Use of genomic tests and sexed semen increase genetic level within herd

Line Hjortø[1], Jehan Ettema[2], Morten Kargo[1,3] and Anders Christian Sørensen[3]

[1] Knowledge Centre For Agriculture P/S
[2] Simherd A/S
[3] Aarhus University

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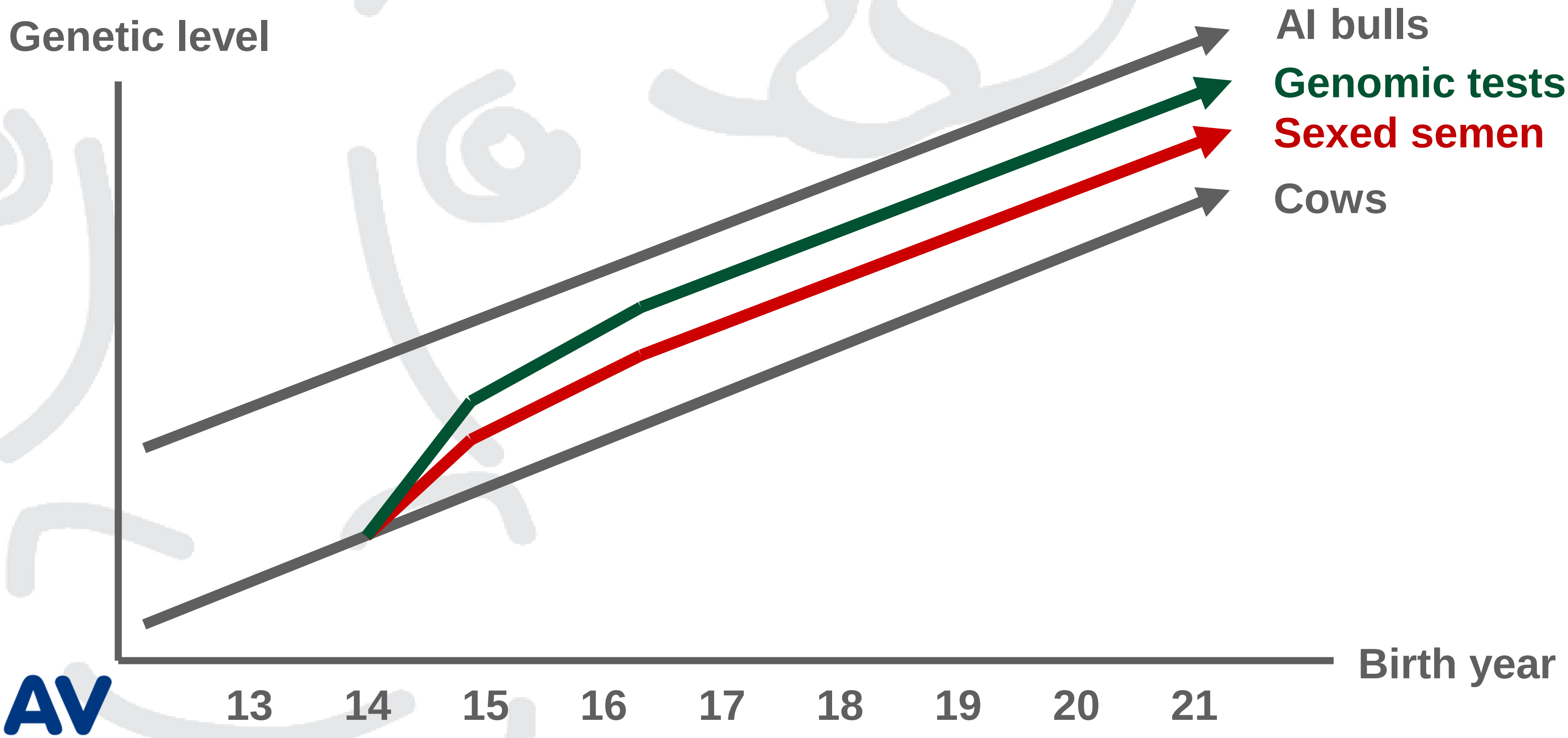
Sexed semen and genomic tests reduce genetic lag



Aim and method

- How many NTM units will the genetic level increase if sexed semen and genomic tests are used?

- Simulation study
  - SimHerd
  - ADAM

Percentage of females inseminated with sexed semen

	Sexed semen scenarios				
Heifers, %	0	60	80	60	60
Cows, %	0	0	0	20	40

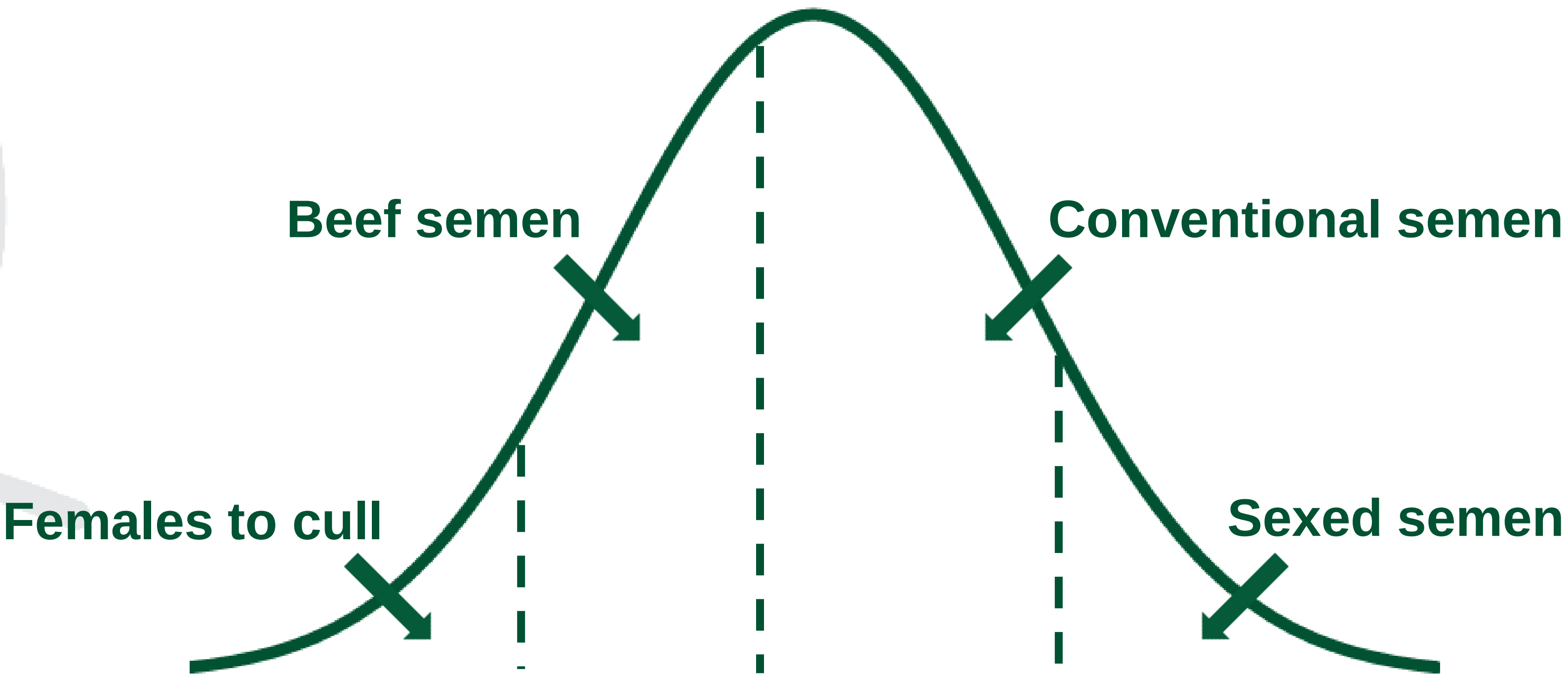
Percentage of heifers with genomic tests (GT)

		Sexed semen scenarios				
	Heifers, %	0	60	80	60	60
	Cows, %	0	0	0	20	40
Scenarios with GT	**None**					
	50 % best					
	All					

General assumptions

- No surplus of heifers
  - Crossbred calves to beef production
- Holstein situation:
  - Reliability DGV(NTM): 50 %
- Herd size: 210 cows
- Danish average management level
- Investigated at equilibrium – no discounting

Genetic response from selection among females



Beef semen

Conventional semen

Females to cull

Sexed semen

Price assumptions, €

- Purebred bull calf: 81
- Crossbred bull calf: 178
- Crossbred heifer calf: 87
- Springing heifer: 1,340
- Genomic test: 50
- Conventional semen, including service: 24
- Sexed semen, including service: 40
- Beef semen, including service: 25

Percentage of cows inseminated with beef semen

	Sexed semen scenarios				
Heifers, %	0	60	80	60	60
Cows, %	0	0	0	20	40
	0	25	32	29	32

- Replacement rate: 41 %

Reduced genetic lag in NTM units

		Sexed semen scenarios				
	Heifers, %	0	60	80	60	60
	Cows, %	0	0	0	20	40
Scenarios with GT	**None**	0	1.2	1.2	1.3	1.5
	50 % best					
	All					

Reduced genetic lag in NTM units

		Sexed semen scenarios				
	Heifers, %	0	60	80	60	60
	Cows, %	0	0	0	20	40
Scenarios with GT	None	0	1.2	1.2	1.3	1.5
	50 % best	0.5				
	All	0.9				

Reduced genetic lag in NTM units

		Sexed semen scenarios				
	Heifers, %	0	60	80	60	60
	Cows, %	0	0	0	20	40
Scenarios with GT	None	0	1.2	1.2	1.3	1.5
	50 % best	0.5	1.9	1.9	2.0	2.3
	All	0.9	2.3	2.3	2.6	2.8

Interactions between use of sexed semen and GT in NTM units

		Sexed semen scenarios				
	Heifers, %	0	60	80	60	60
	Cows, %	0	0	0	20	40
Scenarios with GT	None	0	0	0	0	0
	50 % best	0	0.2	0.2	0.2	0.3
	All	0	0.2	0.2	0.4	0.4

Break-even prices for a genomic test in €

		Sexed semen scenarios				
	Heifers, %	0	60	80	60	60
	Cows, %	0	0	0	20	40
Scenarios with GT	**None**	-	-	-	-	-
	50 % best	22.0	32.0	35.5	33.5	38.5
	All	21.0	27.5	28.0	32.5	32.0

Conclusion

- How many NTM units can the genetic level potentially increase
    - if sexed semen is used: 1.5
    - if genomic tests are used: 0.9
    - if both sexed semen and genomic tests are used: 2.8
- The scenario with the highest genetic level does not correspond to the scenario with the highest break-even price for a genomic test

Comparison between this study and other studies

- EAAP 2013
  - Calus et al.
  - Boichard et al.

- Both studies are based on a different set-up

Assumptions – Calus et al.

- Commercial herd
  - 100 cows
  - Number of heifers available = 15 - 40
  - Replacement rate 15 - 30%
  - Survival female calves = 80%
  - Use of conventional or sexed semen (SS)
    - SS doubles number of heifers available (30 – 80)
  - Proportion of heifers genotyped
    - All or pre-selection based on parent average (PA)

Assumptions – Calus et al.

- $R = i \times \rho \times \sigma H$
  - R = response in Euros
  - i = selection intensity
  - ρ = accuracy of selection
  - $\rho PA = 0.15$; $\rho GS = 0.7$
  - σH = SD breeding goal = 300 Euro (de Roos, 2011)
    - 100 Euro per SD per lactation x 3 lactations
- Additional response:
- $R = i \times (\rho GS - \rho PA) \times \sigma H$

Assumptions – Boichard et al.

- Assuming sexing and no female selection on pedigree
- Additional genetic gain
  - $p = 0.5 \Rightarrow i = 0.8$
  - $\rho GS^2 = 0.7 \Rightarrow \rho GS = 0.85$
  - Do not compare with pedigree index ($\rho PA = 0$)
  - $\sigma H = 100$ €

Conclusion

- Calus and Boichard assume
  - Different set-up
  - Higher selection intensity
  - Larger increase in accuracy of selection
- Higher additional response that can pay for the genomic tests =>
- Higher break-even prices