

Challenges and Opportunities for Improvement in Dairy Production and Genetic Progress in Thailand



Skorn Koonawootrittriron¹ and Mauricio A. Elzo²

¹ Department of Animal Science, Kasetsart University, Thailand

² Department of Animal Sciences, University of Florida, USA

Thailand



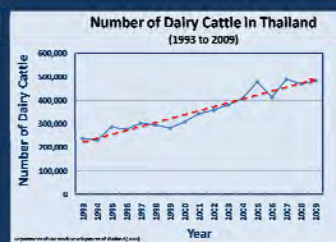
- A tropical country
- 5° 37' to 20° 27' N latitude
- 97° 21' to 105° 37' E longitude
- Elev. 0 to 2,565 m
- Area 513,115 km²
- Tropical Monsoons
- Population: 63,525,062

Seasons:

- **Winter (Nov – Feb)**
 - Cool: 17° to 32° C
 - Dry: 73% RH
 - Prec: 282 mm/year
- **Summer (Mar – Jun)**
 - Hot: 21° to 36° C
 - Dry: 71% RH
 - Prec: 245 mm/year
- **Rainy (Jul – Oct)**
 - Hot: 24° to 33° C
 - Humid: 79% RH
 - Prec: 1,160 mm/year

Dairy Population in Thailand

- **Multibreed:** purebred and crossbred cattle can be parents
- In 2009: **483,899 dairy cattle**, 42% were milking cows (204,805 cows)
- Most of them (> 95 %) are crossbred with high Holstein fraction
- Produced 2,093,421 kg of milk/day (Avg. 10.22 kg/cow/day)



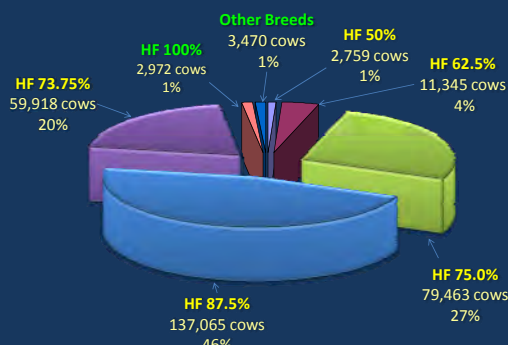
Dairy Population in Thailand

Anim. ID	Birth Date	Death Date	Sex	Color	Parental IDs
PK43058	18/09/2000	PK43067	9189	88 241 MP 22	11818 MS 2 28341 NA 3 10181 28 241 BR 43041 BR
PK42129	27/08/1999	PK42081	9202	83 181 MP 1	1120 RD 10 8841 BR 10 181 BR 3 181 BR 28 841 NA
PK44083	28/07/2001	PK44020	9108	81 148 MP 3	81 148 MP 3 81 148 MP 3 81 148 MP 3 81 148 MP 3
PK44018	28/03/2001	PK440178	9227	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK440184	14/03/2001	PK44018	9208	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK43110	08/10/2000	PK430031	9108	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK431112	27/10/2000	PK43007	9108	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK42038	28/07/1999	PK42188	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK42083	10/10/1999	PK420318	9178	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK42033	14/08/1999	PK42070	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK420332	14/08/1999	PK42070	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430414	10/10/2000	PK430181	9108	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430412	18/07/2000	PK430412	9191	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK421082	20/11/1999	PK42188	9178	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK420873	23/10/1999	PK4208178	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK420871	20/07/1999	PK420871	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430183	22/03/2000	PK43184	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430188	18/07/2000	PK430188	9213	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430123	20/08/2000	PK430123	9197	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430121	17/08/2001	PK430121	9220	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430088	19/02/2000	PK430088	9191	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4
PK430084	24/04/2000	PK430084	9202	80 333 MP 4	80 333 MP 4 80 333 MP 4 80 333 MP 4 80 333 MP 4

Thai Multibreed Dairy Population

HF = Holstein Friesian; BS = Brown Swiss; BRA = Brahman; JER = Jersey; NA = Thai Native;
RD = Red Dane; RS = Red Sindhi; SW = Sahiwal; ZE = Other Zebu

Dairy Population in Thailand



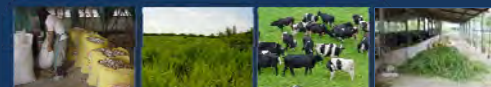
(Department of Livestock Development, 2007)

Dairy Population in Thailand

Feeding :

- > Concentrate: 5 to 15 kg/d, or 1 kg of concentrate per 2 kg of milk
- > Fresh grass: direct grazing or cut and carry; 30 to 40 kg/d

Guinea (*Penicum maximum*), Ruzi (*Brachiaria ruziziensis*)
Napier (*Pennisetum purpureum*), Para (*Brachiaria mutica*)



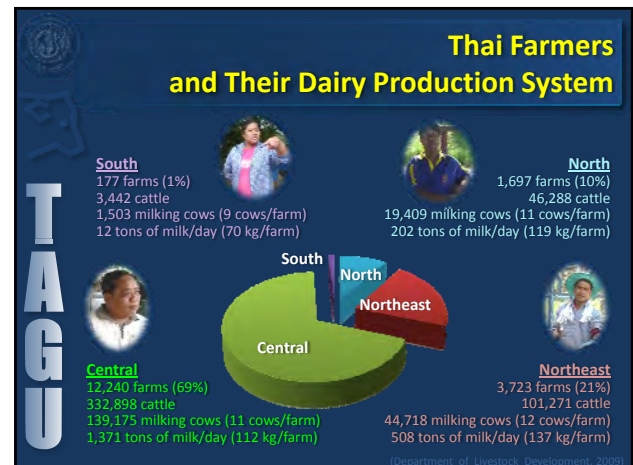
During dry seasons (winter and summer)

Supplements: silage, hay, rice straw, urea-treated rice straw, crop residues, agricultural byproducts



Dairy Population in Thailand

TAGU

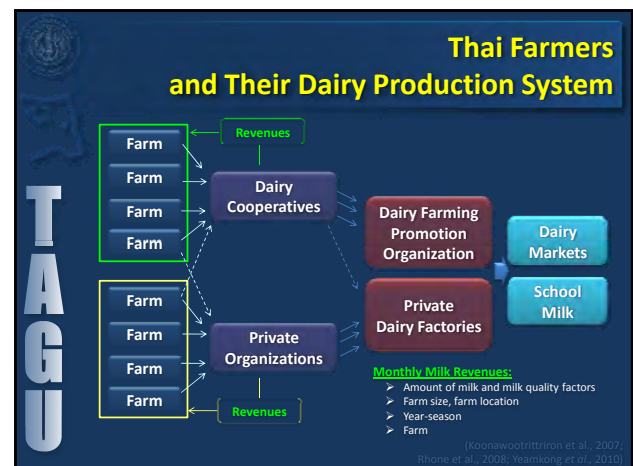


Thai Farmers and Their Dairy Production System

- Most farms (55%) were small holders (< 10 milking cows per day)
- The vast majority of farmers had primary school or no school education (65%), kept no records (78%), and
- Employed family members for dairy work (85%).
- The average farm size was 4 acres (SD = 6 acres) and
- The majority of dairy farmers (52.4%) relied on their dairy business as the sole source of income.
- The remaining farmers received additional income from:
 - Other livestock trade (2.9%),
 - Horticulture or agronomy (41.2%),
 - Other sources (3.5%).
- Each farm employed an average of 2 people (SD = 0.8).
- The average number of dairy cattle per farm was 29 (SD = 20) for all types of dairy cattle, and 11 (SD = 8) for milking cows.
- Monthly averages were 3,551 (SD = 2,681) kg for milk per farm, 338 (SD = 124) kg for milk per cow, 44,789 (SD = 34,994) baht of revenue per farm, and 4,398 (SD = 1,850) baht of revenue per cow.

(Yeamkong et al., 2010; 34,082 records from 800 farms, 2004 to 2008)

TAGU



Dairy Genetic Evaluation and Selection

LARGE -SCALE DAIRY GENETIC EVALUATION PROGRAM

กรมส่งเสริมการเกษตร 2552
กรมส่งเสริมการเกษตร 2552
กรมส่งเสริมการเกษตร 2552

กรมส่งเสริมการเกษตร 2551
กรมส่งเสริมการเกษตร 2551
กรมส่งเสริมการเกษตร 2551

The Dairy Farming Promotion Organization (DPO) [MY, FY, FP, LL, AFC, IV, PY, DTP, PER]
(Dairy Farming Promotion Organization, 2009)

The Department of Livestock Development (DLD) [MY, FY, FP, PY, PP, AFC, 17 type traits]
(Department of Livestock Development, 2009a)

TAGU

Dairy Genetic Evaluation and Selection

Sire selection in Thailand

- Primarily based on **semen availability**
- Secondarily due to **their genetic ability** for economically important traits. (Koonawootrittrirong et al. 2002a, b)

Farmers tried **upgrading** their cow herd to fractions close to H. However, because of health and reproductive problems, farmers **keep their own cattle at 80 to 90% H.** (Koonawootrittrirong et al. 2002a, b)

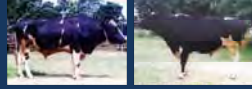
Most Thai dairy farmers (59%) **lacked sufficient knowledge and understanding** of genetic selection and mating strategies. (Saraku et al., 2009)

TAGU

Dairy Genetic Evaluation and Selection

When the farmers **selected sires**, most of them (96%) sought the advice of

- artificial inseminators,
- semen sellers,
- consultants, or
- other people.

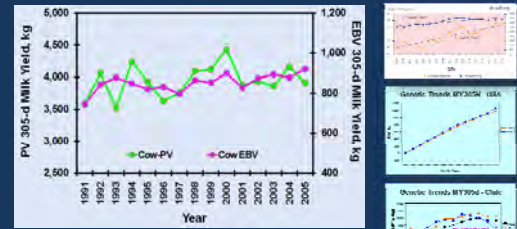


On the other hand, farmers who decided by themselves (4%) used their **own knowledge and experience** (49%) rather than discussing with other farmers or considering EBV of potential sires.

Unfortunately, most farmers (90%) **did not know how to use EBV**. Among farmers who knew the benefit of EBV for selection, less than 5% of them frequently used it.

(Sarakul et al., 2009)

Genetic and Phenotypic Trends

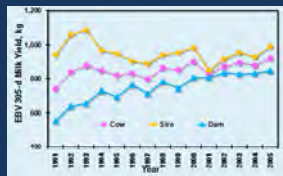


Estimated genetic trends in the Thai dairy population were small (less than 4 kg per year) for 305-d milk yield, and near zero for milk composition traits

Phenotypic trends for 305-d milk yield **varied among Thai dairy populations**. Estimated Phenotypic trends for 305-d milk yield were from 12 kg/year to 60 kg/year

(Koonawootrittrirong et al., 2004, 2009; Department of Livestock Development, 2009a; Sarakul et al., 2010)

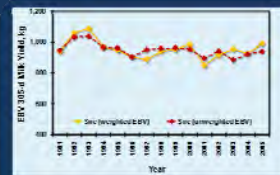
Genetic and Phenotypic Trends



Genetic yearly means for 305-d milk yield in cows, sires and dams suggest that sires and dams were primarily chosen based on considerations other than their EBV for this trait.

This is supported by the closeness of weighted (number of daughters) and unweighted sire yearly mean EBV which suggests that sire usage was similar among available sires within years (1991 to 2005)

(Koonawootrittrirong et al., 2009)



Challenges and Opportunities for Improvement

*Training of producers
in dairy production and genetic improvement*

Farmers may have **limitations in their ability to understand new technology** and to **acquire new knowledge** for improving dairy production and profitability.

(Sarakul et al., 2009)



To overcome these limitations, Thai dairy farmers would need a **program that includes systematic training and continuous support to improve milk production and revenues in a sustainable manner**. Furthermore, a national program of this kind seems advisable

Challenges and Opportunities for Improvement

Data recording and its utilization

Most farmers did not keep records, did not know how to utilize recorded data in their dairy business, and considered data recording to be costly and a waste of time. (Phome et al., 2008a; Sarakul et al., 2009; Teankhong et al., 2010a)



Proper data recording and utilization needs to continue to be promoted and explained to Thai dairy farmers. This will not only benefit individual dairy farmers through improved practices and higher revenues, but it will also benefit the complete dairy industry through improved **regional and national dairy databases** for potential use in production, genetic, economic, and social programs

Challenges and Opportunities for Improvement

National Dairy Genetic and Genomic Evaluation Systems



A **"National Dairy Genetic Evaluation"** needs to be implemented to improve the accuracy of genetic predictions and to increase the availability of Thai and imported sires evaluated under Thai environmental conditions.

Research and development efforts towards the implementation of a **"Genomic Evaluation system"** are needed.

Genomic research will provide needed information on the **importance of genes** associated with dairy traits under **Thai tropical environmental conditions**.

(Dairy Farming Promotion Organization, 2009; Department of Livestock Development, 2009a)

Challenges and Opportunities for Improvement

Sustainability of Dairy Production

The most economically important dairy traits in Thailand are milk yield and fat percentage. Milk price in Thailand is primarily determined by amount of milk produced, with additions and deductions due to milk components.

Most Thai dairy herds are small (less than 10 milking cows).

(Rhine et al., 2008a; Seangun and Koonawootrittriron, 2007)

➡ To stimulate **increases in herd size** and number of dairy farms willing to **participate in genetic improvement** programs, the milk price paid to farmers in Thailand needs to increase.

⬇

A sustainable dairy production program in Thailand needs to consider economic, social, production, and genetic improvement aspects.

⬆

On the other hand, cows between 75% H and less than 100% H had **higher milk production** than purebred H.

(Koonawootrittriron et al., 2009)

➡ Selection programs in Thailand need to include adaptability (heat and humidity tolerance, tolerance to insects), reproduction, and production traits.

Acknowledgements

- Kasetsart University, Bangkok, Thailand
- University of Florida, Gainesville, Florida, USA
- The Higher Education Commission, Ministry of Education, Bangkok, Thailand
- Dairy Farming Promotion Organization, Ministry of Agriculture and Cooperatives, Saraburi, Thailand
- Department of Livestock Development, Ministry of Agriculture and Cooperatives, Thailand
- Muaklek Dairy Cooperative Limited, Saraburi, Thailand
- Midland Dairy Limited Partnership, Saraburi, Thailand
- Huay Sad Yai Dairy Cooperative Limited, Prachuab Kirikan, Thailand
- All Thai Dairy Farmers