Genetics of Taiwan Holstrei

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Outline

1. The environment of Taiwan
2. Current Status of Dairy Farming
3. Dairy Herd Improvement (DHI)
4. Genetics of Taiwan Holstein
5. Perspective of Taiwan Holstein
The geography of Taiwan

- Taiwan is located on the Tropics of Cancer in the Pacific Ocean, east of Mainland China.
- Taiwan consists of the main island Taiwan and the Pescadores, Matsu and Kinmen.
- Island Taiwan covers an area of 35,989 km².
- 26% is coastal plain, 27% is slope land, and 47% is mountainous.
The climate of Taiwan

- The climate is mainly subtropical and in the southern part tropical.
- The average of temperature is 28°C, with a variation from 8 to 35°C. July is the hottest month. February is the coldest month.
- The average of relative humidity is 85% with a variation from 70 to 99%.
- Taiwan is hardly an ideal place for dairy farming, Hot and high humidity cause much heat stress to Holsteins.
The dairy farming in Taiwan started in 1957.

Animals were imported from foreign country. Breeds included Jersey, Brown Swiss, Gurnsey, Illawala, Short Horn, etc.

From 1968 to 1975, LRI conducted a performance test trial of purebred Holstein, Jersey, Brown Swiss, Short Horn and their crossbreds.
The results of performance test trial

- Holstein: **Milk yield** was better than other purebreds and crossbreds.
- **Milk quality** was the best for fresh milk.
- Holsteins were recognized as the sole dairy breed in Taiwan.

**Holstein performance improvement:**
- Importing frozen semen by AI from the United States
- Importing registered heifers from the United States, Japan, New Zealand, and Australia.
- Improvement of feeds and feeding, management with automation and mechanization.
- Renovated housing and facilities.
- Monitor and control disease.
Breeding Strategies

- AI was introduced into Taiwan in 1970.
- Farmers did AI by themselves and AI skill was trained by AI school at LRI.
- About 80% of animals were artificially inseminated by imported frozen semen from US, CA, JP.
- Price of imported semen ranges from US$12 to US$50/straw.
Forage Supply

Three kinds of main local produced grass

- Napier grass
- Corn
- Pangola grass
Green Chop

Making silage in summer and use in winter
Imported Forage

Alfalfa hay bale

Bermuda grass

Alfalfa hay cubes
Heifers feeding system

- Heifers were grouped by age as a unit for feeding and management as to normal growth rates, economical rations and labor efficiency.
The feeding system

- TMR extension program had been performed since 1992.
- Some farmers set up TMR mix machine.
- Feeding cows by group
The dairy barn

• Three sides of the barn open and on the northern side with wall.

• With high, insulated roof, ridge vent and big fan running in barn for good ventilation.

• With enough space for mechanical operation and cow exercise.
Facility in dairy barn

- Automatic manure scraper.
- Individual cow bed mat.
- Automatic washing machine.
- To keep cows’ body clean and feeling comfortable.
Some farmers used computer in farm office and remote monitors in barn to manage their dairy herds.
Due to high temperature and high humidity, the main constrains that dairy farmers have long been confronted are the cows' heat stress:

- Summer infertility syndrome
- Less milk
- Mastitis
- Foot and leg problems
- Short productive life
15 milk processing plant
Dairy Herd Improvement (DHI)

DHI is one of the most important projects for dairy farms in Taiwan. 

PERFORMANCE TEST

- Milk yield weighing and milk sampling of all individual cows in the herd will be taken.
- Collected data will be processed and generate information to provide the uniform, accurate, and integrity essential reports so that farmers can understand the performance of all individual cows.
- DHI will form a national dairy database to generate information for extension, research, and education.
Farmers keep all essential data with different color cards in the folder.
Or in computer.
DHI technicians visit farm once a month routinely to identify each of cows in the herd and to collect data on the barn sheets.

Each cow’s ID was frozen branded by liquid nitrogen on the hide at one year age. For Heifer’s ID was plastic ear tag.
Milk weighing and sampling

- To weigh milk yield and take milk sample from each milking for all individual cows in the herd during 24-hour period in a day.
- To record down calving, breeding, drying, culling data of the herd on barn sheet.
Sending test day records and milk samples to DRPC (Dairy records Processing Center)
DRPC – Milk Lab.
Milk sample testing

- Fat%, protein%, lactose%, and SCC, MUN in milk will be determined by approved procedures and equipment
- Solids-not-fat (SNF) through calculation
- Computers capture milk component test results
- Transmit results to the DRPC
- Merge with other data collected
Dairy Records processing Center (DRPC)

- Organizing all collected data
- Calculating the lactation milk yield totals
- Standardizing milk yield (305-2X-ME)
  1. number of milking times per day
  2. length of the lactation
  3. age of the cow and month of the year at calving
- Generating reports
- Sending reports to dairy farmers by Post mail or e-mail or fax.
### Enrollment in DHI from 1981 to 1995

<table>
<thead>
<tr>
<th>Year</th>
<th># of herds in TW.</th>
<th># of herds in DHI</th>
<th>% of enroll.</th>
<th># of cows in TW.</th>
<th># of cows in DHI.</th>
<th>% of enroll.</th>
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</thead>
<tbody>
<tr>
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<td>DHI initiation</td>
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<td>968</td>
<td>199</td>
<td>21</td>
<td>66377</td>
<td>9132</td>
<td>14</td>
</tr>
<tr>
<td>Year</td>
<td># of herds in TW.</td>
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<td>% of enroll.</td>
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<td>% of enroll</td>
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<tr>
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<tr>
<td>1995</td>
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<tr>
<td>2008</td>
<td>591</td>
<td>219</td>
<td>37.1</td>
<td>52566</td>
<td>17100</td>
<td>32.5</td>
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The average milk yield and component on DHI (2000~2005)

<table>
<thead>
<tr>
<th>Year</th>
<th>Daily milk (kg/day)</th>
<th>SCC $10^3$cells/c.c.</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>21.1±0.09</td>
<td>523±1.63</td>
<td>3.57±0.01</td>
<td>3.11±0.01</td>
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<tr>
<td>2001</td>
<td>21.2±0.07</td>
<td>421±1.43</td>
<td>3.78±0.01</td>
<td>3.29±0.01</td>
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<tr>
<td>2002</td>
<td>21.4±0.06</td>
<td>419±1.33</td>
<td>3.78±0.01</td>
<td>3.28±0.01</td>
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<tr>
<td>2003</td>
<td>21.7±0.05</td>
<td>406±1.32</td>
<td>3.83±0.01</td>
<td>3.28±0.01</td>
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<tr>
<td>2004</td>
<td>21.8±0.05</td>
<td>357±1.32</td>
<td>3.86±0.01</td>
<td>3.29±0.01</td>
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<tr>
<td>2005</td>
<td>22.3±0.05</td>
<td>322±1.31</td>
<td>3.82±0.01</td>
<td>3.29±0.01</td>
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</table>
The average milk yield and component in DHI
(1996 ~2000)

<table>
<thead>
<tr>
<th>Year</th>
<th>Daily milk (kg/day)</th>
<th>SCC $10^3$cells/c.c.</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>23.2±0.09</td>
<td>29.1±1.84</td>
<td>3.74±0.01</td>
<td>3.27±0.01</td>
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<tr>
<td>2007</td>
<td>23.7±0.09</td>
<td>33.2±1.74</td>
<td>3.74±0.01</td>
<td>3.21±0.01</td>
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<tr>
<td>2008</td>
<td>23.0±0.08</td>
<td>30.1±1.74</td>
<td>3.69±0.01</td>
<td>3.26±0.01</td>
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<tr>
<td>2009</td>
<td>23.7±0.08</td>
<td>30.8±1.63</td>
<td>3.68±0.01</td>
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<tr>
<td>2010</td>
<td>25.4±0.09</td>
<td>28.6±1.63</td>
<td>3.57±0.01</td>
<td>3.28±0.01</td>
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</tbody>
</table>
Genetics of Taiwan Holstein

Estimates of genetic parameters for lactation traits

- Chen (2006) edited DHI database from April 1989 to November 2005. There were 109,944 records from 580 herds and 1,752 sires for using to estimate Genetic parameters for lactation traits.

- Lactation traits were milk yield, milk component % and somatic cell score.

- Restricted Maximum Likelihood method with animal model were used.

- Model included fixed effects of herd-year-season and random effect of animal and error.
Estimates of genetic parameters for lactation traits for Taiwan Holsteins

<table>
<thead>
<tr>
<th>Traits</th>
<th>MY</th>
<th>FY</th>
<th>PY</th>
<th>LY</th>
<th>Fat (%)</th>
<th>Prot. (%)</th>
<th>SCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY</td>
<td>0.34</td>
<td>0.89</td>
<td>0.98</td>
<td>0.97</td>
<td>-0.11</td>
<td>-0.04</td>
<td>-0.36</td>
</tr>
<tr>
<td>FY</td>
<td>0.79</td>
<td>0.37</td>
<td>0.9</td>
<td>0.89</td>
<td>0.35</td>
<td>0.08</td>
<td>-0.33</td>
</tr>
<tr>
<td>PY</td>
<td>0.93</td>
<td>0.84</td>
<td>0.38</td>
<td>0.97</td>
<td>-0.03</td>
<td>0.19</td>
<td>-0.38</td>
</tr>
<tr>
<td>LY</td>
<td>0.93</td>
<td>0.8</td>
<td>0.94</td>
<td>0.36</td>
<td>-0.09</td>
<td>-0.01</td>
<td>-0.46</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>-0.30</td>
<td>0.32</td>
<td>-0.12</td>
<td>-0.25</td>
<td>0.27</td>
<td>0.27</td>
<td>0.14</td>
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<tr>
<td>Protein(%)</td>
<td>-0.34</td>
<td>0</td>
<td>0.01</td>
<td>-0.26</td>
<td>0.54</td>
<td>0.2</td>
<td>0.1</td>
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<tr>
<td>SCS</td>
<td>0.06</td>
<td>0.08</td>
<td>0.07</td>
<td>0.16</td>
<td>0.22</td>
<td>0.34</td>
<td>0.16</td>
</tr>
</tbody>
</table>
The Level of milk production, fat% and protein% in milk for Taiwan Holsteins in 2008 in international positions.

Taiwan is shown in the graph.
Selection of Elite milking cows

Elite milking cows minimum requirement:

1: 305-2X-ME milk yield over 9,000kg.
2: Breeding value for milk yield over 700kg.
3: The average of protein % over 3.5%
4: The average of SCC less than 100X10^3/ml

Ranked by the average of protein %
Top 10 head will be awarded

High production cows minimum requirement:

1: 305-2X-ME milk yield over 12,000公斤
2: Breeding value for milk yield over 350kg
3: The average of protein % over 3.5%
4: The average of SCC less than 100X10^3/ml

Ranked by the average of least SCC
Top least 10 head will be awarded
<table>
<thead>
<tr>
<th>Year</th>
<th>Elite cows</th>
<th>High production cows</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>2009</td>
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<tr>
<td>2008</td>
<td>185</td>
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<td>2007</td>
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<td>2004</td>
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<td>2003</td>
<td>51</td>
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<tr>
<td></td>
<td><strong>1238</strong></td>
<td><strong>2633</strong></td>
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冠軍牛
2010春期賽優質牛競賽
精緻農業—種畜禽產業科技整合應用計畫
場內號：837
牛生日：2002/03/21
酪農戶：高雄 孫竹木
測乳員：李約增
行政院農業委員會畜產試驗所 頒贈
中華民國九十九年七月三十日

行政院農業委員會畜產試驗所
地址：台南縣新化鎮牧場路112號
網址：www.angrin.tiri.gov.tw
電話：(06)5911211分機 312
傳真：(06)5912513
Perspective of Taiwan Holsteins

- To set a website for dairymen to get the DHI herd information as soon as possible after their herds sampling.
  - The website is http://www.angrin.tlri.gov.tw.
  - Each farmer will have his own farmer code and password and access the DHI database easily routinely.
  - To download herd information and to print about 20 different of customized management reports with color marking to illustrate the importance of information from website.
Perspective of Taiwan Holsteins(2)

- To use RFID (Radio Frequency Identification) with PDA and on farm computer to manage herd efficiently.
- RFID may be ear tags as transponder and do not require a battery.
- Tags currently available are tamper resistant and durable.
- They would send radio signals when activated by a reader.
To attend international dairy organization as a membership to connect with worldwide dairy industry.
## Portfolio of Interbull evaluations

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Type</th>
<th>Cellcount</th>
<th>Longevity</th>
<th>Calving</th>
<th>Fertility</th>
<th>Workability</th>
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<tbody>
<tr>
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<td>Production</td>
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<tr>
<td>2007</td>
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<td>2008</td>
<td>Production</td>
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<td>Cellcount</td>
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<td>Fertility</td>
<td>Workability</td>
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</tbody>
</table>

## International information

- **Cross-reference list**
  - Interbull Cross-reference lists of bulls with multiple registrations
- **Production**
  - Evaluation summaries for production traits
- **Conformation**
  - Evaluation summaries for conformation traits
- **Udder health**
  - Evaluation summaries for udder health traits
- **Direct longevity**
  - Evaluation summaries for direct longevity traits
- **Calving Traits**
  - Evaluation summaries for calving traits
- **Female Fertility**
  - Evaluation summaries for female fertility traits
- **Workability**
  - Evaluation summaries for milking speed and temperament
Thanks For Your Attention!

037-911412