

Dutch gene bank for farm animals: beyond conserving genetic material

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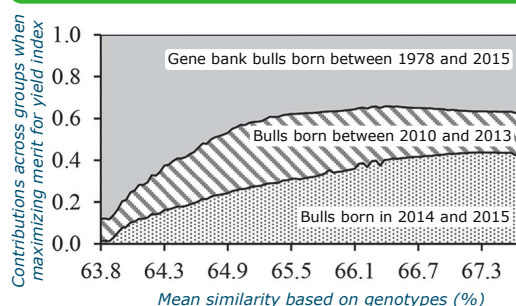


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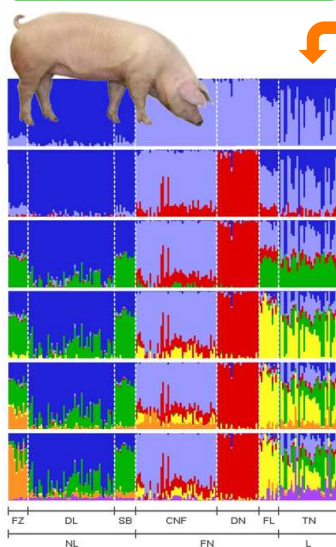
Dutch gene bank objectives

- Cryopreservation of farm animal genetic diversity for long term conservation, an insurance for future catastrophes
- Support breeding programmes of endangered breeds through providing genetic material, prevent (near) extinction of breeds
- Focus on native breeds of economically most important farm animal species in the Netherlands
- Resource for genomic research and monitoring of genetic diversity

Genetic value of Holstein Friesian gene bank bulls for commercial breeding populations



Measuring loss of genetic diversity in pigs over time



Genetic diversity after consolidation of Landrace pig lines in the Netherlands
TN = current Dutch Landrace line; others are purebred lines that no longer exist

- Genomic characterization of gene bank collection showed the need to cryopreserve purebred breeding lines before consolidation, as genetic diversity got lost²
- Gene bank material from old breeding lines is now used to support Dutch Landrace pig breeding

Current Dutch gene bank collections

Species	Breeds	Donors	Doses	Years of sampling
	22	6,378	253,629	←→
	11	336	31,567	←→
	33	767	21,946	←→
	31	270	18,662	←→
	6	82	6,476	←→
	13	253	4,538	←→
	8	62	1,957	↔
	3	67	1,591	↔
	7	19	612	←→
	1	11	102	↔
	135	8,245	341,080	1966 → 2018

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- Holstein Friesian gene bank bulls can increase genetic variability and improve genetic merit in the current population¹
- In case of major breeding goal changes, the gene bank is a valuable resource for commercial breeding populations

An important resource for future horse breeding



Dutch draft horses showing their original usage

- Alarming inbreeding rates in the Dutch draft horse population ($\Delta F = 1.3\%$ per generation)³
- Advice provided to studbook: without measures extinction plausible
- Semen from important stallions stored in gene bank, creating a unique reservoir for future breeding and research

High scrapie-resistance in conserved goat breed

- Frequency of scrapie-resistant haplotype (29%) in the Dutch Toggenburger goat exceeds frequency in any other breed worldwide⁴
- Gene bank collections are a valuable source of farm animal genetic diversity



Dutch Toggenburger goats possess valuable genetic diversity

¹ Doekes HP, Veerkamp RF, Bijma P, Hiemstra SJ, Windig JJ 2018. *J. Dairy Sci.*, 101(11):100222-100333, <https://doi.org/10.3168/jds.2018-15217>

² Submitted: Hulsegge B, Calus MPL, Hoving AH, Lopes MS, Megens HJWC, Oldenbroek JK Impact of merging commercial breeding lines on the genetic diversity of Landrace pigs

³ Schurink A, Hiemstra SJ, Oldenbroek JK, de Wit AAC, Ducro BJ, Windig JJ 2018. *CGN report 41*, Wageningen University & Research, <https://edepot.wur.nl/465037>

⁴ Windig JJ, Hoving AH, Priem J, Bossers A, van Keulen LJM, Langeveld JPM 2016. *J. Anim. Breed. Genet.*, 133(5):366-374, <https://doi.org/10.1111/jbg.12211>