Current Situation and Future Prospects for National Genetic Evaluation of Cattle in Thailand

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- Current Situation
- National Genetic Evaluations
- DPO Genetic Evaluation
- DPO Genetic Trends
- Future Prospects
- Final Thoughts

Current Situation - Thailand

- Dairy Cattle Popn = 300,000
- Recorded Cows = 30,000 (10%)
- DPO = 2,000 (7%)
- DLD = 24,000 (80%)?
- Private Farms = 4,000 (13%)?

Published Genetic Evaluations

Public Sector	Private Sector
DPO Since 1996 Kasetsart Univ	Chokchai Farms Since 2002? Khon Khaen Univ
DLD Since 2006?	

Observation

Tremendous Potential for Growth and Development of National Genetic Evaluations in Thailand

Why Are National Genetic Evaluations Needed?

- Provide a Uniform Comparison Tool Within a Country
- Maximize Accuracy of Prediction and Animal Rankings
- Selection and Mating Tool Uni & Multibreed
- Marketing Tool Increase Economic Value of Animals

Major Components

- Cattle Population
- Data Collection & Maintenance System
- Connectedness
- Genetic Evaluation System
- Continuity & Dynamic Goals
- Flexible Organization & Resources

DPO Genetic Evaluation

1996
Single Trait Sire (or Dam) Model (SAS)
100d MY, kg; 100d FY, kg

1997-1999
Single Trait Animal Model (MATVEC)
100d MY, kg; 100d FY , kg
305d MY , kg; Total MY, kg; Lact Length, d

2002-2004
Multiple Trait Animal Model (ASREML)
100d MY & 100d FY, kg; 305d MY & 305d FY, kg
Lact Length, d; Age at First Calving, mo

Mating Scheme - DPO

Upgrading to Holstein

Many Intermediate Crossbred Groups

Straightbred and Crossbred Sires

Straightbred and Crossbred Dams

Cattle Population - DPO

Multibreed

Population composed of purebred and crossbred animals that interbreed

Complete?

Incomplete?

Complete Multibr Popn UF Angus-Brahman Herd

	Breed Group of Sire					
BGDam	A	.75 A	.50A	.25A	B	Br
A	35	12	17	20	30	33
.75 A	25	16	19	18	32	28
.50A	33	15	20	20	36	33
.25A	23	13	16	16	30	22
B	23	11	15	18	49	23
Br	23	9	18	18	27	36

Number of Parents

2004	Daughters with records	
Breed Group	Sires	Dams
(80-100)H	279	336
(60-79)H	11	317
(40-59)H	2	170
(20-39)H	0	31
(0-19)H	5	29

Number of Daughters

2004	Breed Group Sire	
BG Dam	Holstein	(0-99)H
(80-100)H	360	38
(60-79)H	310	51
(40-59)H	172	26
(20-39)H	30	4
(0-19)H	29	3

Type of Population - DPO

Incomplete Multibreed Population

Holstein, Native, Brahman, Red Sindhi, Sahiwal, Jersey

Holstein – Other

(Other = Native, Brahman, Red Sindhi, Sahiwal, Jersey, Red Dane)

Population Structure

BG Dam	DPO, %	Thailand, %
(80-100)H	39	47
(60-79)H	35	51
(40-59)H	19	1
(20-39)H	3	0
(0-19)H	3	1
Number Cows	1,023	296,992

Data Collection - DPO

Production, Reproduction

Complete Pedigree (Animals, Sires, Dams)

Breed Identification and Breed Composition
(Animals, Sires, Dams)

Date1, {Measurements1}, …

Data Editing - KU

Original Dataset Edited for Incomplete or Incorrect Information

Edited Dataset Checked for Connectedness
Sires and Maternal Grandsires
versus
Herd-Year-Seasons

Multibreed Contemporary Groups

Herd
x
Year
x
Season

Connectedness

Herd-Yr-Season		
1	X	
2	X	X
3	X	X
4		X
5	X	X
6	X	X
7	X	

Genetic Evaluation - KU

Multiple-Trait Linear Model
100d MY & 100d FY, kg
305d MY & 305d FY, kg
Lact Length, d
Age at First Calving, mo

Computed by Direct Procedures
(Program ASREML)

Multibreed Model

Record

Herd-Year-Season
Dam Calving Age (Regression on H)

Holstein Fraction (Regression)

Animal Additive Genetic Effect

Residual

Multibreed Genetic Base

Multibreed Additive Genetic Base
=
Mean of alleles from all the Other breeds in the population

Other
Native, Brahman, Red Sindhi,
Sahiwal, Jersey, Red Dane

Genetic Predictions

Animal EBV

=

Holstein Fraction of Animal
x
Estimate of Holstein Breed Group

+

Prediction of Random Animal Genetic Effect

Genetic Evaluation System

Dairy Producers
Multibreed Dairy Population

DPO
Data Collection and Maintenance

KU-UF
Annual Genetic Evaluations

DPO Genetic Trends

By Animals in the Pedigree

By Holstein Fraction of Animals

Chilean Genetic Trends

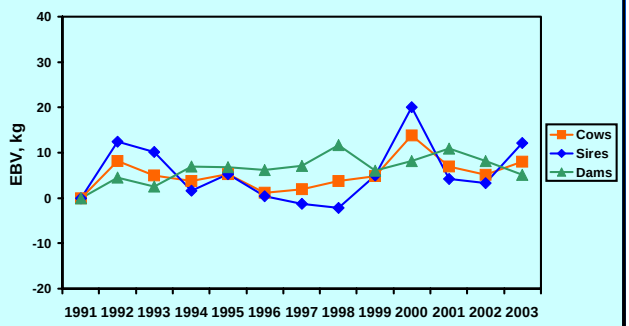
USA Genetic Trends

DPO Genetic Trends

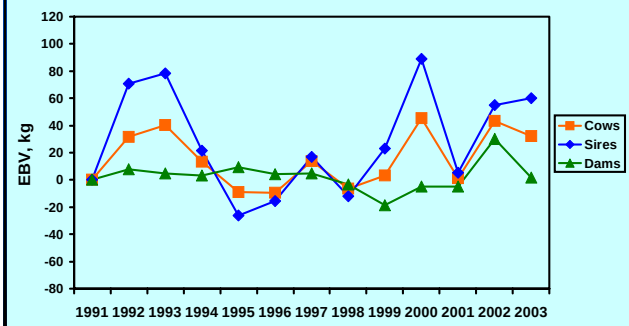
By Animals in the Pedigree

Cows
Sires
Dams

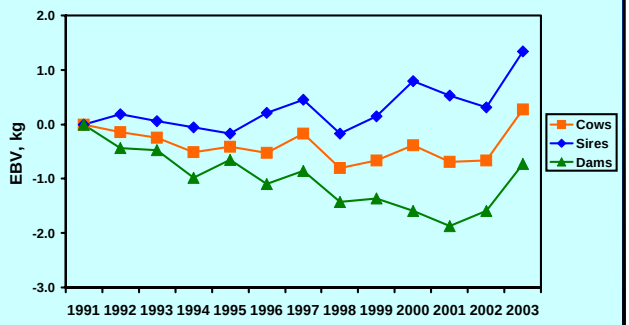
Genetic Trends MY 100d - DPO



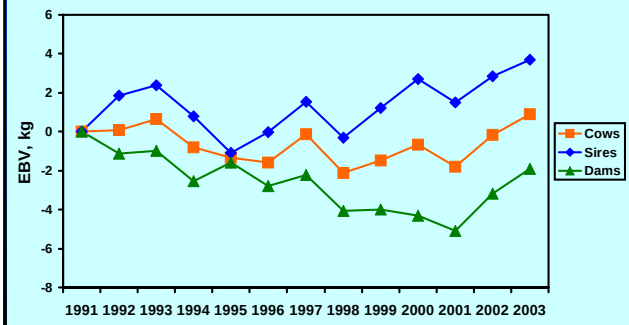
Genetic Trends MY 305d - DPO



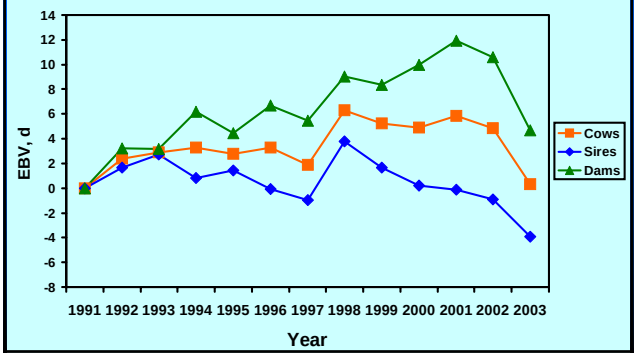
Genetic Trends FY 100d - DPO



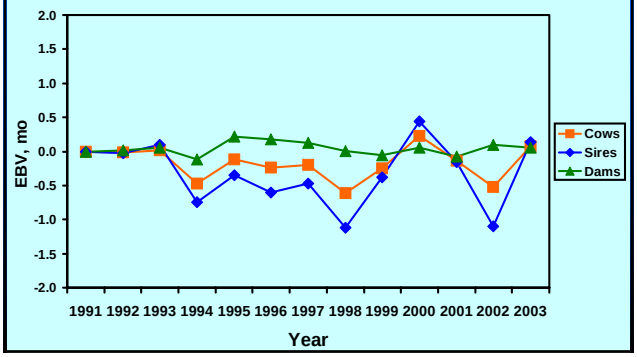
Genetic Trends FY 305d - DPO



Genetic Trends Lact Len - DPO



Genetic Trends AFC - DPO

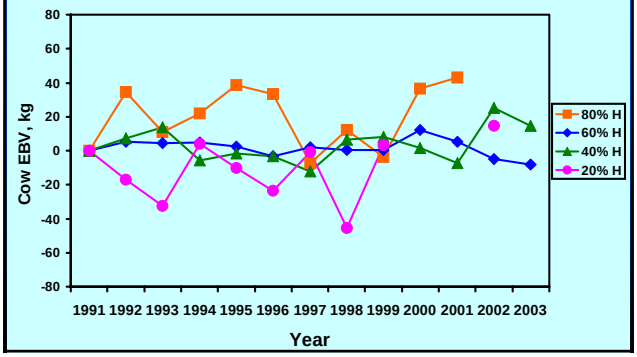


DPO Genetic Trends

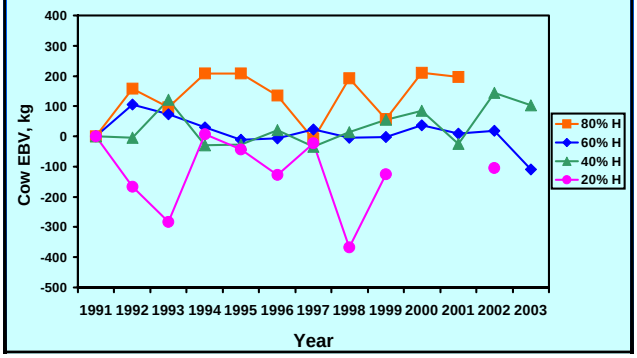
By Holstein Fraction of Cow

80 to 100% H
60 to 79% H
40 to 59% H
20 to 39% H

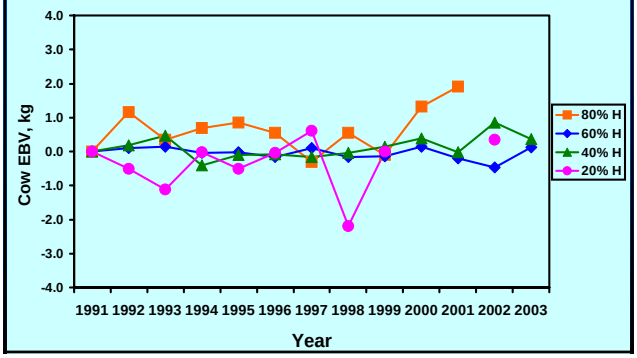
Genetic Trends MY 100d - DPO



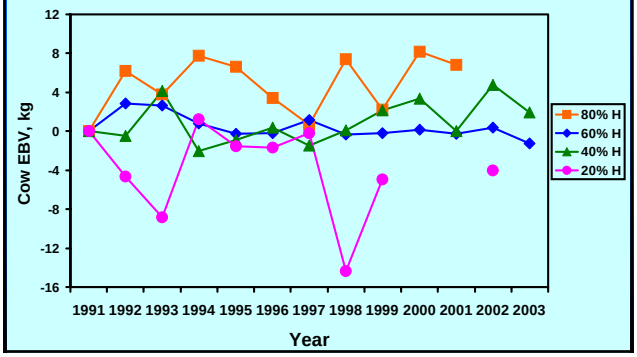
Genetic Trends MY 305d - DPO



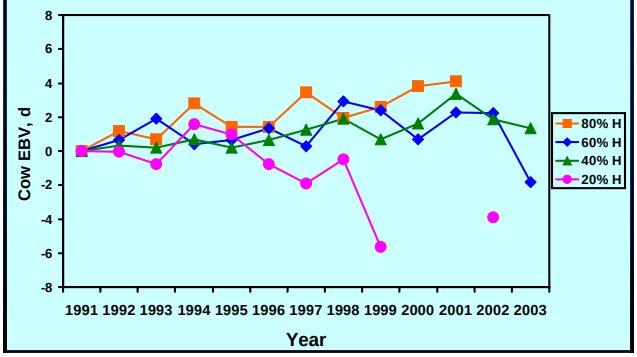
Genetic Trends FY 100d - DPO



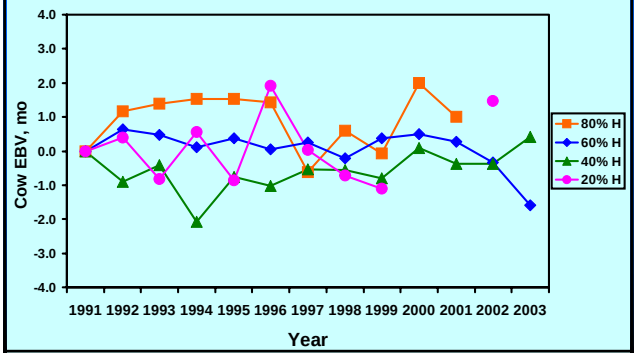
Genetic Trends FY 305d - DPO



Genetic Trends Lact Len - DPO



Genetic Trends AFC - DPO

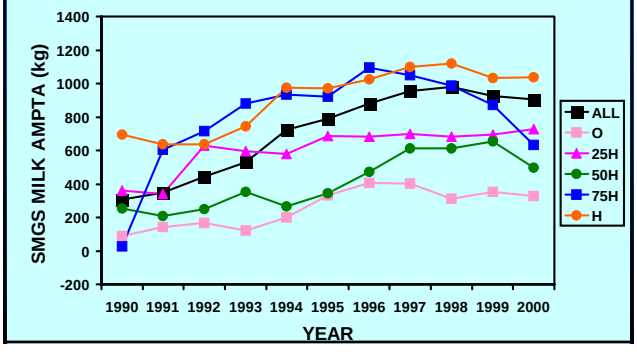


Chilean Genetic Trends

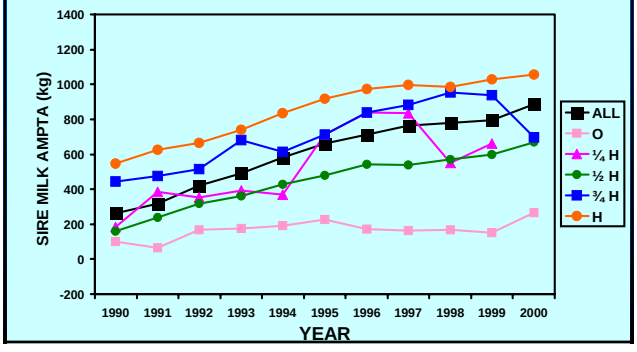
By Holstein Fraction of Cow

100% H
75% H
50% H
25% H
0% H

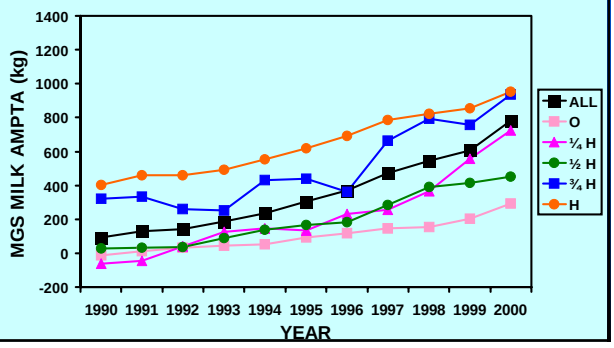
Genetic Trends MY305d - Chile



Genetic Trends MY305d - Chile



Genetic Trends MY305d - Chile

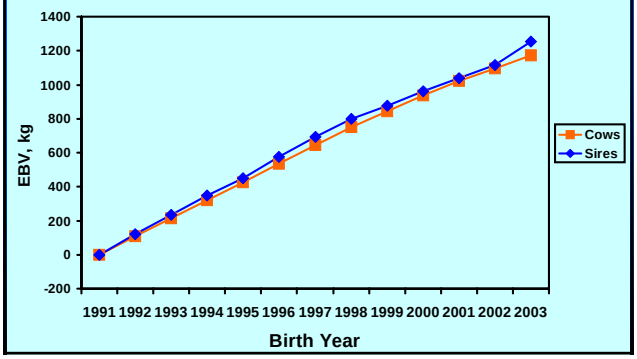


USA Genetic Trends

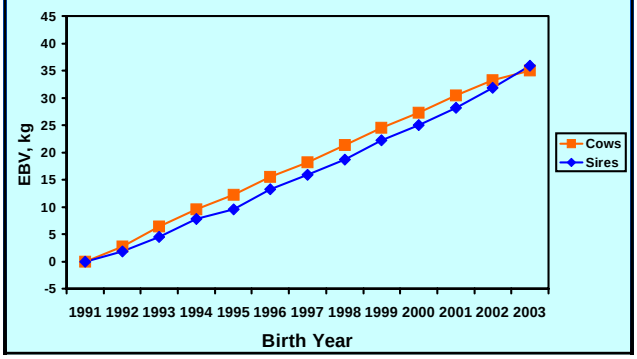
By Animals in the Pedigree

Cows
Sires

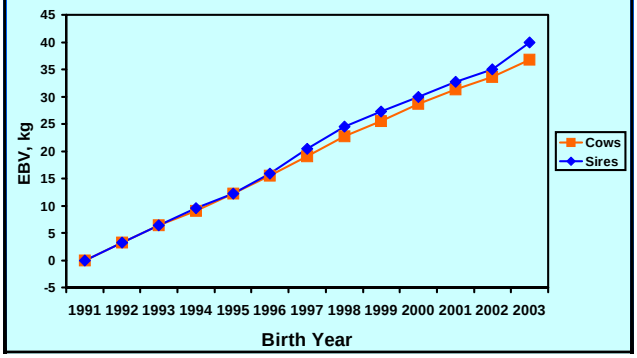
Genetic Trends MY305H - USA



Genetic Trends FY305H - USA



Genetic Trends PY305H - USA



Summary
DPO 12-yr Genetic Trends

	Sires	Dams	Cows
MY305, kg	36.3	2.8	21.4
FY305, kg	2.2	-4.0	-0.8
LL, d	-0.8	9.8	4.4
AFC, mo	-0.4	0.0	-0.2

Why Low Genetic Trends?

- Small Population Size
- How were sires chosen?
- How were dams chosen?
- Which traits were used to select parents?
- How many traits were used for selection?

Popn Size vs Genetic Change

Dataset	Number Cows Evaluated	MY305 12-yr Change
DPO	2,000	21 kg
Chile	60,000	1,138 kg
USA	7,000,000	1,118 kg

How were sires chosen?

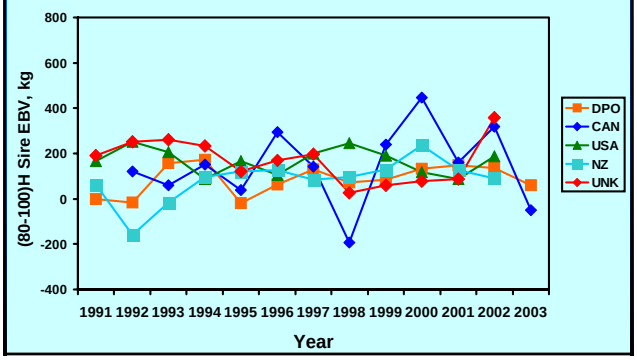
- EBV Within Population (USA, CAN, NZ, UNK)?
- Traits Other than Production?
- Pedigree?
- Semen Price?
- MY305 = 36.3 kg/12 yr
- FY305 = 2.2 kg/12 yr
- LL = -0.8 d/12 yr
- AFC=-0.4 mo/12 yr

Emphasis on MY305

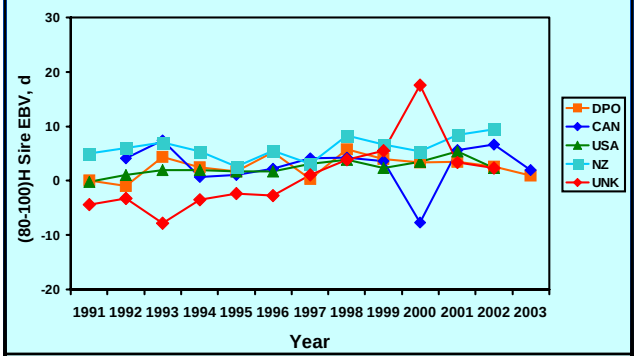
Were Foreign Sires Chosen Differently from DPO Sires?

NOT for the traits evaluated in the DPO population

Genetic Trends MY305H - DPO



Genetic Trends LLH - DPO



How were dams chosen?

Phenotype? | Pedigree? | EBV?

MY305 = 2.8 kg/12 yr

FY305 = -4.0 kg/12 yr

LL = 9.8 d/12 yr

AFC=0.0 mo/12 yr

Emphasis on Lactation Length

Which Traits Were Used For Selection?

Primarily Production Traits (e.g., MY, FY)?

Primarily Reproduction Traits (e.g., AFC)?

Other Traits (e.g., health, adaptation, type)

Likely a Combination of Reproduction, Production, and Health Traits (EBV? Phenotypes?)

Low Selection Pressure on Traits Evaluated by DPO

How Many Traits Were Used for Selection?

Single Trait (e.g., MY)?

Multiple Traits (e.g., MY, LL)?

Other Traits (e.g., health, adaptation, type)?

Case 1: no selection, only Culling

Case 2: Selection Using Several Traits (Reproduction, Health, Production; Phenotypes? EBV?)

DPO: Why the Low Genetic Trends?

Small Population

⇩

Few High BV Animals

Low Accuracy EBV

Unclear Sire Selection Strategy (EBV?)

Unclear Dam Selection Strategy (Phen, EBV?)

Traits Used for Selection? (Reprod, Prod, Health, Type)

Low Usage of the Best Sires

Low Genetic Trends

What needs to be done next?

Improvements in Data Collection

Improvements in Genetic Evaluation

Establish Short and Long-Term Goals

Improvements in Data Collection

Must Increase Number of Recorded Animals

Factors Causing Slow Increase in Numbers

Modify Data Collection Strategies?

Increase Benefits to Producers?

Establish Economic Incentives?

Improvements in Genetic Evaluation

- Models of Higher Complexity and Precision
- Substantially Larger Dataset
- Simple Genetic-Economic Indexes
- Simple Cost-Benefit Analyses

Short-Term Goals

- Greatly Increase Recorded Population
- Identify Factors Slowing Growth
- Evaluate Additional Traits
- Develop Genetic-Economic Indexes

Long-Term Goals

- Broader Research & Development Goals
- Integrate Genetic-Economic-Management-Health
- Incorporate a Wider Range of Target Traits
- Create a Formal Feedback Mechanism

Future Prospects

Phase 1: Finished.
Basic Structure for National Genetic Evaluations is in Place

Phase 2:
National Genetic Improvement Plan with Clear Research and Development Objectives

Some Ideas for Phase 2

- Develop a National Consortium for Genetic Improvement of Dairy Cattle in Thailand
- Producers-Government Organizations-Universities-Private Companies
- Research and Development Workplan
- Broad Research and Development Goals [Genetic-Economic-Management-Health]

Some Ideas for Phase 2

- Good Integration and Communication Among Participating Organizations
- Effective Feedback Mechanism
- Effective System to Implement New Strategies
- Periodic Reevaluations

Iterative Reevaluation of Goals and Results

Genetic-Economic-Management-Health Factors

Current Decisions

New Results

Current Results

Revised Decisions

Final Thoughts 1

Free-Trade Agreements Will Force Producers to Lower Costs and Be Efficient

National Genetic-Economic Information Will Help Producers to Remain Competitive

Accuracy of Genetic Evaluations in Thailand Must Increase

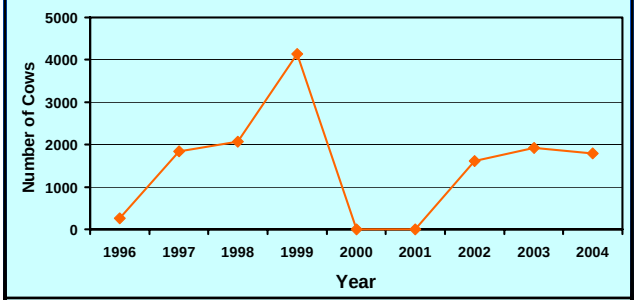
Final Thoughts 2

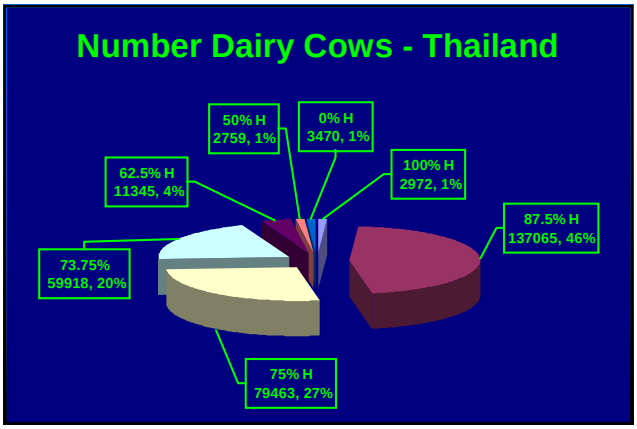
Dairy Producer Participation in National Genetic Evaluations Must Increase (Currently 10% Producers Collect Data)

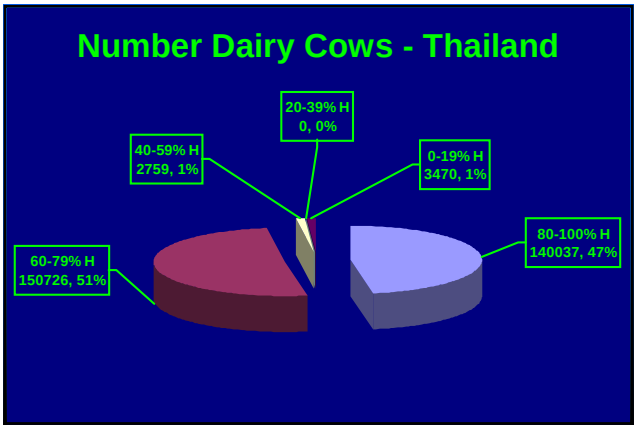
Combine Genetic and Economic Information

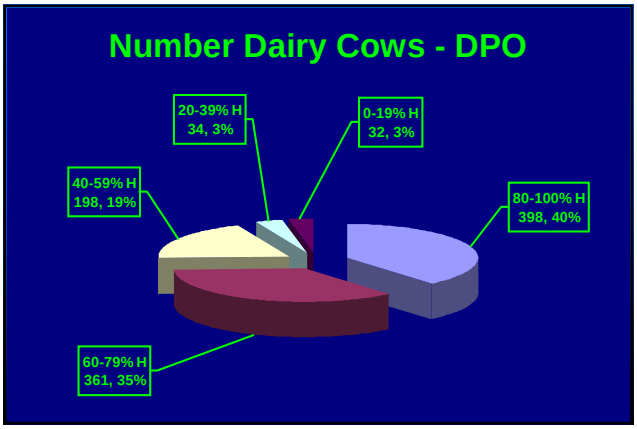
Develop a National Consortium for Genetic Improvement of Dairy Cattle in Thailand

Number of Cows per Genetic Evaluation - DPO




Number Dairy Cows - Thailand
50% H
2759, 1%
0% H
3470, 1%
62.5% H
11345, 4%
100% H
2972, 1%
87.5% H
137065, 46%
73.75%
59918, 20%
75% H
79463, 27%


Number Dairy Cows - Thailand
20-39% H
0, 0%
40-59% H
2759, 1%
0-19% H
3470, 1%
80-100% H
140037, 47%
60-79% H
150726, 51%


Number Dairy Cows - DPO
20-39% H
34, 3%
0-19% H
32, 3%
40-59% H
198, 19%
80-100% H
398, 40%
60-79% H
361, 35%