Kinship breeding in theory and practice

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Content:

- Kinship breeding system
- The Dutch Frisian breed
- Results of 30 years breeding
- Conclusion

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Dutch Frisian dairy cows

The bases of the Holsteins of today

Dutch Frisian breeding

- 70'-80's: DF replaced by HF
- Today total ~ 1500 cows in NL
- Pure bred breeders: ~800 cows
- Breeding with own bulls
- 1992: Foundation of Nucleus breeders

→ Farm Based Kinship breeding

→ Different pure lines within the population

Kinship breeding

Kinship breeding is a breeding system that is used to protect the Dutch Friesian breed for going extinct. About 15 dairy farmers in the Netherlands (12) and France (3) breed their cows more or less following this breeding system. They select each year 3-5 breeding bulls from their best cows and use these bulls for breeding in the own herd taking care that no relationship in the first 3 generations occurs. In this way they establish different genetic islands which have no or little genetic relationship. Since each farmer has it's own view on the best type of animal for the specific farm type and management, each herd will develop towards a different type of cow within the breed as a whole.

Kinship breeding:

- Breeding program:
  - Breeding goal defenition
    - *traits + weight*
  - Breeding value estimation
    - *Phenotype versus genotype*
    - *Information relatives*
  - Selection and mating

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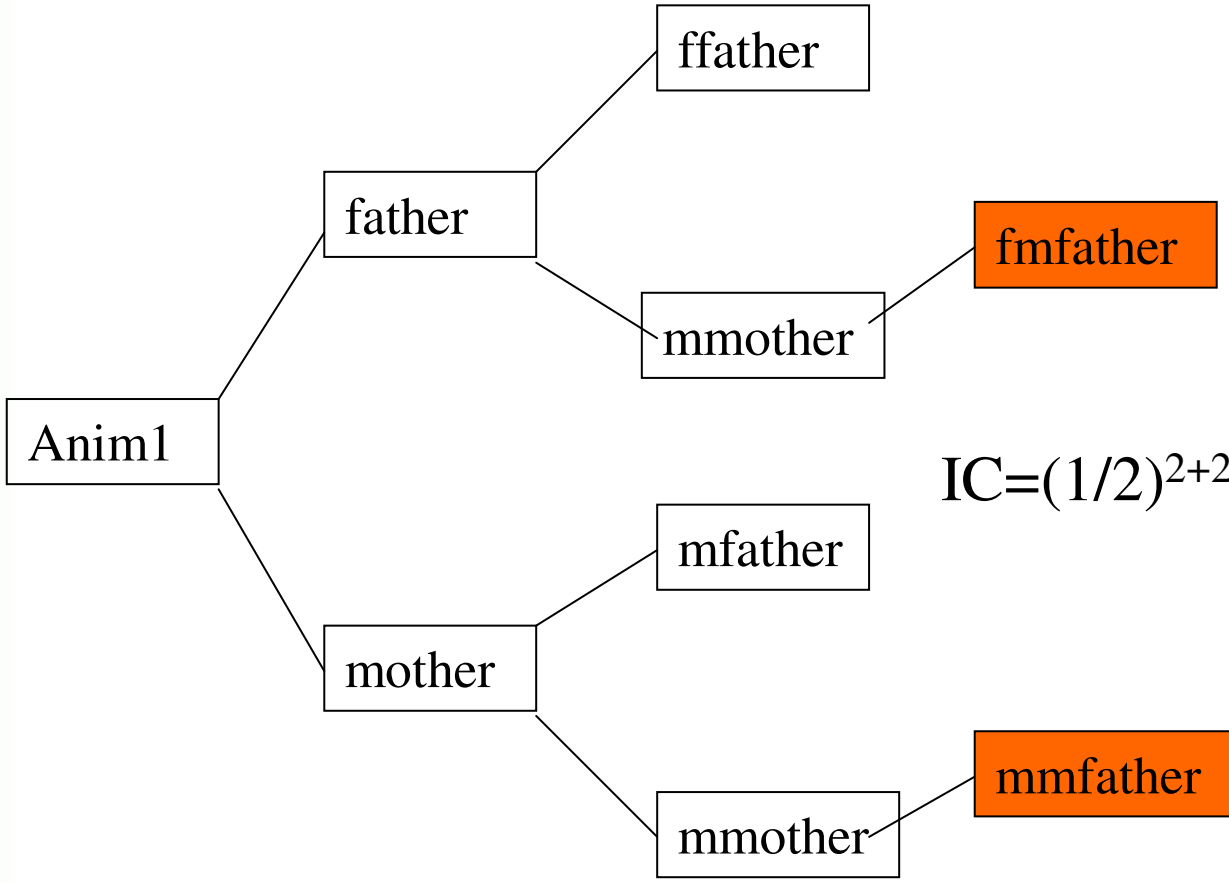
Kinship breeding:

- Selection best bull mothers from different cow families
- Selection of 4-5 bulls from these cows
- Use these bulls evenly over the herd
- No inbreeding in first 3 generations
- Repeat this every year

Control of inbreeding: maximum of one identical relative in 3rd generation



$IC=(1/2)^{2+2+1}= 1/32 = 3,125\%$

Why farm based kinship breeding?

- Breeding aspects:
  - Secure genetic diversity (use of more young bulls)
  - Less GxE (soil type, barn, fodder)
  - More influence of mother lines in herd
  - Use of qualitative traits (farmer)
  - Use of inbreeding and heterosis
  - Develop a uniform herd
  - Better fertility
  - Effect of epigenetics (animal x farm)

and:

- Social/economic:
  - Rural development (breeding networks)
  - Choices in own hand (breed/type)
  - Breeding companies can not
  - Hobby, compassion
  - Better farm output

Secrets behind kinship breeding:

- Reliability from homozygote animals
- Less risks with more young bulls/year
- Balance in own breeding goal
- Careful input of new breeding animals

Important for kinship breeding:

- Stable management
- Be consequent each year
- Long term breeding goal
- Selection on vigour, vitality

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Some different types within the Dutch Frisian breed:

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Milk type

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Uniform and late mature

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Grass converters

Dual purpose

AI bull

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Breeding is based on natural mating

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Results:

Describing data of 30 years

Kinship breeding

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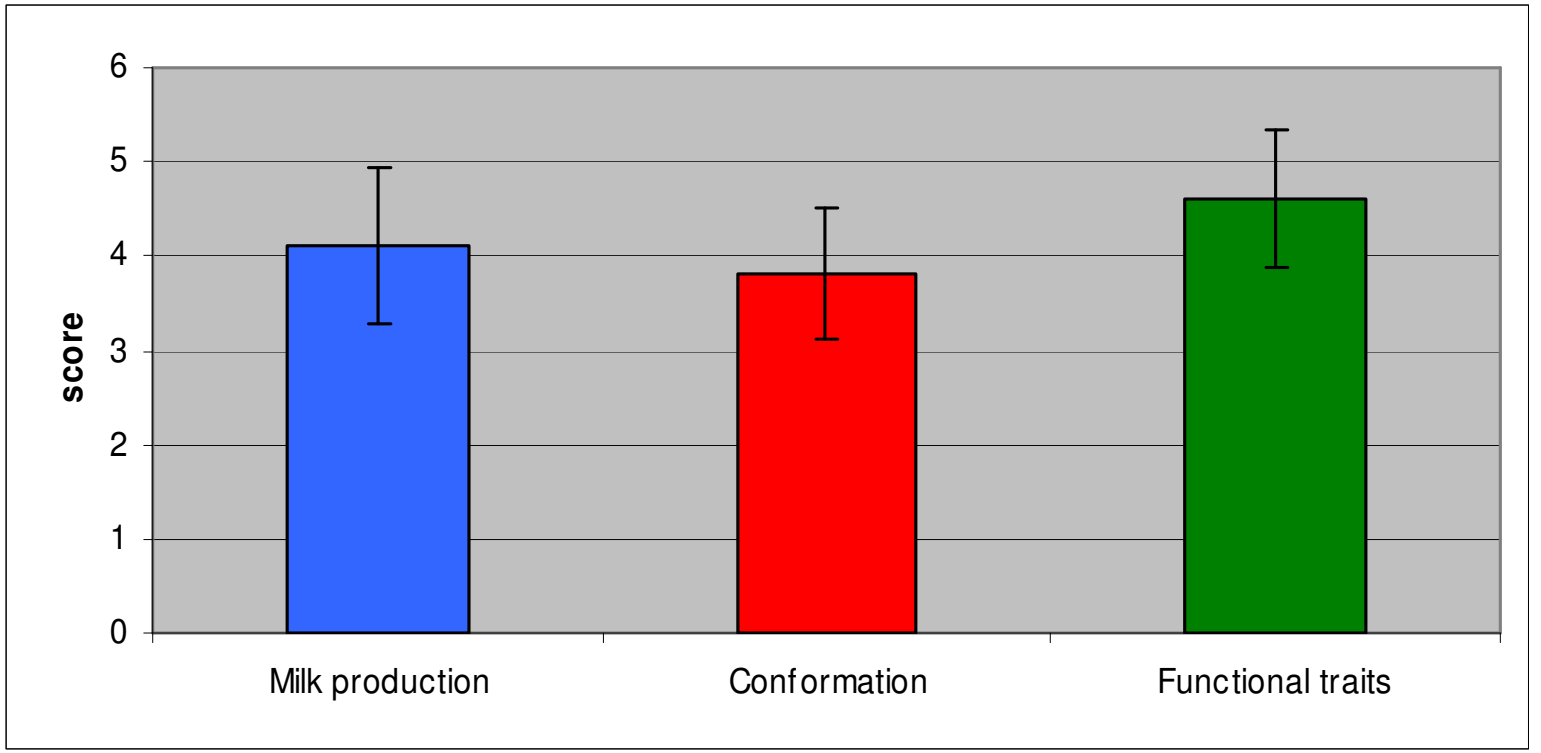
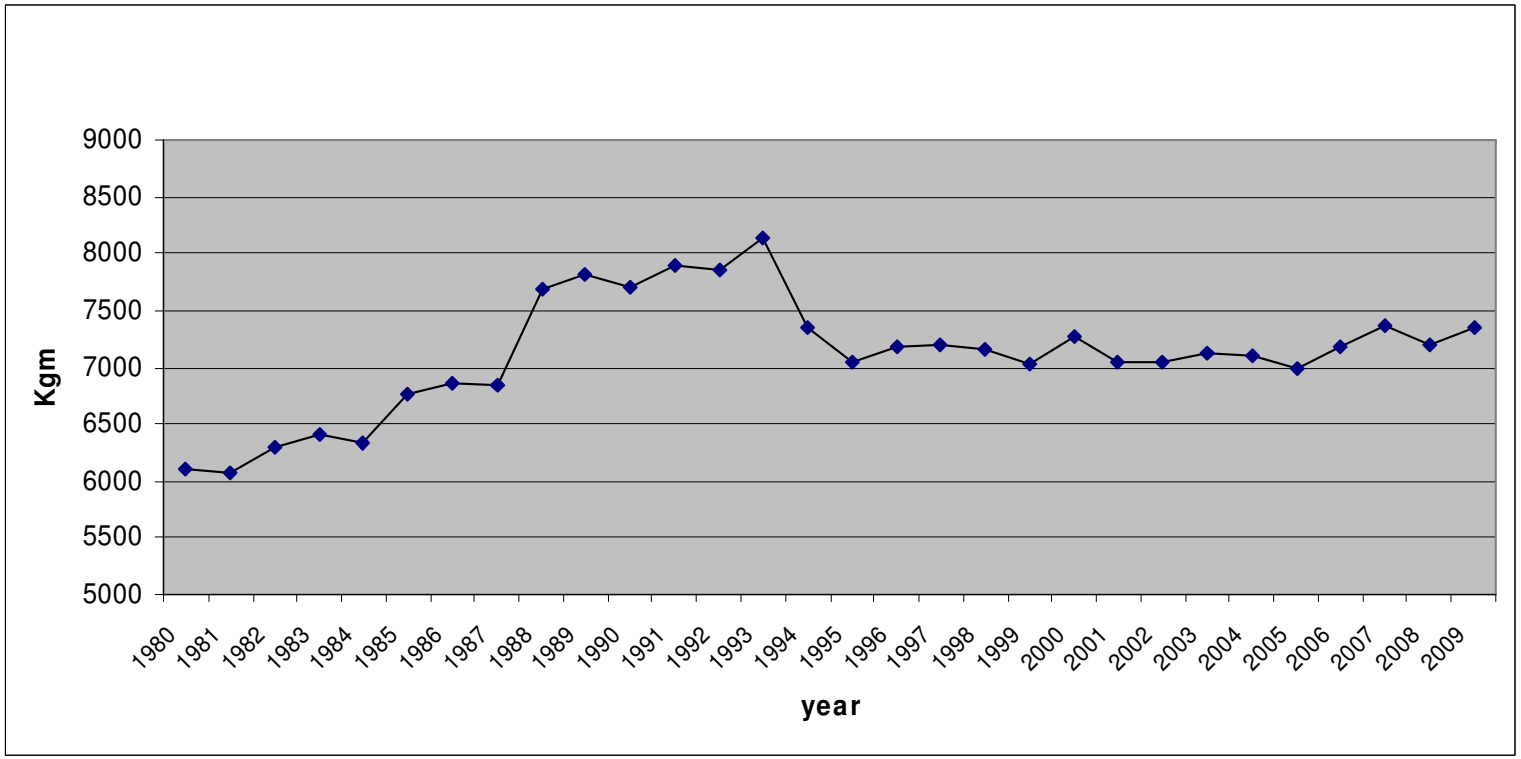
Nucleus farms (12):

Area (ha)	37
Nature land (ha)	7,6
Maïs (ha)	5,3
Cereals (ha)	1,3 (1 farm)
Milk quota (ton)	432 (220 – 650)
Milking cows (#)	64 (38 – 103)
Concentrates/cow (kg)	1755 (600 – 3050)
Kg milk heifers	6150 (4500-9000)
Kg milk cows	8200 (6000-12000)
Barn type	5 tie stall , 7 cubicles
Pasture	92%

Overall Breeding goal :



Milk production 1980-2009:



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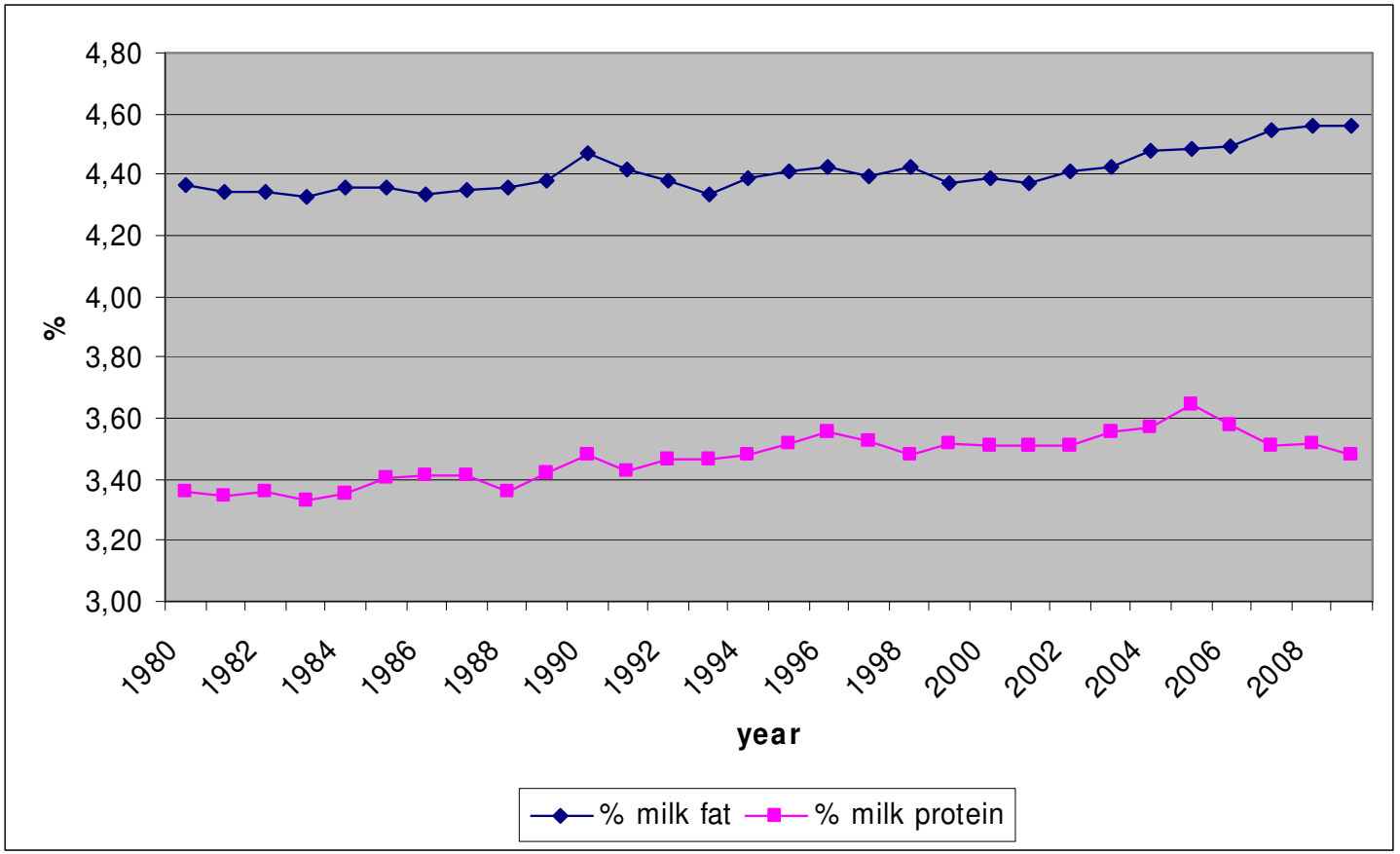
Milk production 1980-2009:



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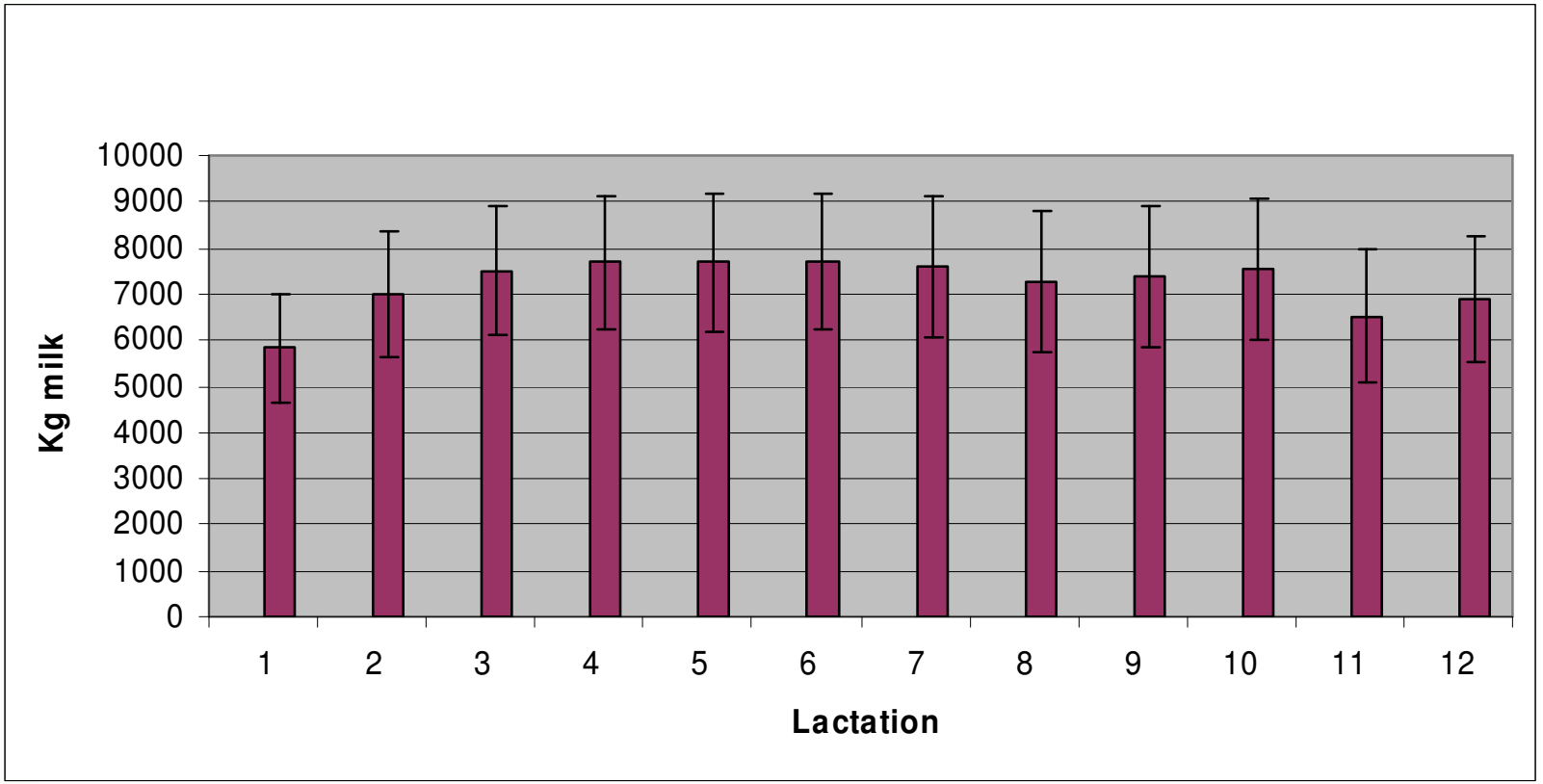
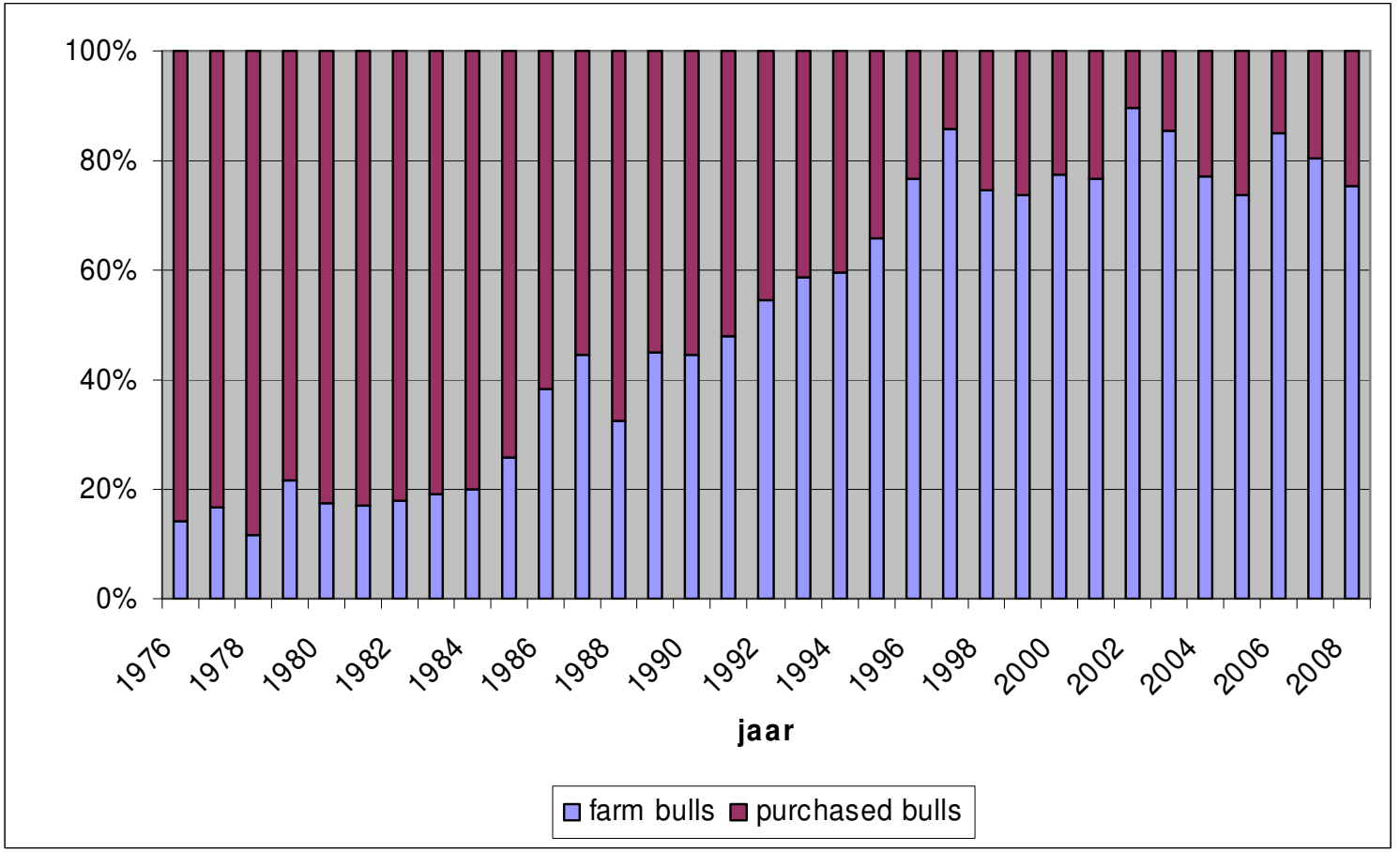
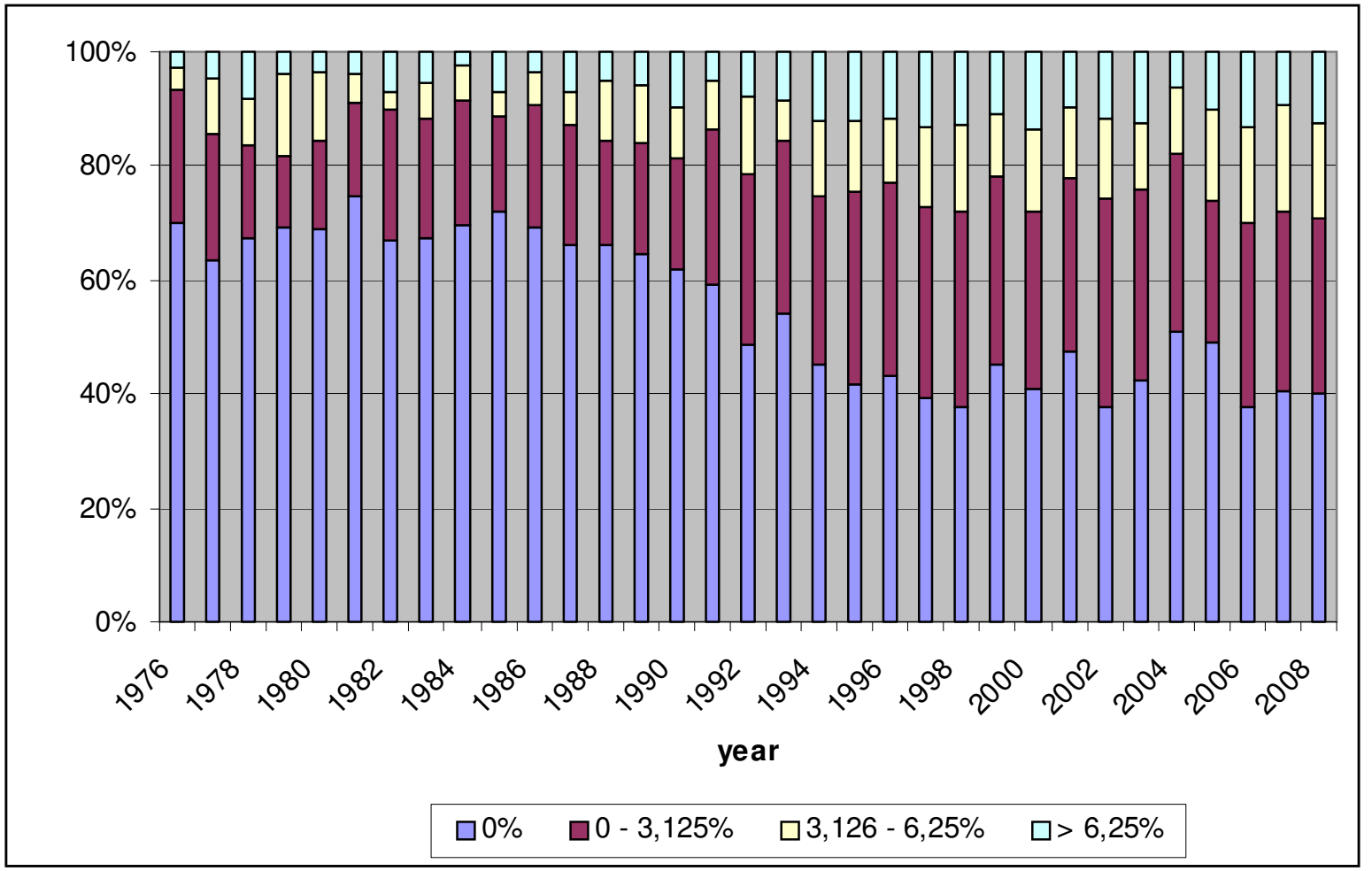
Kg milk per lactation :



Use of farm or non-farm bulls:



Trend of IC :



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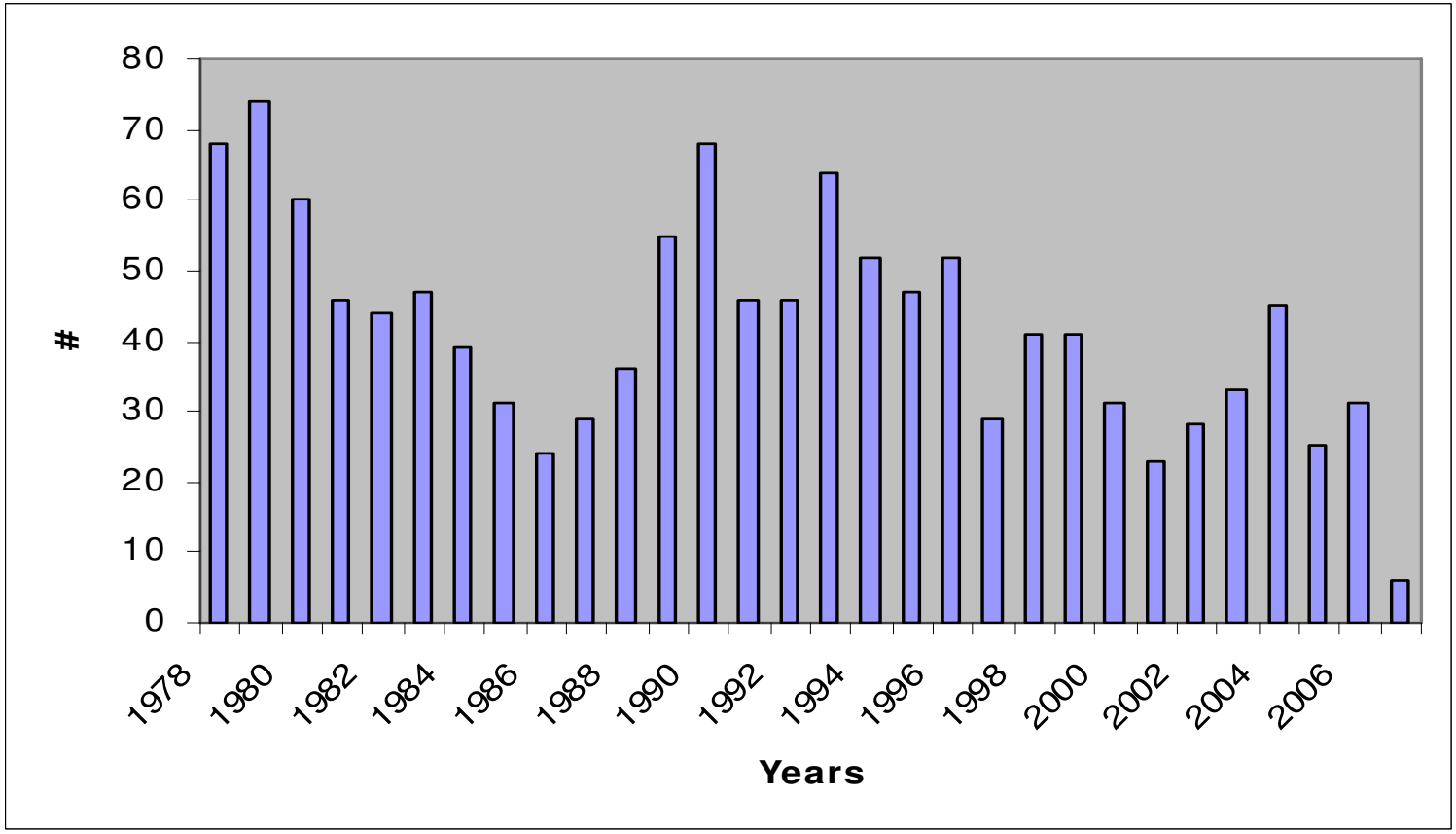
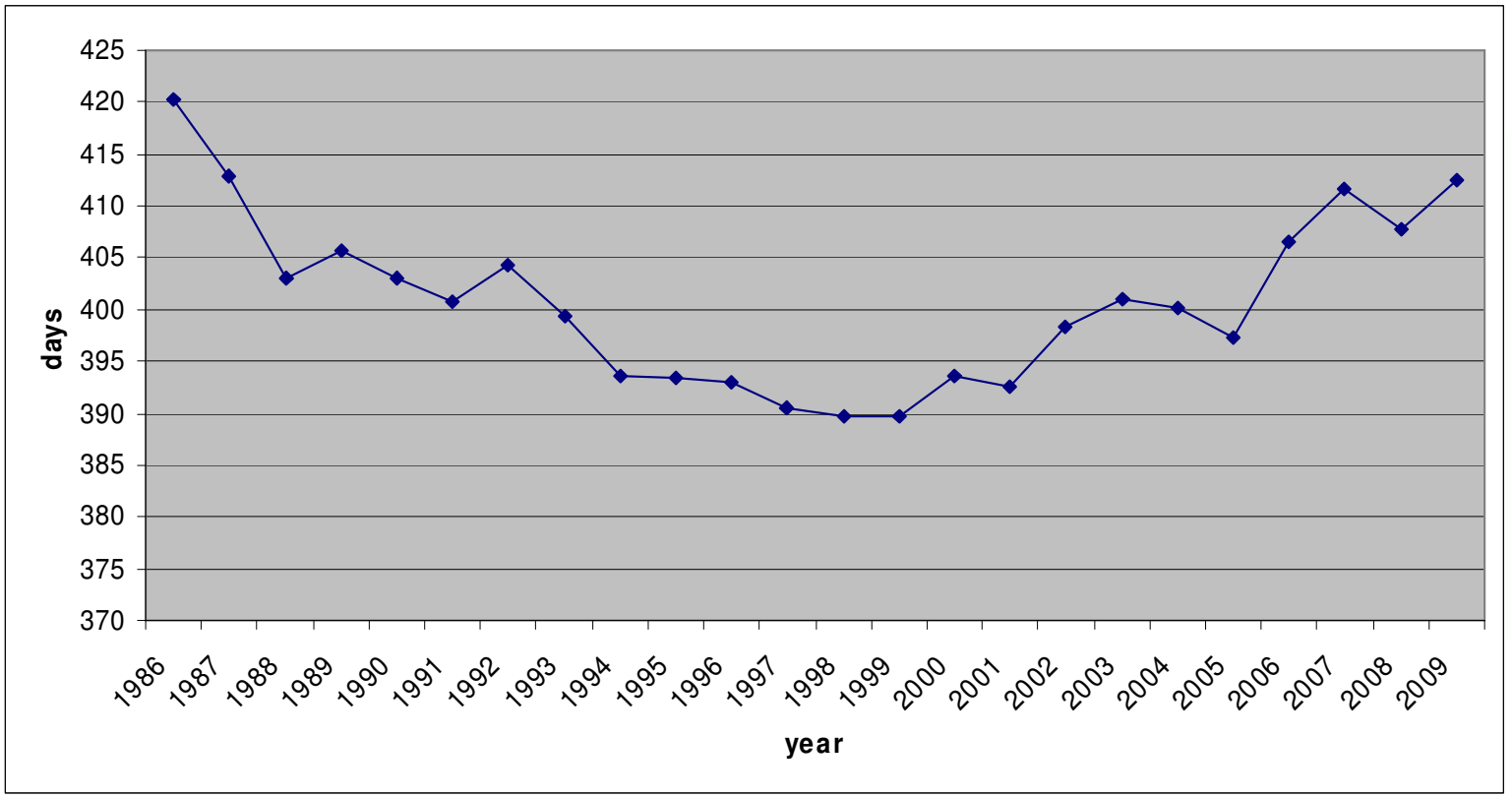
Use of bulls



Average 42 bulls/year over 20 farms

(breeding + other farms)

Fertility: Calving Interval (CI)



In short:

- Production: 6000 → 7400 kg
- Protein: 3,39 → 3,54%
- 70% offspring from own farm-bulls
- 42 new bulls per year (in pop. of 800)
- Average IC = 1.9 (range:1.6 - 3.5)
- CI : 390 – 420 days
- Nb. of inseminations/cons.: 1,5
- Average SCC = 230.000cells/ml

Conclusions:

- Large variation in farm managements
- Genetic variation protected
- Just a few high inbreeding coefficients
- Stable results, good milk contents, fertility, udder
- Robust cows (can be used in a wide range of environments)

→ **Kinship breeding makes it possible to breed and secure a healthy and productive population**