

Management of Animal Genetic Resources in the Netherlands - focus on MRIJ

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Mario Calus, Sonia Eynard, Ina Hulsegge, Anouk Schurink, Rita Hoving, Sipke-Joost Hiemstra, Jack Windig



Why conserve Animal Genetic Resources?

Insurance for the future!

Conserve flexibility of the genetic system: food security

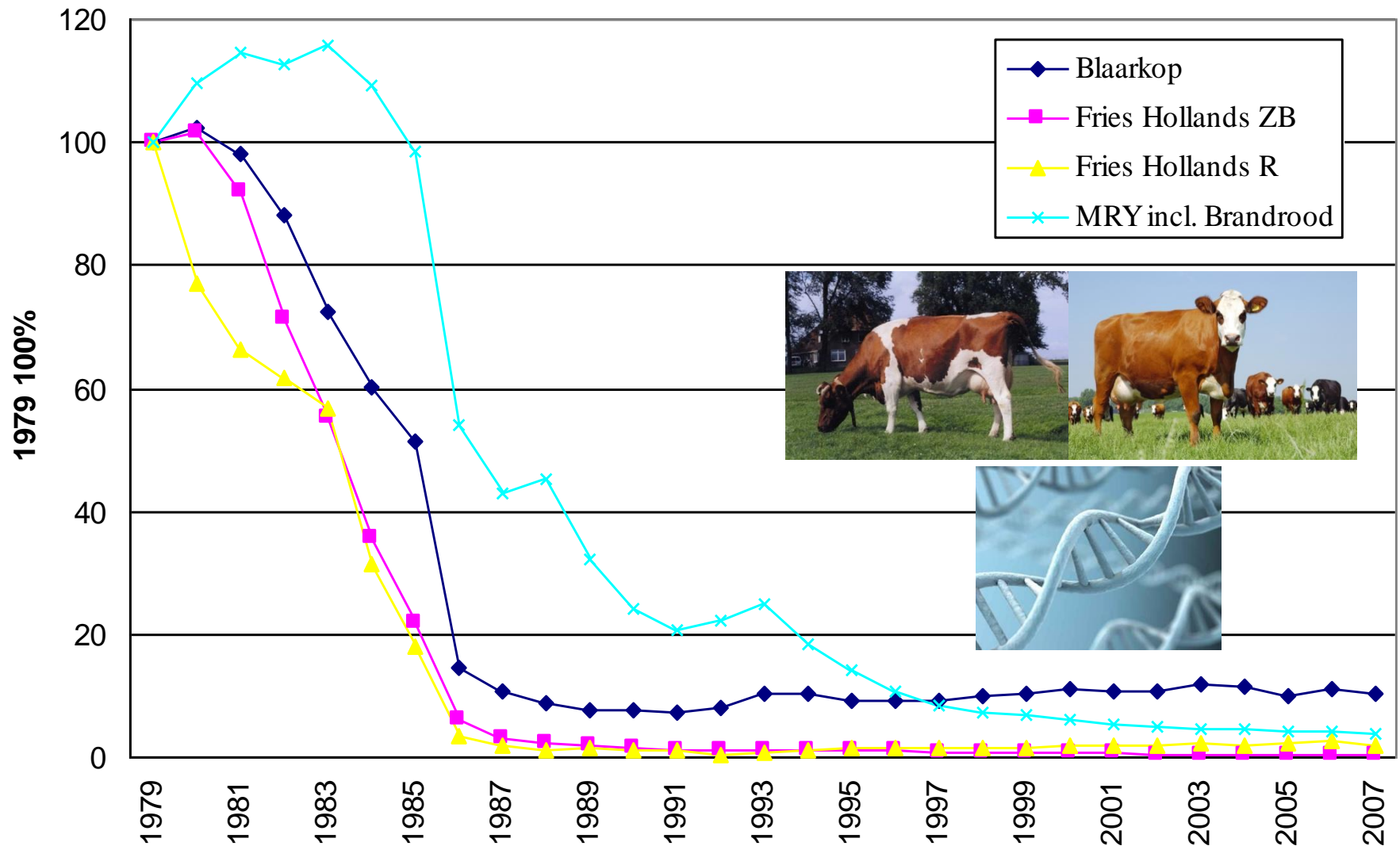
- Risk of change in environment, market demands and disasters (e.g. diseases)

(Farm) animal breeds of Dutch origin are a valuable part of our cultural heritage

- Breeding programs are expensive, many breeds are set aside



% change in population size 1979 - 2007



Conservation of Animal Genetic Resources

Centre for Genetic Resources, the Netherlands

Conserve and use (farm) animal genetic resources:

- Compose and manage gene bank collections
- Advise about genetic management of rare breeds
- Policy advice (national and international level)
- Scientific research: population genetics, genomics, breeding, cryobiology, reproduction



Aim of Dutch AnGR gene bank (*ex situ*)

Long term

- To safeguard all rare/native/endangered breeds of farm animals in the gene bank
- To promote and facilitate conservation of back-up samples of all (commercial) breeds in the gene bank

Short term

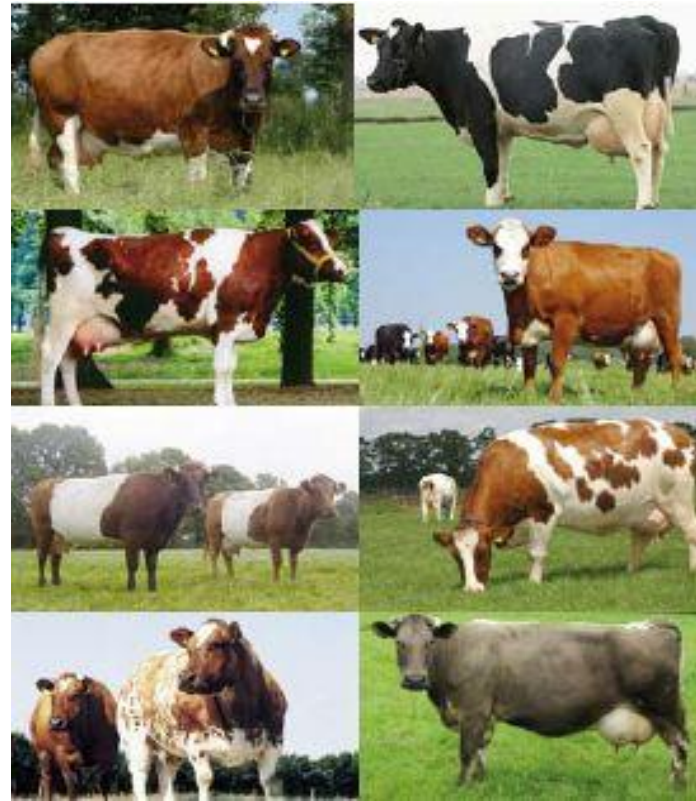
- To support breeding programs of endangered breeds - by distribution of gene bank semen



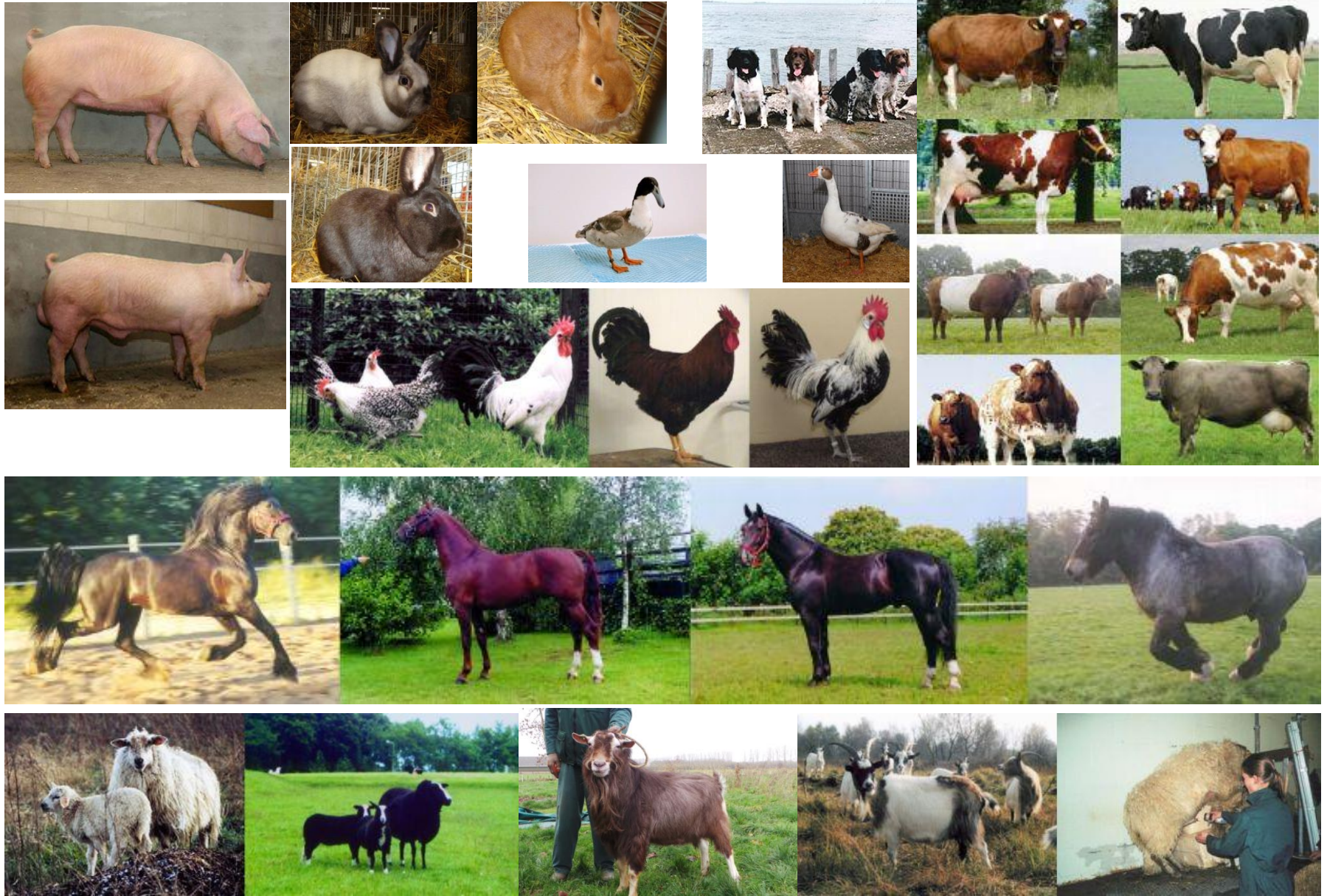
Not only rare breeds in the gene bank

Cattle

- Brandrood
- Roodbont Fries
- Lakenvelder
- Verbeterd roodbont
- Fries Hollands
- Groninger Blaarkop
- MRIJ
- Witrik
- Holstein Friesian



Species and breeds in the gene bank



Material in the gene bank



Compose and manage gene bank collections

- Mostly semen, but also embryos, egg cells and DNA

Species	# Breeds	# Males per breed	# Doses
Cattle	18	1 – 5,223	239,793
Sheep	10	8 – 71	31,154
Goat	5	5 – 33	6,590
Horse	9	1 – 41	3,307
Pig	28	1 – 56	20,464
Chicken	31	1 – 20	18,828
Duck	3	14 – 34	1,588
Dog	5	1 – 8	410
Rabbit	8	3-12	1,957



Tools

- Optimal contributions (Gencont)
 - Maximise genetic gain while restricting inbreeding rate
 - Or minimise inbreeding rate
- Inbreeding monitor
 - Inbreeding and structure of existing populations
- Genetic Management Simulator
 - Simulation of inbreeding and genetic diversity
 - Different population structure
 - Different genetic management

Dissemination - Books



The MRY breed

Maas-Rijn-IJssel (MRY) cattle



Maas-Rijn-IJssel (MRY) cattle

Main characteristics:

- Red-and-white
- Dual purpose (milk & meat)
- High milk protein percentage
- Robust, strong & self-reliant
 - Good fertility & longevity

Some numbers (2016)

	MRY	HF (B&W)
No. of registered purebred animals	7527	637,033
No. of registered >50% animals	24,860	
No. of inseminations with MRV	41,502	
Average milk production (305 days)	6560 kg	8939 kg
Average fat content (305 days)	4.45%	4.25%
Average protein content (305 days)	3.69%	3.48%
Non-return 56 days	68%	
Calving interval	392 days	

Current management MRY population

- CRV breeding program; implementing genomic selection
- Active role 2 Breed Associations (MRIJ Zuid & MRIJ Oost)
- Centre for Genetic Resources NL
 - >300 bulls stored in gene bank

=> Is there any added benefit of considering MRY bulls from the gene bank in the current (breeding) population?

Data used to answer this question

Population:

- **Conserved:** 294 bulls born before 2000
- **Current:** 119 bulls born in or after 2000
- Both pedigree & (50k) genotypes on all bulls

Different considered scenarios

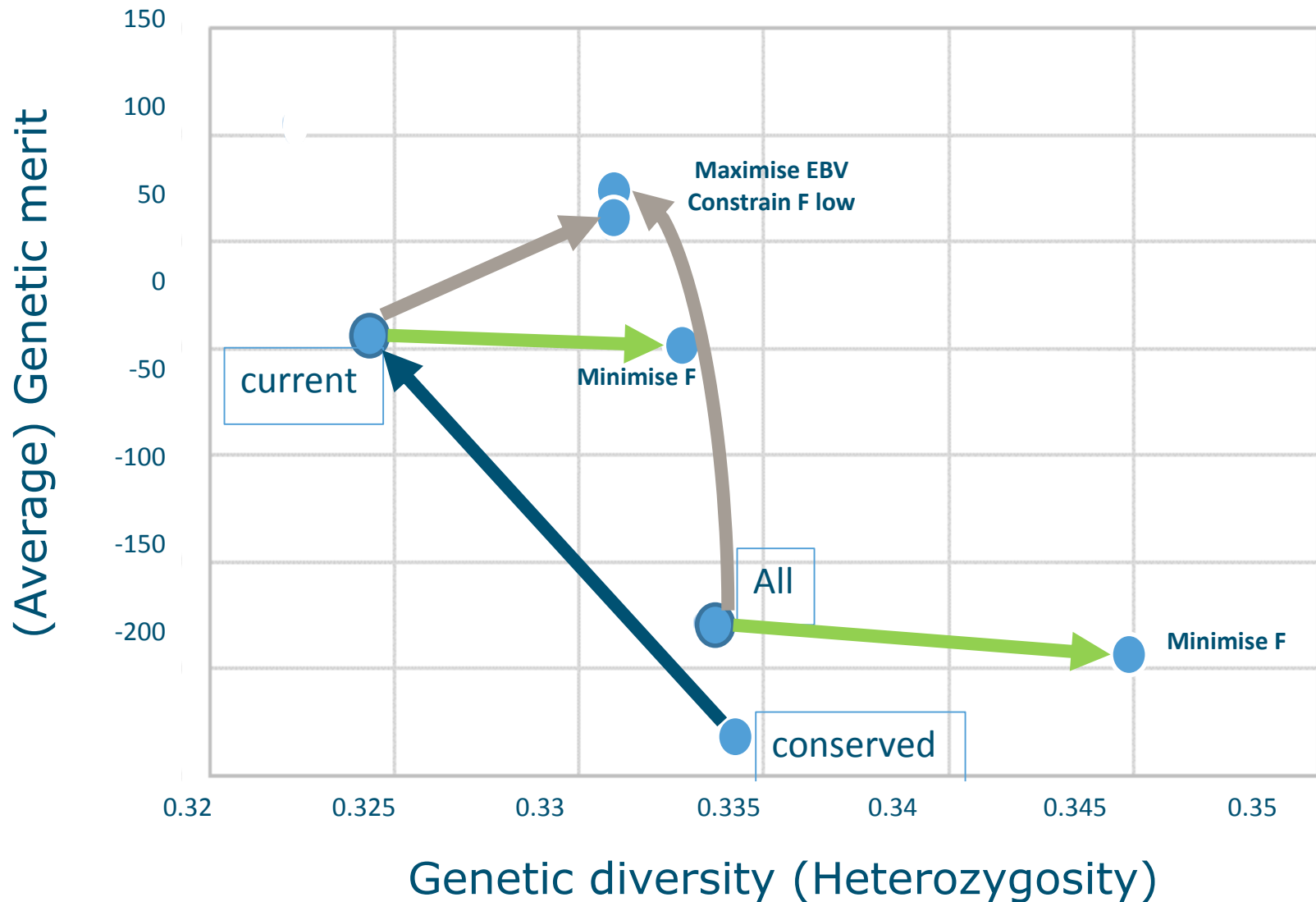
Compute optimal contributions from perspective of:

- Breeding program
 - Maximize genetic gain while restricting inbreeding
- Gene bank
 - Minimize inbreeding rate

Using:

- Current bulls
- Current + conserved bulls

Impact on Genetic Diversity versus Merit



Results summarized

Using conserved in addition to current bulls:

Breeding program perspective:

- Slightly increased realized genetic merit
- Yielded similar genetic diversity

Gene bank perspective:

- Yielded considerably higher genetic diversity

MRY – in summary

- Dual purpose breed, with high protein% & good fertility
- A relatively small but viable breed
- Implementation of genomic selection underway
- Using gene bank material in MRY breed is beneficial

Acknowledgements

