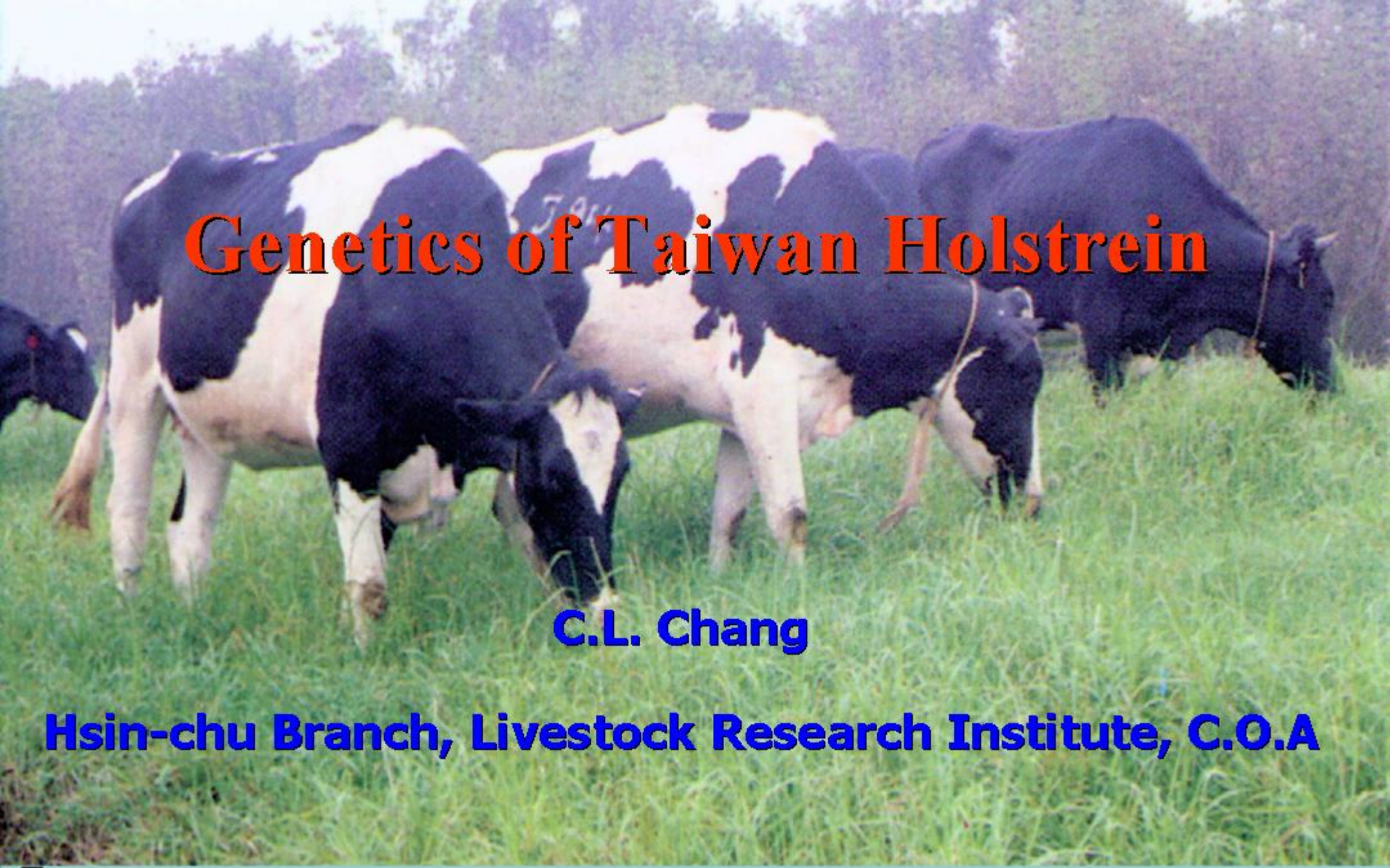


Genetics of Taiwan Holstrein

C.L. Chang

Hsin-chu Branch, Livestock Research Institute, C.O.A

Outline

1、The environment of Taiwan

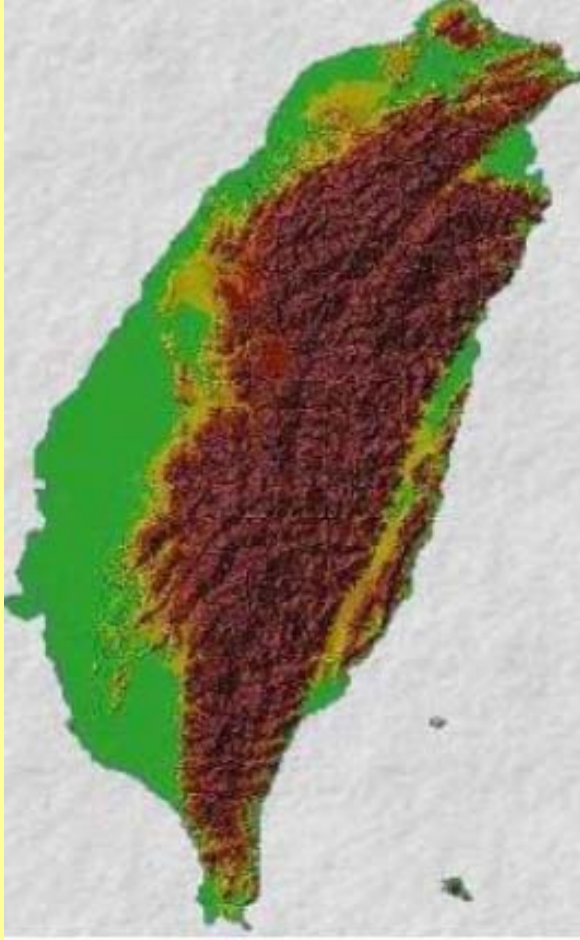
2、Current Status of Dairy Farming

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 km^2.
- 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 breeds in Taiwan and their origin

- The dairy farming in Taiwan started in 1957.
- Animals were imported from foreign country. Breeds included Jersey, Brown Swiss, Gurnsey, Illawala,Short Horn ....
- 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

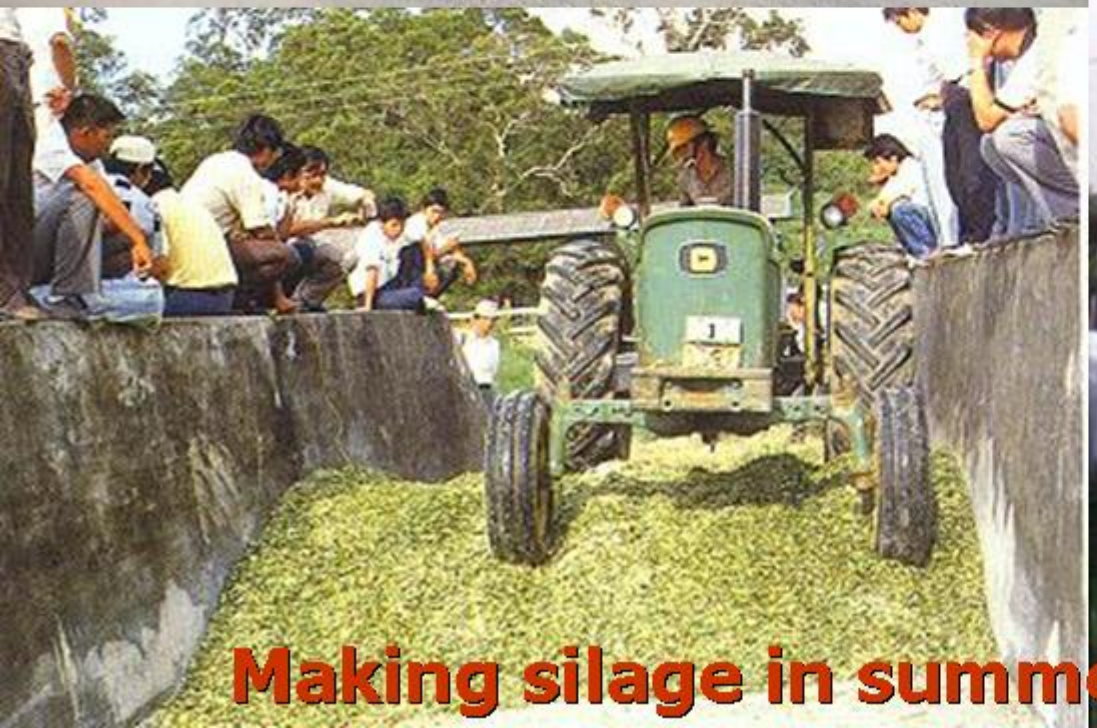
- AI was introduced into Taiwan in 1970.
- Farmers did AI by themselves and AI skill was trained by AI school at LRI.
- About 80% of animals were artificially inseminated by imported frozen semen from US, CA. JP.
- Price of imported semen ranges from US$12 to US$50/straw.

Forage Supply

Three kinds of main local produced grass

- Napier grass
- Corn
- Pangola grass

Green Chop



Making silage in summer and use in winter

Pangola pasture

Hay making

Haylage making

Imported Forage

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.

Feeds and Feeding

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.

Constrains of Dairy farming

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

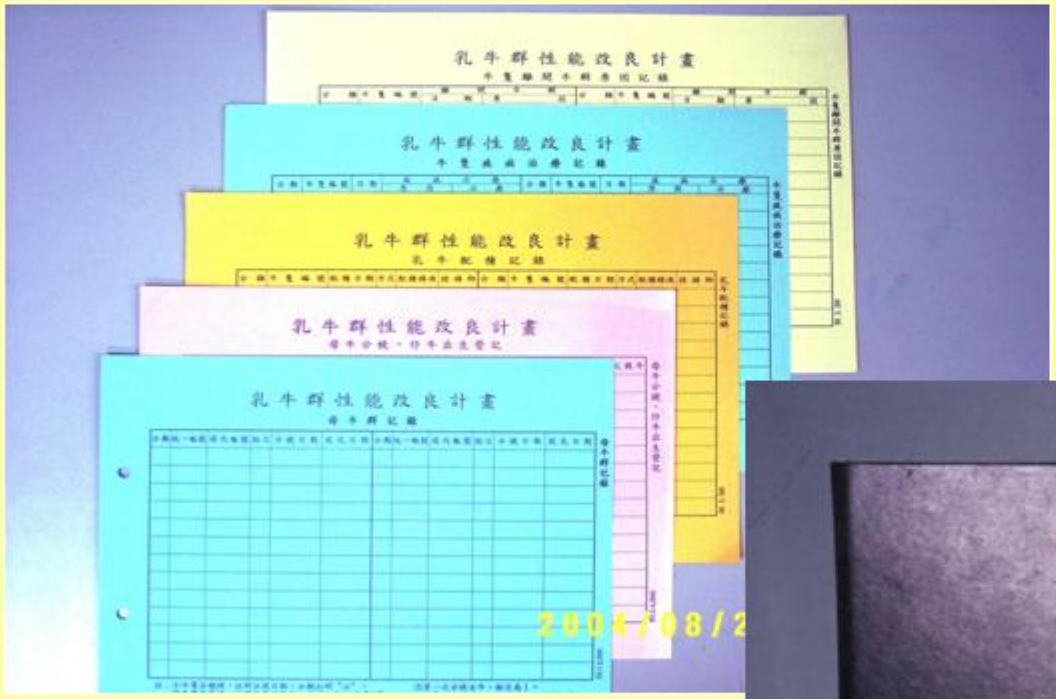
Dairy Herd Improvement (DHI)

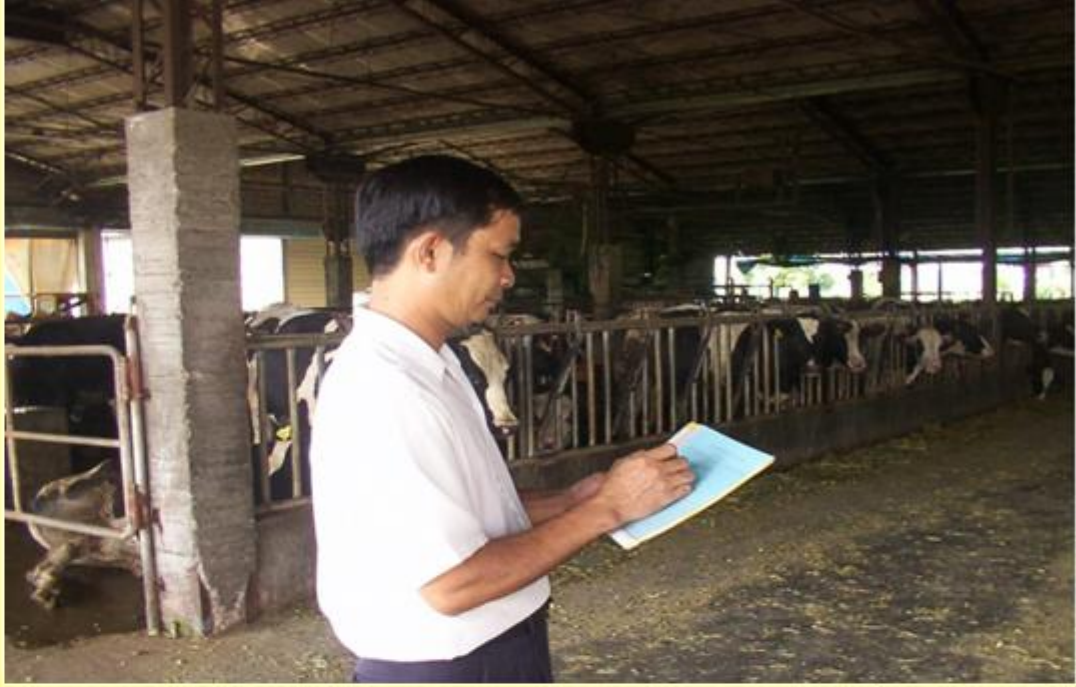
DHI is one of the most important projects for dairy farms in Taiwan.

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 determinated 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

Year	# of herds in TW.	# of herds in DHI	% of enroll.	# of cows in TW.	# of cows in DHI.	% of enroll
1977	DHI initiation					
1981	699	344	49	12159	3250	27
:	:	:	:	:	:	:
1985	1020	414	41	22752	5546	24
:	:	:	:	:	:	:
1990	1128	210	19	46342	5124	11
:	:	:	:	:	:	:
1995	968	199	21	66377	9132	14

Enrollment in DHI from 1995 to 2010

Year	# of herds in TW.	# of herds in DHI	% of enroll.	# of cows in TW.	# of cows in DHI	% of enroll
1995	968	199	21	66377	9132	14
:	:	:	:	:	:	:
2000	829	217	26	64331	13989	22
:						
2005	638	286	45	53151	20592	39
:						
2008	591	219	37.1	52566	17100	32.5
2009	572	189	33.0	53170	15292	28.8
2010	571	177	31.0	55296	15164	27.4

The average milk yield and component on DHI (2000~2005)

Year	Daily milk (kg/day)	SCC 10^3cells/c.c.	Fat (%)	Protein (%)
2000	21.1±0.09	523±1.63	3.57±0.01	3.11±0.01
2001	21.2±0.07	421±1.43	3.78±0.01	3.29±0.01
2002	21.4±0.06	419±1.33	3.78±0.01	3.28±0.01
2003	21.7±0.05	406±1.32	3.83±0.01	3.28±0.01
2004	21.8±0.05	357±1.32	3.86±0.01	3.29±0.01
2005	22.3±0.05	322±1.31	3.82±0.01	3.29±0.01

The average milk yield and component in DHI (1996 ~2000)

Year	Daily milk (kg/day)	SCC 10^3cells/c.c.	Fat (%)	Protein (%)
2006	23.2±0.09	29.1±1.84	3.74±0.01	3.27±0.01
2007	23.7±0.09	33.2±1.74	3.74±0.01	3.21±0.01
2008	23.0±0.08	30.1±1.74	3.69±0.01	3.26±0.01
2009	23.7±0.08	30.8±1.63	3.68±0.01	3.26±0.01
2010	25.4±0.09	28.6±1.63	3.57±0.01	3.28±0.01

Genetics of Taiwan Holstein

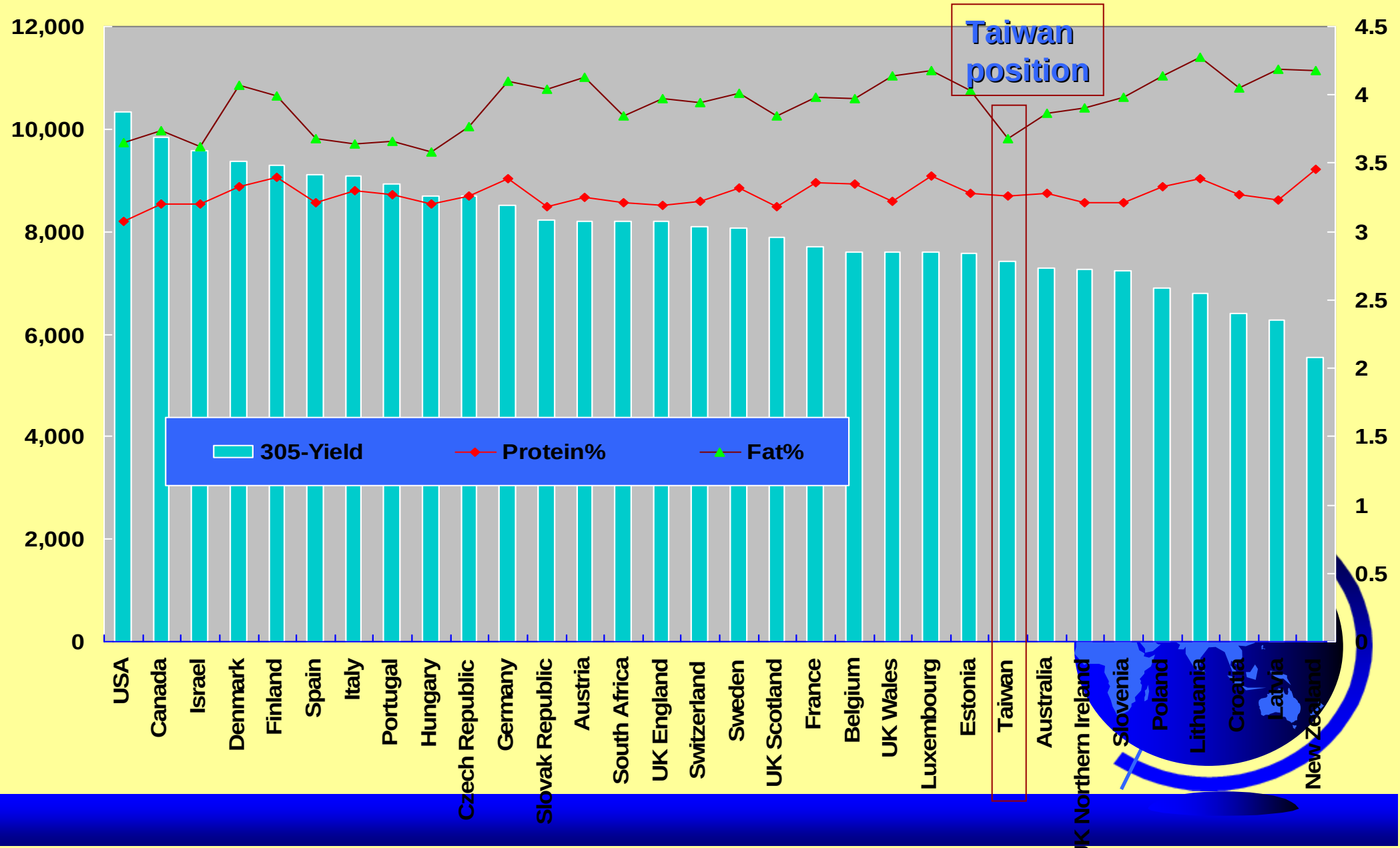
Estimates of genetic parameters for lactation traits

- 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

Traits	MY	FY	PY	LY	Fat (%)	Prot. (%)	SCS
MY	0.34	0.89	0.98	0.97	–0.11	–0.04	-0.36
FY	0.79	0.37	0.9	0.89	0.35	0.08	-0.33
PY	0.93	0.84	0.38	0.97	–0.03	0.19	-0.38
LY	0.93	0.8	0.94	0.36	–0.09	–0.01	-0.46
Fat (%)	–0.30	0.32	–0.12	–0.25	0.27	0.27	0.14
Protein(%)	–0.34	0	0.01	–0.26	0.54	0.2	0.1
SCS	0.06	0.08	0.07	0.16	0.22	0.34	0.16

The Level of milk production, fat% and protein% in milk for Taiwan Holsteins in 2008 in internation



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 than100X10^3/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 than100X10^3/ml

Ranked by The average of least SCC

Top least 10 head will be awarded

Number of Elite cows and High production cows by year

Year	Elite cows	High production cows
2010	207	332
2009	202	295
2008	185	336
2007	183	324
2006	129	326
2005	135	325
2004	114	248
2003	51	144
2002	32	103
2001	0	32
	1238	2633

行政院農業委員會畜產試驗所
Livestock Research Institute, Council of Agriculture, Executive Yuan
地址：台南縣新化鎮牧場路112號
網址：www.angrin.tlri.gov.tw
電話：(06)5911211分機 312
傳真：(06)5912513

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

2010年10月30日(星期六)
畜牧永續經營嘉年華會會場主體館
彰化溪州公園(彰化縣溪州鄉中央路三段138號)

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.

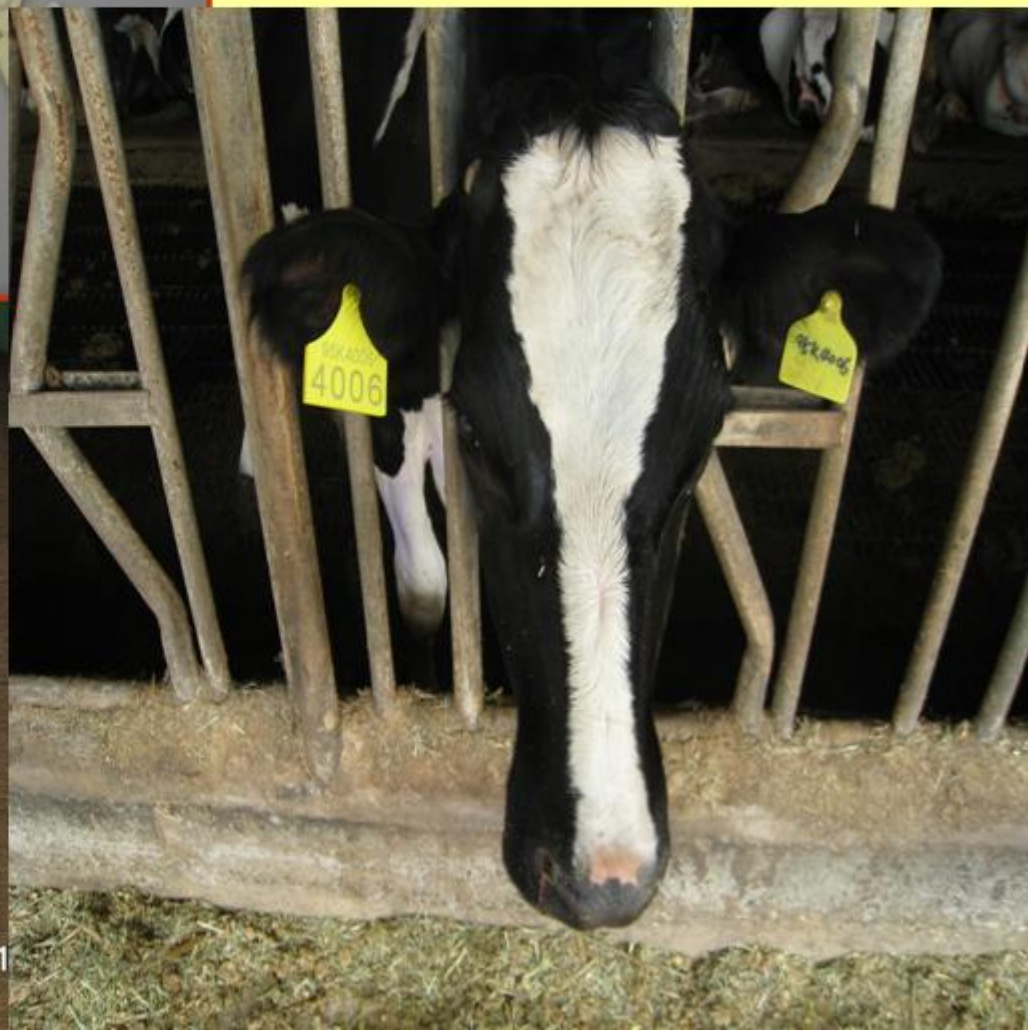
☞Each farmer will have his own farmer code and password and access the DHI database easily routinely.

☞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.

UHF RFID ear tag for dairy cattle

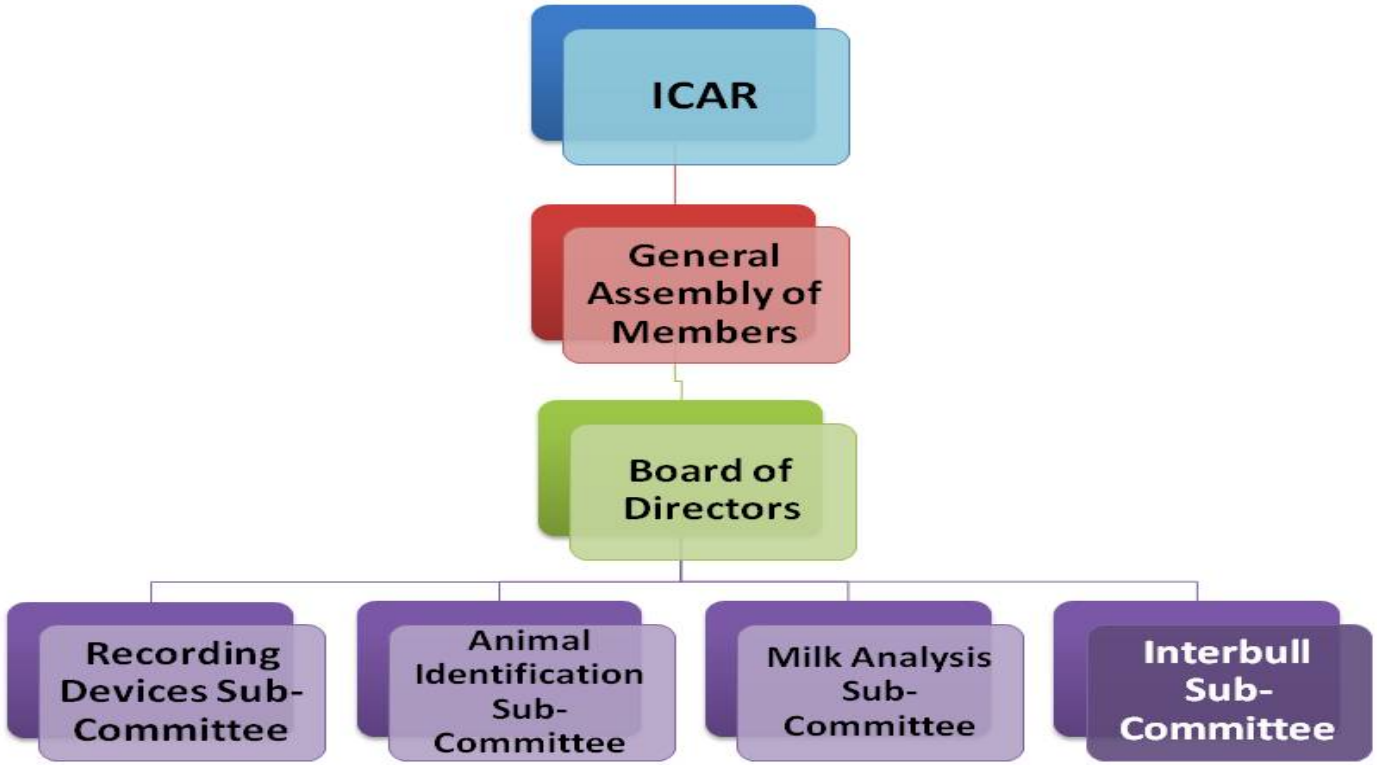



MOTOROLA


Over 80CM

Perspective of Taiwan Holsteins(3)

■. To attend international dairy organization as a membership to connect with worldwide dairy industry.



Portfolio of Interbull evaluations

1995	Production						
1999	Production	Type					
2001	Production	Type	Cellcount				
2004	Production	Type	Cellcount	Longevity			
2005	Production	Type	Cellcount	Longevity	Calving		
2007	Production	Type	Cellcount	Longevity	Calving	Fertility	
2008	Production	Type	Cellcount	Longevity	Calving	Fertility	Workability

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