroad</strong></td>
<td>951,064</td>
<td><strong>66.46</strong></td>
</tr>
<tr>
<td>Total need for Italy market</td>
<td>1,431,037</td>
<td>100</td>
</tr>
</tbody>
</table>

Year 2021: The number of young cattle purchased abroad to be fattened in Italy n. 951,064 x approximately 1,200 euros/head
= Euro 1,141,276,800
INCREASE THE WEANED CALVES PRODUCED IN ITALY IN COLLABORATION WITH DAIRY COW BREEDERS!

- Stipulate supply chain commercial agreements
- Use of sexed semen for internal replacement (dairy cow herds)
- Use of semen from beef bulls to obtain beef crossbreeds
- Application of quality and sustainability regulations
- Organize collection of unweaned calves in collection centers
- Organization of weaning centers
- Fattening in protected stables
- Certification of fattened cattle and use of the brand of Italian consortia
OUTLINE

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Italian dairy cattle skyline
31 dairy cattle breeds in milk recordings
(closed lactations, source: AIA, 2021)
ANAFIBJ in numbers

- 2 Herdbooks (Holstein and Jersey)
- third one is working progress (Brown)
- ≈ 10,000 members
- > 1,100,000 registered cows
- ≈ 800,000 young stock
- 27 employes
- 6 bianconero magazine /year
- 70 breeding values
- 49 runs/year

ANAFIBJ is one of the 15 members of FEDANA

Records processed (2023) | Numbers
--- | ---
Pedigree data-records | 20,863,419
Cow lactation records | 32,822,933
Evvalutaiotn Scoring records | 11,287,374
Cows changing herds | 2,769,903
Grade animals | 15,851,240
Management herd registration | 58,379
Cow’s Insemination records | 69,991,452
Genealogical Certificate (2023) | 5,142
# Italian Holstein population around the world

*(WHFF, 2023)*

<table>
<thead>
<tr>
<th>Country</th>
<th>Rank</th>
<th>Total HF cows</th>
<th>Rank</th>
<th>HB-Registered HF cows</th>
<th>Rank</th>
<th>% of di Vacche Holstein iscritte su Totali</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>1</td>
<td>7,990,000</td>
<td>5</td>
<td>1,000,000</td>
<td>6</td>
<td>12%</td>
</tr>
<tr>
<td>France</td>
<td>2</td>
<td>2,674,000</td>
<td>2</td>
<td>1,244,946</td>
<td>4</td>
<td>46%</td>
</tr>
<tr>
<td>Germany</td>
<td>3</td>
<td>2,345,673</td>
<td>1</td>
<td>1,656,116</td>
<td>3</td>
<td>71%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>4</td>
<td>1,600,000</td>
<td>6</td>
<td>650,000</td>
<td>5</td>
<td>41%</td>
</tr>
<tr>
<td>ITALY</td>
<td>5</td>
<td>1,500,000</td>
<td>4</td>
<td>1,148,705</td>
<td>2</td>
<td>77%</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>6</td>
<td>1,152,495</td>
<td>3</td>
<td>1,152,495</td>
<td>1</td>
<td>100%</td>
</tr>
</tbody>
</table>
1. Italian beef market circumstances

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6. Conclusions
Crossbreeding and Beef on Dairy in Italian HF population

In 2030 we expected a 34% (trend is +1.6% per year)

Trend of inseminations with dairy-not-HF and beef breeds

Official data available on the Anafibj Database, 2024
Trend of breed of sire use for BoD in Italian Holstein population
### Market average Value of males and females calves of different genotypes, (Trento province, FPA-TN)

<table>
<thead>
<tr>
<th>Breed</th>
<th>Avg. weight</th>
<th>Mean /Euro/kg</th>
<th>Average value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holstein Friesian (HF)</td>
<td>62.9</td>
<td>€2.07</td>
<td>€144.94</td>
</tr>
<tr>
<td>Brown Swiss (BS)</td>
<td>71.1</td>
<td>€1.75</td>
<td>€124.67</td>
</tr>
<tr>
<td>Simmental (Sim)</td>
<td>72.8</td>
<td>€4.50</td>
<td>€327.79</td>
</tr>
<tr>
<td>Rendena</td>
<td>70.7</td>
<td>€3.64</td>
<td>€257.23</td>
</tr>
<tr>
<td>Alpine Grey (AG)</td>
<td>73.3</td>
<td>€3.65</td>
<td>€267.65</td>
</tr>
<tr>
<td>BB x Brown Swiss</td>
<td>72.9</td>
<td>€6.48</td>
<td>€472.63</td>
</tr>
<tr>
<td>BB x Holstein Friesian</td>
<td>72.7</td>
<td>€5.58</td>
<td>€405.66</td>
</tr>
<tr>
<td>BB x Simmental</td>
<td>73.6</td>
<td>€7.42</td>
<td>€545.70</td>
</tr>
<tr>
<td>BB x Rendena</td>
<td>73.5</td>
<td>€6.70</td>
<td>€492.59</td>
</tr>
<tr>
<td>BB x Alpine Grey</td>
<td>73.7</td>
<td>€6.67</td>
<td>€491.33</td>
</tr>
<tr>
<td>Lim x Brown Swiss</td>
<td>72.7</td>
<td>€5.44</td>
<td>€395.40</td>
</tr>
</tbody>
</table>
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FREQUENCY OF THE USE OF BEEF SEMEN BY PARITY

INSEMINATION YEAR

FREQUENZA

ORDINE DI PARITO
Manze
Primipare
Secondipare
Terzipare
Quartipare
Quintipare

5 PARITY
4 PARITY
3 PARITY
2 PARITY
1 PARITY
HEIFERS
AFTER HOW MANY INSEMINATIONS IS USED THE BEEF SEMEN?

REDUCING #INSEMINATION OVER TIME!!!

....except HEIFERS
FREQUENCY OF THE USED OF BEEF SEMEN PER MONTH

NO MONTH/SEASON EFFECT !!!
FREQUENCY OF THE USE OF BEEF SEMEN PER PRODUCTION LEVEL

BEEF SEMEN IS USED MORE IN HIGH PRODUCTION LEVEL HERDS

PRODUCTION LEVEL
LOW MEDIUM HIGH
DAIRY HERDS classes for % of use BEEF semen within Holstein in official HB data of ANAFIBJ
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BREED EFFECT analyses for STILLBIRTH, CALVING EASY and GESTION LENGTH

EDITING

Starting observations (calvings) = 949,409

Editing:
- delete sire breeds which recorded a frequency <1%, i.e., Maremmana (30), Podolica (34) and Romagnola (69);
- delete cows for which we did not know date of birth;
- retention of cows born from 1985 onwards;
- retention of calves born between 1995 and 2023
- retention of parity orders from 1 to 10. Parities ≥5 were grouped in one class ('5');
- retention of records with the following age at calving within parity:
  - $18 \leq$ cow age $\leq 40$ for parity $= 1$
  - $30 \leq$ cow age $\leq 58$ for parity $= 2$
  - $42 \leq$ cow age $\leq 76$ for parity $= 3$
  - $54 \leq$ age of cow $\leq 94$ for parity $= 4$
  - cow age = any for parity $\geq 5$
- retention of herds for which the number of parity was $\geq 50$ distributed over at least 5 years.

Final observations (calvings) = 807,985.

USING A GLINMIX PROCEDURE (SAS)
$Y = \text{birth\_year\_calf} + \text{calf\_season} + \text{sire\_breed} + \text{sex} + \text{parity} + \text{herd} + \text{cow}$ (as random)
Stillbirth
(calves death within 48h from calving)

BC  A  ABC  ABC  BC  C  A  AB  BC

P<0.001  Belgian Blue, Limousine and Marchiana >> Inra95, Holstein, Angus
CALVING EASE

(1 = easy  2 = birth assisted by one person only  3 = cesarean section  4 = difficult part  5 = embryotomy)

Angus, Holstein >> Belgian Blue, Inra95

\[ P < 0.001 \]
Gestation length (d)

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>E</th>
<th>C</th>
<th>BC</th>
<th>G</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus</td>
<td>276</td>
<td>280</td>
<td>281</td>
<td>282</td>
<td>283</td>
<td>284</td>
<td>285</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>Blue Belga</td>
<td>276</td>
<td>280</td>
<td>281</td>
<td>282</td>
<td>283</td>
<td>284</td>
<td>285</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>Charolaise</td>
<td>276</td>
<td>280</td>
<td>281</td>
<td>282</td>
<td>283</td>
<td>284</td>
<td>285</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>Chianina</td>
<td>276</td>
<td>280</td>
<td>281</td>
<td>282</td>
<td>283</td>
<td>284</td>
<td>285</td>
<td>286</td>
<td></td>
</tr>
<tr>
<td>Frisona</td>
<td>276</td>
<td>280</td>
<td>281</td>
<td>282</td>
<td>283</td>
<td>284</td>
<td>285</td>
<td>286</td>
<td></td>
</tr>
</tbody>
</table>

P<0.001

Inra95 >> Holstein (+5d)
Parity effect on Calving easy for different breed of Sire

Multiparous cows showed a higher calving easy then primiparous, in avg. around -4%
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Conclusions

BoD is a common practice in Italy in Holstein populations and its interest and use are growing.

Farm profit can benefit from combining the use of sexed semen on the best heifers and cows and beef semen on cows exceeding the replacement needs.

The sire beef breed has an impact on the calving ease of the dam and stillbirth, and this has to be taken into account when BoD is used.

Anafibj developed a tool for the dairy farmers
Thank you for your attention

Martino Cassandro  martinocassandro@anafi.it  www.anafibj.it
class  byear_calf calf_season sire_brd sex1 parity id_herd;
model  sb (event='0')= byear_calf calf_season sire_brd sex1 parity id_herd/dist=binary link=logit;
random  intercept / subject=id_cow;
lsmeans  byear_calf calf_season sire_brd sex1 parity / ilink lines adjust=tukey;
run;

proc glimmix data = FINAl;
class  byear_calf calf_season sire_brd sex1 parity id_herd;
model  ce3 = byear_calf calf_season sire_brd sex1 parity id_herd;
random  intercept / subject=id_cow;
lsmeans  byear_calf calf_season sire_brd sex1 parity / ilink lines adjust=tukey;
run;

proc glimmix data=FINAl;
class  byear_calf calf_season sire_brd sex1 parity id_herd;
model  gl = byear_calf calf_season sire_brd sex1 parity id_herd/ dist=normal link=identity solution /*link=logit solution*/;
random  intercept / subject=id_cow;
lsmeans  byear_calf calf_season sire_brd sex1 parity/ilink adjust=tukey lines pdiff;
run;
Effect of Parity, Sex, Season and Year on CALVING EASE

Tukey-Kramer Grouping for parity Least Squares Means (Alpha=0.05)

<table>
<thead>
<tr>
<th>parity</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.3359 A</td>
</tr>
<tr>
<td>5</td>
<td>1.2869 B</td>
</tr>
<tr>
<td>4</td>
<td>1.2862 B</td>
</tr>
<tr>
<td>3</td>
<td>1.2815 C</td>
</tr>
<tr>
<td>2</td>
<td>1.2813 C</td>
</tr>
</tbody>
</table>

Tukey-Kramer Grouping for sex1 Least Squares Means (Alpha=0.05)

<table>
<thead>
<tr>
<th>sex</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.3255 A</td>
</tr>
<tr>
<td>male</td>
<td>1.2633 B</td>
</tr>
</tbody>
</table>

Tukey-Kramer Grouping for calf_season Least Squares Means (Alpha=0.05)

<table>
<thead>
<tr>
<th>calf_season</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>winter</td>
<td>1.3007 A</td>
</tr>
<tr>
<td>autumn</td>
<td>1.2945 B</td>
</tr>
<tr>
<td>spring</td>
<td>1.2929 C</td>
</tr>
<tr>
<td>summer</td>
<td>1.2895 C</td>
</tr>
</tbody>
</table>

LS-means with the same letter are not significantly different.

y = -0.0029x + 7.1558
R² = 0.4131

Calving easy over years
### Effect of Sex on Gestation length, Calving ease, Stillbirth

#### Gestation length

Tukey-Kramer Grouping for sex1 Least Squares Means (Alpha=0.05)

<table>
<thead>
<tr>
<th>sex1</th>
<th>Estimate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>282.26</td>
<td>A</td>
</tr>
<tr>
<td>fema</td>
<td>281.42</td>
<td>B</td>
</tr>
</tbody>
</table>

LS-means with the same letter are not significantly different.

#### Calving ease

Tukey-Kramer Grouping for sex1 Least Squares Means (Alpha=0.05)

<table>
<thead>
<tr>
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<th>Estimate</th>
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<tr>
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<td>1.3255</td>
<td>A</td>
</tr>
<tr>
<td>fema</td>
<td>1.2633</td>
<td>B</td>
</tr>
</tbody>
</table>

LS-means with the same letter are not significantly different.

#### Stillbirth

Tukey-Kramer Grouping for sex1 Least Squares Means (Alpha=0.05)

<table>
<thead>
<tr>
<th>sex1</th>
<th>Estimate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>-2.8617</td>
<td>A</td>
</tr>
<tr>
<td>fema</td>
<td>-3.4821</td>
<td>B</td>
</tr>
</tbody>
</table>

LS-means with the same letter are not significantly different.
Effect of Parity on Gestation length, Calving ease, Stillbirth

### Gestation length

<table>
<thead>
<tr>
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<th>Estimate</th>
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<tr>
<td>4</td>
<td>282.35</td>
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<td>3</td>
<td>282.13</td>
</tr>
<tr>
<td>2</td>
<td>281.68</td>
</tr>
<tr>
<td>1</td>
<td>280.57</td>
</tr>
</tbody>
</table>

LS-means with the same letter are not significantly different.

### Calving ease

<table>
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<tr>
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</tr>
<tr>
<td>3</td>
<td>1.2815</td>
</tr>
<tr>
<td>2</td>
<td>1.2813</td>
</tr>
</tbody>
</table>

LS-means with the same letter are not significantly different.

### Stillbirth

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