Fokken van gezonde rashonden

https://www.wur.nl/nl/project/fokken-van-gezonde-rashonden.htm

Wetenschapswinkelproject, Tweede bijeenkomst begeleidingscommissie

12/10/2023 Jack Windig, Talita Kuijpers, Rita Hoving

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Agenda tweede bijeenkomst begeleidingscie “Fokken van gezonde rashonden”

- Welkom - Lèneke Pfeiffer, Wetenschapswinkel
- N.a.v. verslag 12/4
- Resultaten tot nu toe – Jack Windig, Talita Kuipers
    - ACT groep
    - Wetterhoun
    - Bouvier
    - Verdere plannen
- Reacties
- Afronding project: hoe opgedane kennis breder delen?

Onderzoeksvragen

- Hoe kan fokkerij voor gezonde honden het beste vorm worden gegeven?

- Specifiek per ras
  - Welke gezondheidsproblemen met welke frequentie?
  - Huidige populatiegrootte / structuur en inteelt(toename)?
  - Inteelttoename in toekomst bij verschillend beleid

Onderzoeksvragen

- Hoe kan fokkerij voor gezonde honden het beste vorm worden gegeven?
- Algemeen rashondfokkerij
    - Welke rol kunnen DNA typeringen spelen?
    - Wanneer en hoe kan fokwaardeschatting worden opgezet, en hoeveel zal dit bijdragen tot een betere gezondheid?
    - Wanneer en hoe kan outcross worden opgezet, en hoeveel zal dit bijdragen tot een betere gezondheid?

ACT Group

- 7 Students 8 weeks
  - Literature review
  - Interviews
- Report
  - Genetics
  - Perspective owners and breeders
  - Ethics
  - Recommendations

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Genetics

DNA USAGE

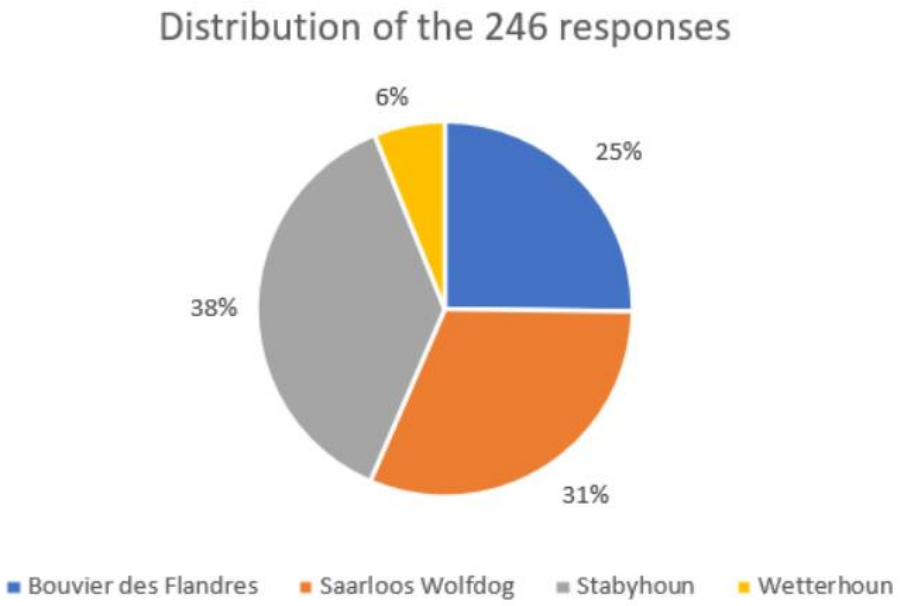
- Use of DNA / SNP chips
  - DNA tests for diseases
    - How breed specific?
    - What to do with carriers?
  - Determine inbreeding and relatedness
    - Gain relative to pedigree?
  - High cost
  - Ownership data?

Genetics

- Outcross
  - Trade off – genetic diversity / breed purity
- Use look a likes
  - SNP chip to identify breed purity and relatedness
- Estimate breeding values
  - Polygenic traits and multiple traits
- Genetic management
  - Mean kinships and Optimal contributions

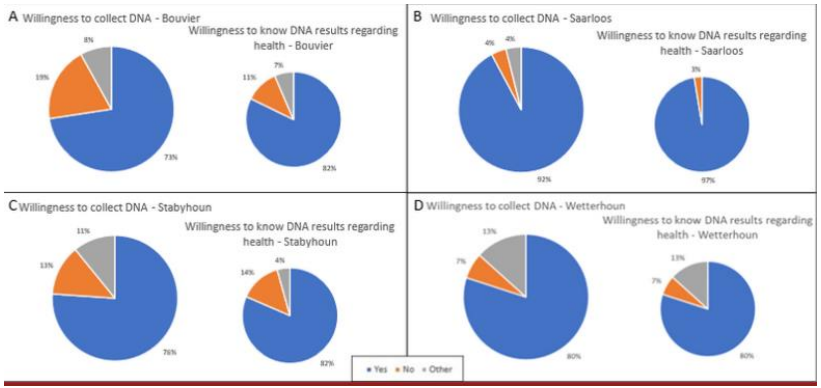
Perspective of owners and breeders

- Interviews via facebook
- Massive respons
  - Bouvier 62
  - Saarloos 77
  - Staby 92
  - Wetterhoun 15



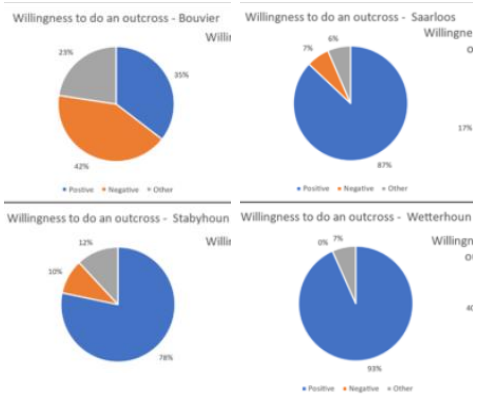
Main findings 1

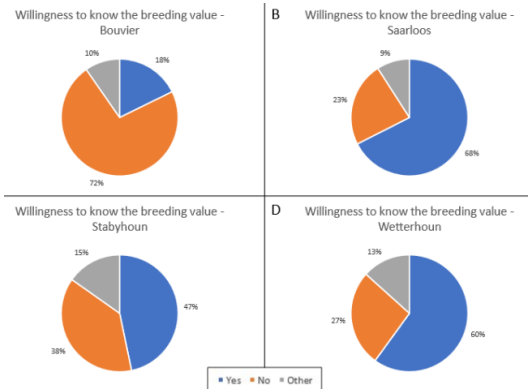
- Few pups used for further breeding
    - Selection on appearance
    - Difficulty finding breeders
    - >90% of pups get a pedigree
- Willingness to collect DNA
    - 73 – 92% positive
    - 80% - 97% Want to know results of health tests



Main findings 2

- Outcross
  - Divided opinions
  - Bouvier more negative
  - Saarloos and Wetterhoun most positive
- Breeding values often mistrusted
  - “Too materialistic, capitalistic, scientific”
  - “Should accept dogs as they are”
  - Confused with economic value

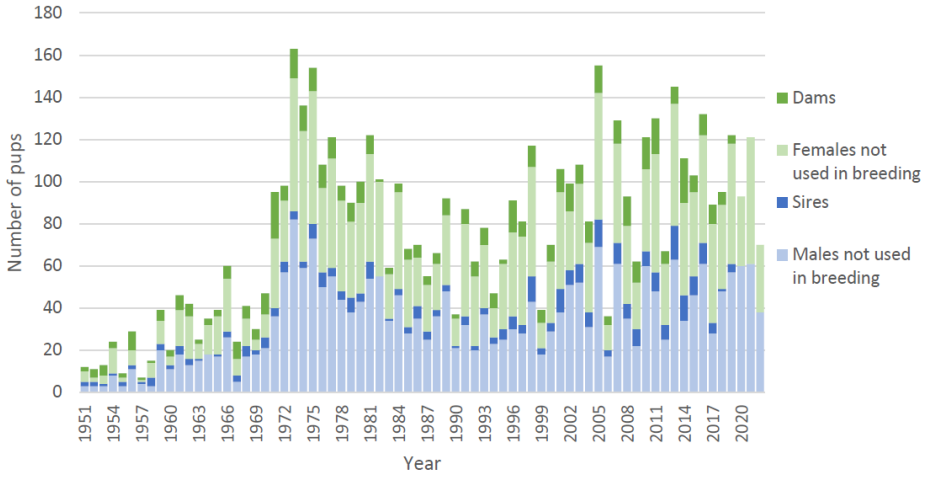


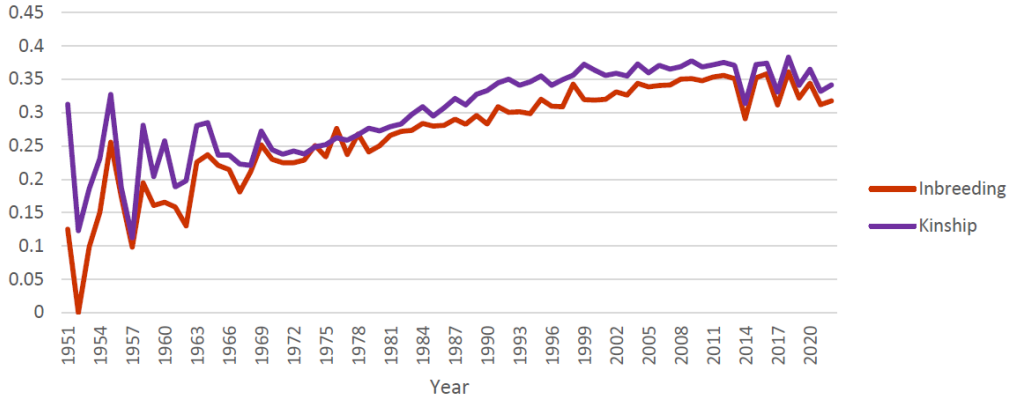


Recommendations

- Keep updating the databases regularly
  - Look into the gEBV
  - Use Sweden & UK for reference
- Consider look-alike population as a reserve
- Promote communication between breeders
- Organise breeders' info markets
- Weighted disease index

Wetterhoun: Population structure and inbreeding



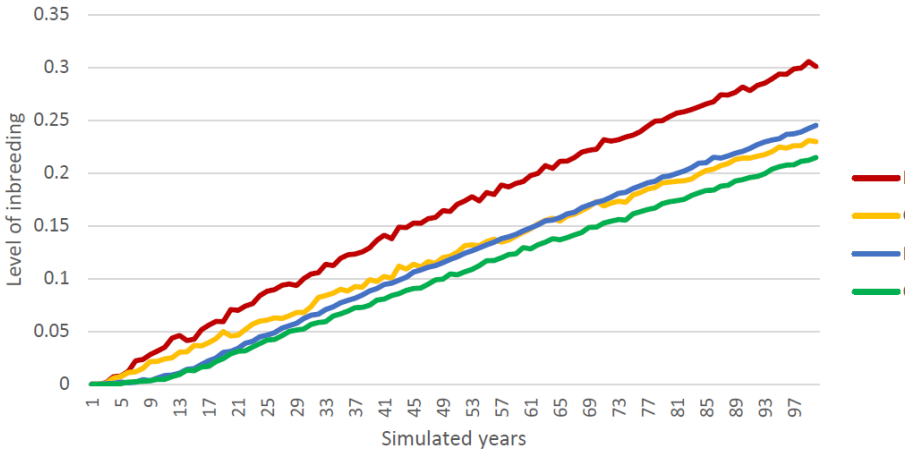


BSc thesis
Aisha Boering

- Population structure
  - Rather small breed
  - Currently more males used for breeding
- Inbreeding
  - Has been way too high
  - Decreased in final decade

Period	Inbreeding rate	Kinship rate
1951-1970	3.66	0.12
1970-1985	2.12	2.62
1985-1995	2.00	3.68
1995-2004	1.48	1.16
2004-2012	1.32	0.57
2012-2022	-1.51	-1.41

Wetterhoun: Genetic management



Method	Inbreeding rate
None	2.34
NVSW regulations	1.32
Minimise kinship parents	1.17
Use Mean Kinships	1.01
Kinship parents + MK breed	0.99

- Current policy reduces rate considerably
  - But not below 1%
- Mean kinship most effective
  - At 1%

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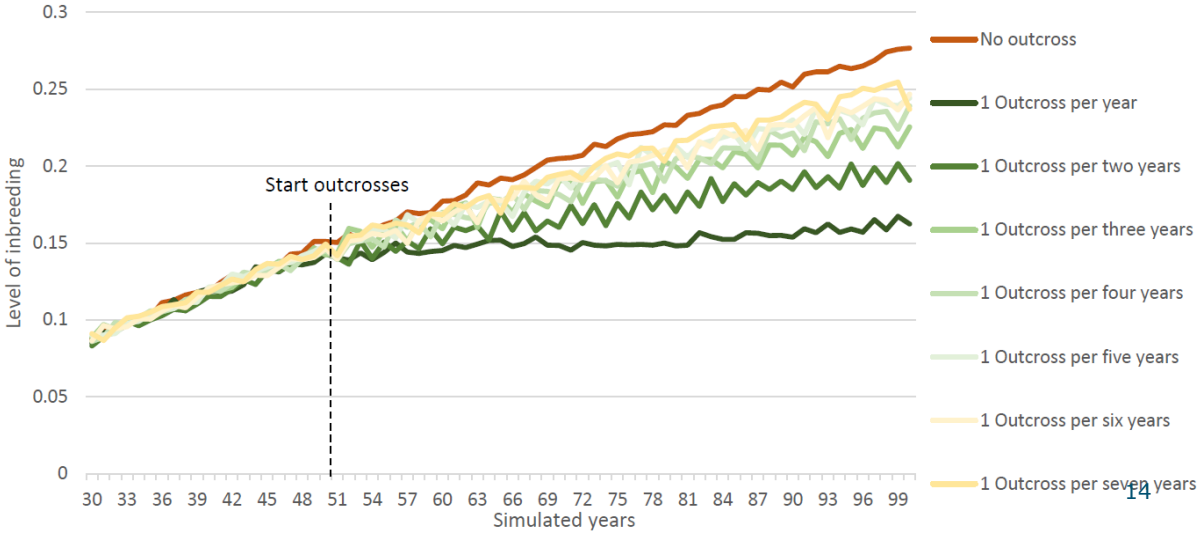
Wetterhoun: Outcross

- Increased litter size
  - WH x WH: 5.9 pups
  - WH x other: 7.8 pups
  - WH x look alike: 4.0 pups

- Outcrosses
- Should be repeated for a lasting effect on inbreeding
- Useful for a reset



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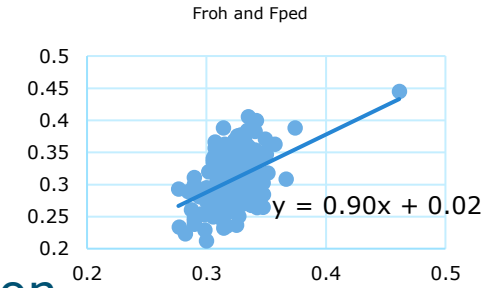
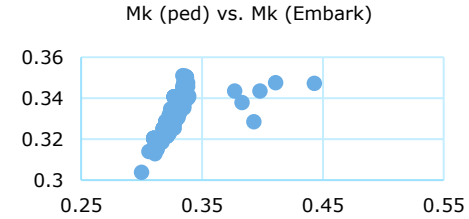
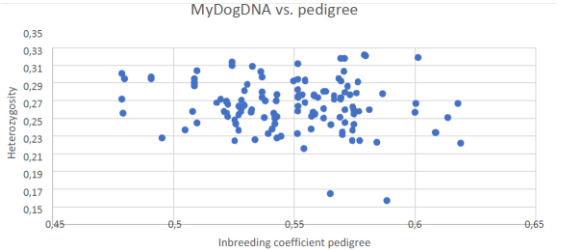
Stabij + Saarloos (2019)

- Both: MK best method
- Stabij
  - DNA (Embark) vs. pedigree: high correlation
  - Depends on method
- Saarloos
  - DNA (My Dog) vs. pedigree: no match
  - Outcross
    - Backcrosses reduce effect
    - Repeats needed







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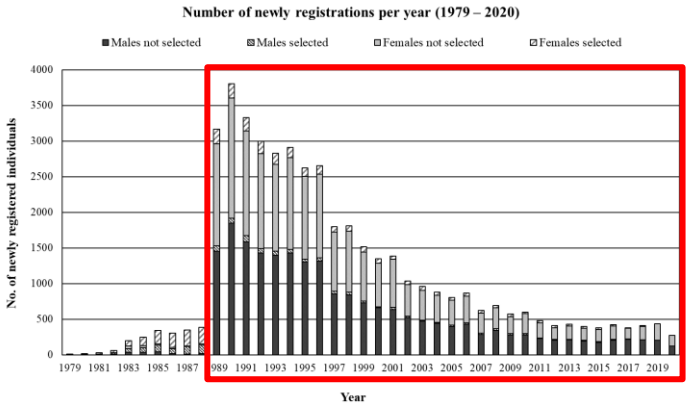
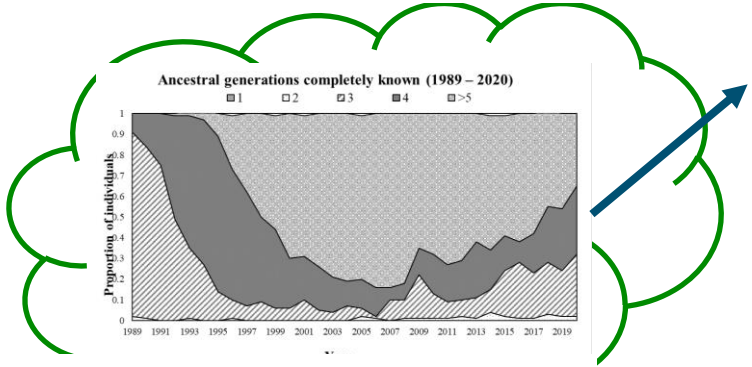
Summary Bouvier Pedigree analysis

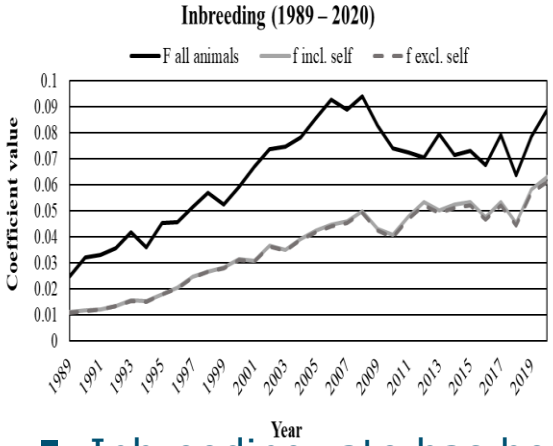
Research practice
Talita Kuipers



- Pups born per year decreased
  - >3000 before 1993
  - Around 400 since 2011



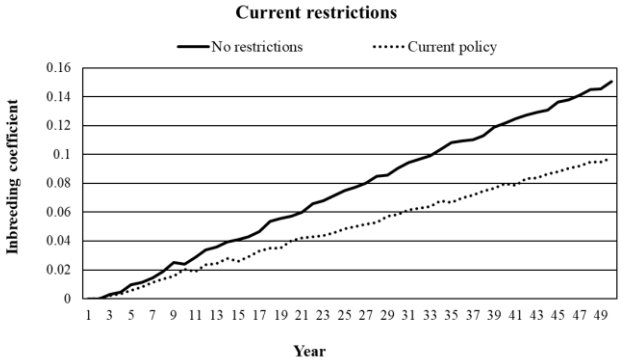
Pedigree not complete after 2001!

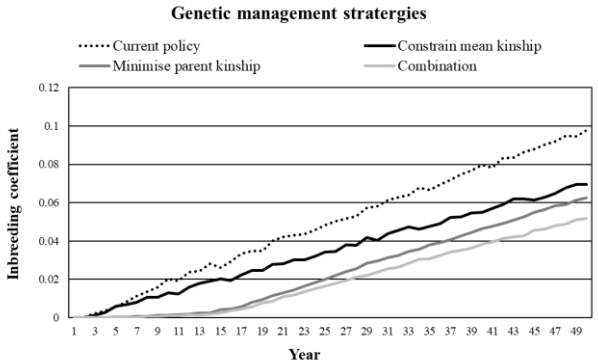


Period	deltaF	deltaf
1981-1990	0.93%	0.30%
1991-2000	1.29%	0.95%
2001-2010	0.77%	0.63%
2011-2020	0.45%	0.42%

- Inbreeding rate has been too high
- And possibly still is on the high side

Summary Bouvier simulations





Inbreeding rate:

1.34% No restrictions
0.83% Current restrictions

- Current restrictions are important
- Further reduction possible
  - Recommend a combination of Mean kinship and minimising parent kinship

0.83% Current restrictions
0.56% Use Mean Kinship
0.58% Minimise Kinship parents
0.43% MK + Kinship parents

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Genetic (?) problems in the Bouvier

Disease	Age of onset	Prevalence	Possible mode of Inheritance
HD	Varying	now low	Polygenic
ED	Varying	now low	Polygenic
PPM	>6 weeks	17.1 %	Recessive, dominant or polygenic?
PHTVL/ PHPV	Undetermined	10.6 %	Autosomal incomplete dominant
Hereditary cataracts	Few weeks to months	Congenital: 9.5 % Non-congenital: 27.6 %	Autosomal recessive/dominant ?
RD	2 – 3 months	8.2 %	Autosomal recessive (X-linked?)
Distichiasis	0.3 – 8.9 years	11.6 %	Autosomal dominant ?
Corneal dystrophy	Varying	9.5 %	Sex linked recessive?
PRA	Early: 2 – 6 weeks Late: 2 – 5 years	0 %	Autosomal recessive
Entropion	4 – 7 months	4.8 %	Polygenic?
Microphthalmia	Undetermined	-	Autosomal recessive
Primary Glaucoma	± 7 years	“not free of ICAA”: 78.4%	Polygenic (?)

- More than 80% of the dogs have some sort of genetic disease
- Genetic background often unclear

Priority for reducing Genetic problems

Disease	Age of onset	Prevalence	Severity
Primary Glaucoma	± 7 years	“not free of ICAA”: 78.4%	Severe, but late
Hereditary cataracts	Few weeks to months	Congenital: 9.5 % Non-congenital: 27.6 %	Severe
PPM	>6 weeks	17.1 %	Potentially severe
Distichiasis	0.3 – 8.9 years	11.6 %	Moderately severe
PHTVL/ PHPV	Undetermined	10.6 %	Moderate?
Corneal dystrophy	Varying	9.5 %	Less severe
RD	2 – 3 months	8.2 %	Less severe
Entropion	4 – 7 months	4.8 %	Not severe
PRA	Early: 2 – 6 weeks Late: 2 – 5 years	0 %	Severe
Microphthalmia	Undetermined	-	-
ED	Varying	now low	Moderately severe
HD	Varying	now low	Moderately severe

- Table based on prevalence
- Severity gives similar priority
- Onset changes priority
- Discussion over first two

- Theoretical formula: Priority = severity * healthy days lost
- Hard to determine severity

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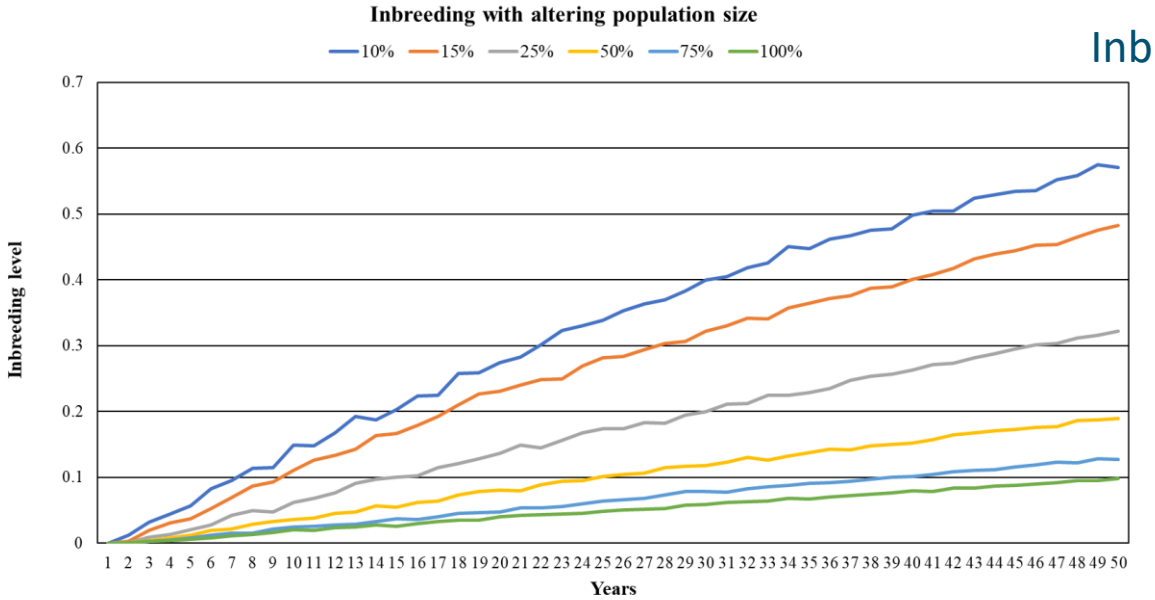
Reduce breeding population?



Inbreeding rate:

5.45%

4.54%

2.99%

1.67%

1.11%

0.83%

There is **no scope** to reduce # of individuals in the breeding population!

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Recommended steps

Short term

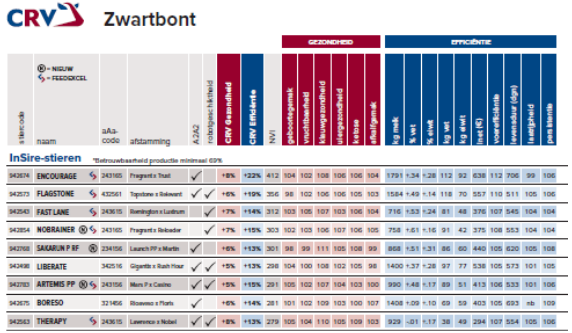
- Include Mean Kinship and Minimise parental kinship
- Prioritise diseases

Long term

- Create disease inventory
- Unravel genetic background
- Reassess priority list
- Calculate EBVs
- Create health index
- Select (and Mate) based on EBVs, Inbreeding coefficients, and Health index

How to select against multiple genetic diseases

- Animal breeders' approach: construct an (economic) index
  - Define breeding goal (H)
  - Determine economic weight of traits
    - $H = a_1X + a_2Y + a_3Z + \ldots$
  - Measure traits influencing performance
  - Determine heritabilities and genetic correlations
  - Estimate breeding value of individuals
    - Weighing information of relatives, predictor traits etc.



- Example: cattle breeding – Total merit index, production index, udder health index, fertility index, etc.

Work needed for a health index

- Better knowledge of genetics needed
  - Mode of inheritence for monogenic traits
  - Heritabilities and genetic correlations for polygenic traits needed
- Create index
  - How to weigh Severity?
- Set op estimation of breeding values
  - Overcome mistrust -> communication needed
  - Look at GB and Sweden
- Advice breeders
  - Include MK in advice

What is next

- 2 BSc projects ongoing (Schapendoes + Saarloos?)
    - Outcross
    - DNA vs. pedigree
- Final Report
    - Overview results ACT group and theses
    - General advice for breed societies
        - When and how to use DNA typing?
        - When and how to do an outcross?
        - How to deal with multiple genetic diseases
    - Breeding value estimation

Tijd voor discussie

Priority with mutiple diseases

Outcross

Use of DNA

Breeding values

And more...

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