IT-Solutions for
Animal Production

# Management of genetic characteristics

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# Background

- Van Raden et al. (2011) showed that some haplotypes (HH1,HH2,HH3) may cause embryonic loss in the homozygote state
- Fritz et al. (2013), Cooper et al. (2013) & Sahana et al. (2013) identified additional haplotypes
- Other genetic characteristics are desirable (Polled, Casein), and should be expanded
- In future there will be a lot of recessive defects but also positive properties which have to be combined for publications and mating decisions
- *Aim:*
  - Index of genetic properties which summarize the genetic characteristics considering economic values

## Materials and Methods

- Birth years 2011 - 2013 were used to determine the allele frequency in the German population

- Polled:
  - Economic value: 7 €/calf (5 € salary, 2 € drugs)
  - Social policy value not considered

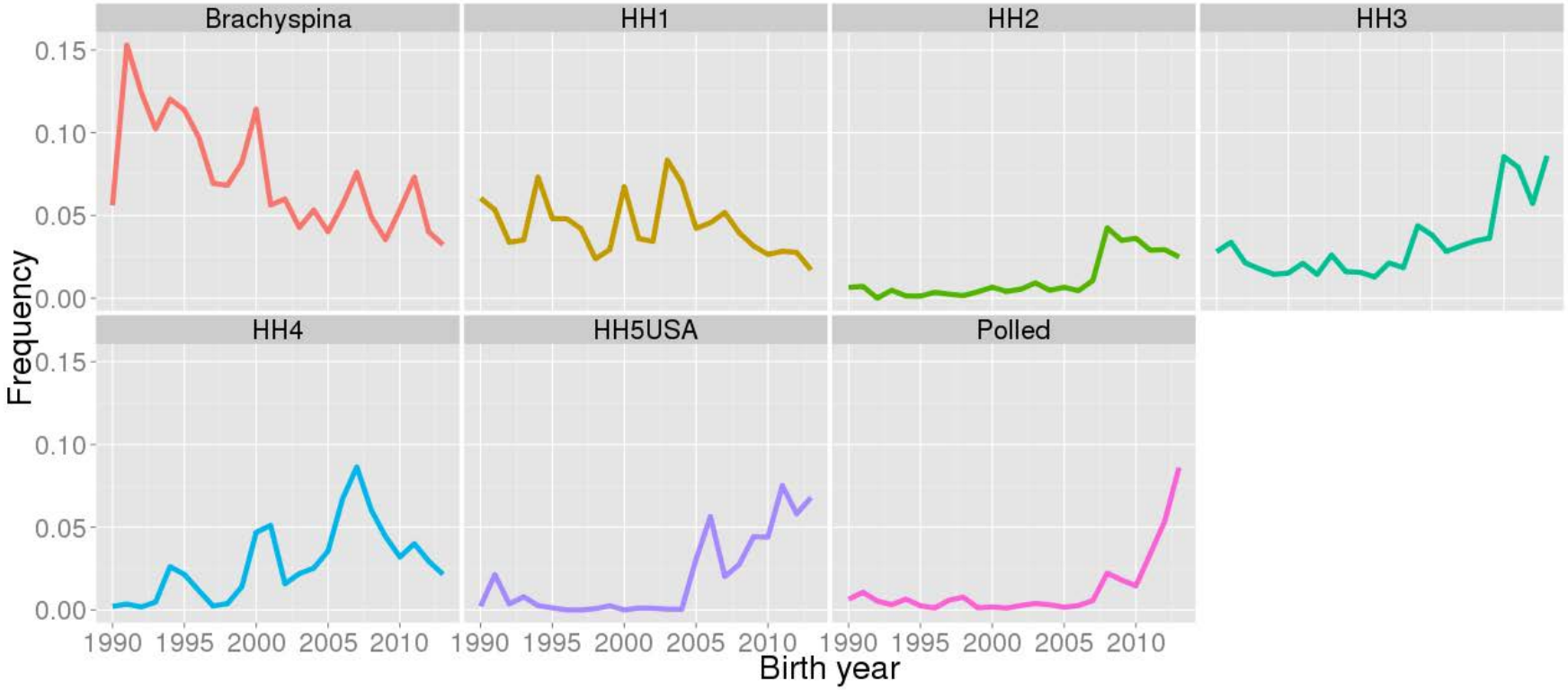
- No other positive traits, because no economic benefit for an average farmer

# Materials and Methods

| | NRR56 decrease heifer (%) | NRR90 decrease heifer (%) | NRR56 decrease cow (%) | NRR90 decrease cow (%) | Stillbirth increase (%) | Economic value per embryo (€) |
|---|---|---|---|---|---|---|
| BY | -0,2 ± 0,3 | -1,6 ± 0,3 *** | 0,5 ± 0,5 | -0,7 ± 0,6 | 1,8 ± 0,3*** | 95 |
| HH1 | -0,5 ± 0,3 | -2,1 ± 0,3 *** | 1,5 ± 0,8 | 0,8 ± 0,8 | 1,3 ± 0,2*** | 95 |
| HH2 | -0,6 ± 0,1 | -2,8 ± 0,1 | -0,3 ± 0,3 | -0,2 ± 2,8 | 2,7 ± 0,9 ** | 95 |
| HH3 | -3,5 ± 0,7*** | -4,4 ± 0,7 *** | -2,8 ± 1,5 | -3,2 ±1,5 * | -0,3 ± 0,5 | 52 |
| HH4 | -4,0 ± 0,4*** | -4,2 ± 0,4 *** | -2,3 ± 0,9 * | -3,1 ± 0,9 ** | -0,7 ± 0,2** | 52 |
| HH5 | -3,0 ± 0,3 ** | -1,0 ± 1,2 | 2,3 ± 0,2 | -1,1 ± 0,3 | 2,1 ± 0,8* | 95 |

# Materials and Methods

Carrier frequency of the analyzed traits



# Materials and Methods

- Index for genetic characteristics (Falconer,1980)

| Genotyp | Average effect |
|---|---|
| AA | 2q α |
| AB | (q-p) α |
| BB | -2p α |

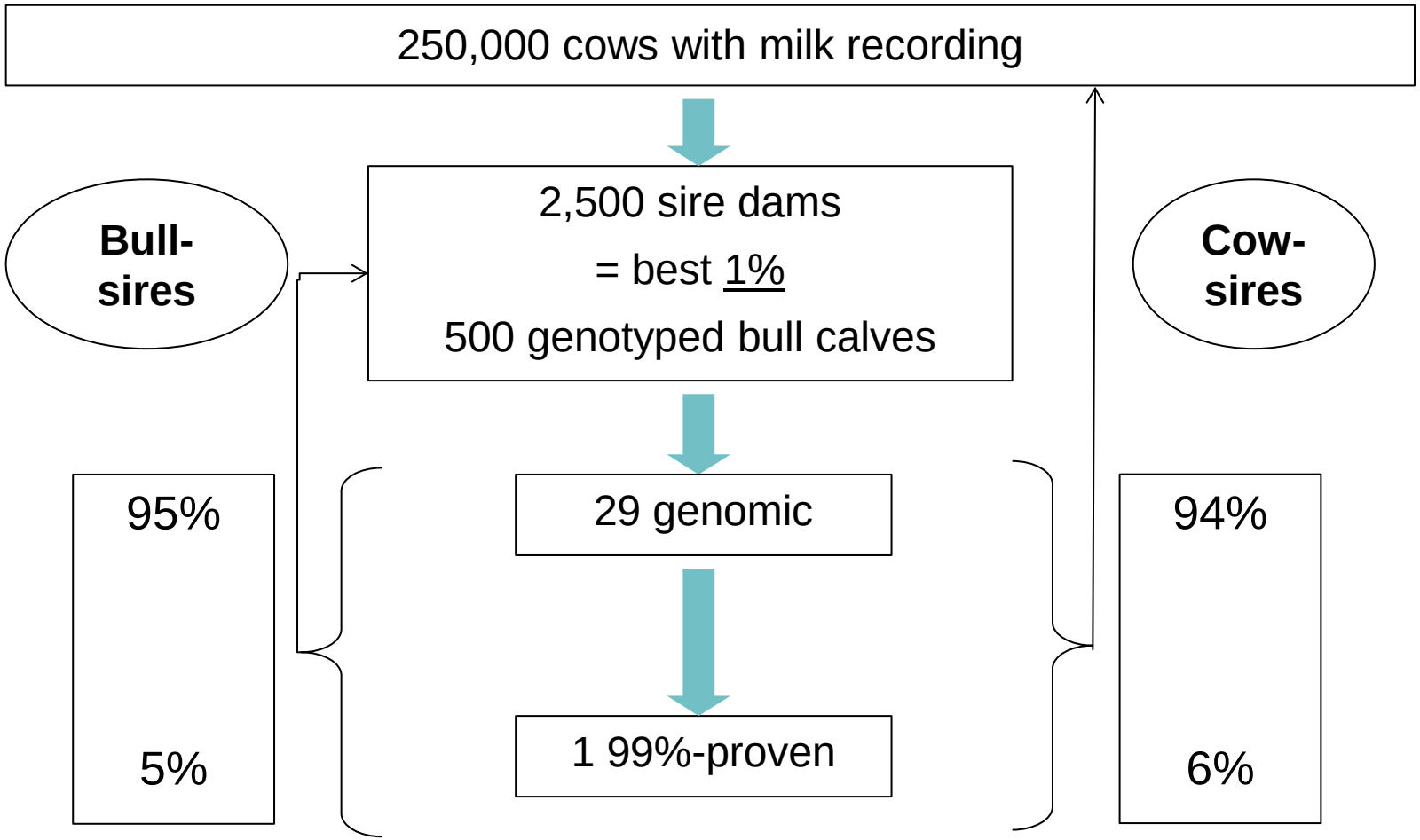
α : economic value

p & q: allele frequency of the population

- Genetic index: $GI = \sum_{k=1}^{n} ZW_k$

# Materials and Methods

## Genomic breeding program




Täubert et al., 2012

## Materials and Methods

- EBV = true breeding value + mendelian sampling + residual
- Breeding values for the base cow population:
  - Mean: 100
  - Variation: 20
  - Reliability: 50%
- Breeding values for the AI bulls:
  - 500 bulls with mean 130
  - Selection of the top 30
  - Reliability 67% genomic bulls 99 % proven bulls
- No mating of close related animals
- 100 repeats of the simulation

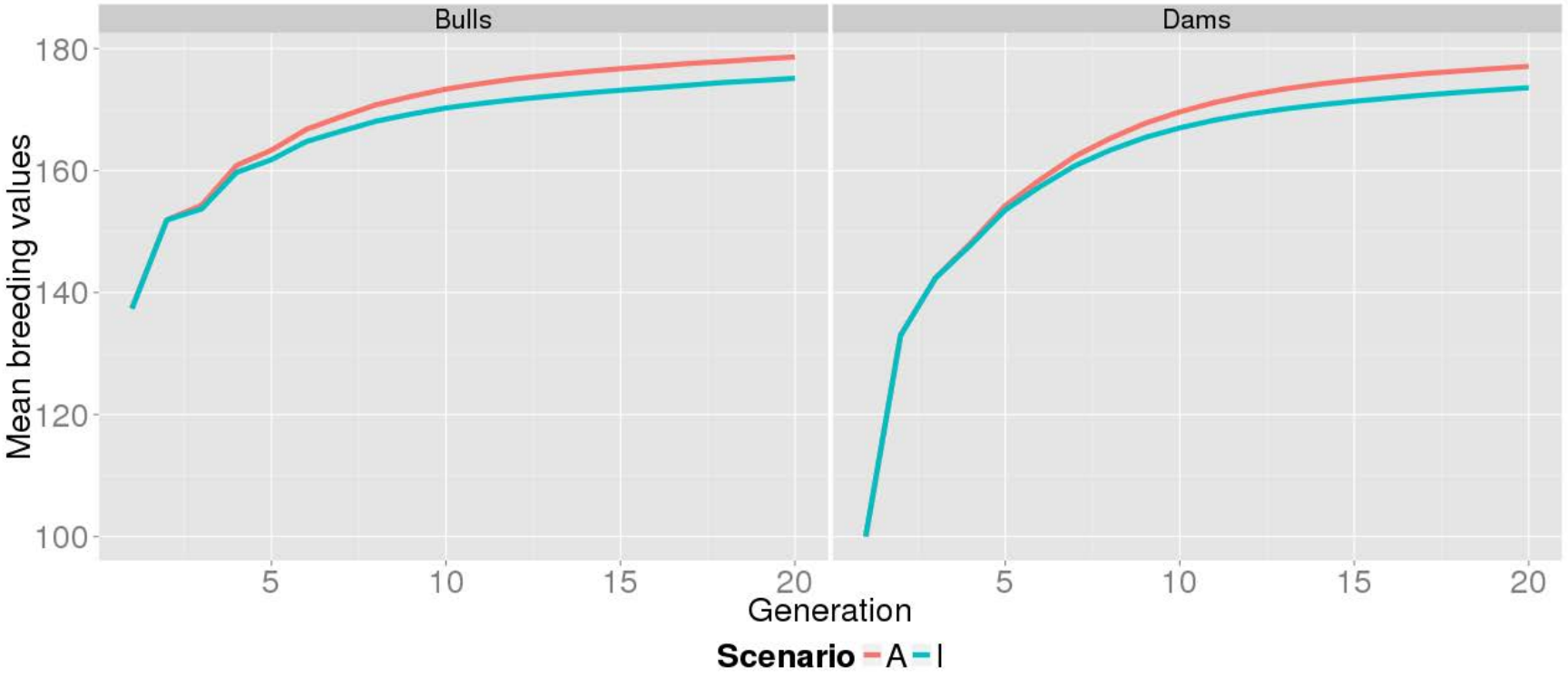
## Materials and Methods

Breeding scenarios for the females:

- **A**: Selection all animals due to breeding values – assortative mating
  - No consideration of genetic index
- **I**: Selection dam-dam due to the genetic index
- Selection of the AI bulls always due to EBVs

# Results

Development of the breeding values over 20 generations



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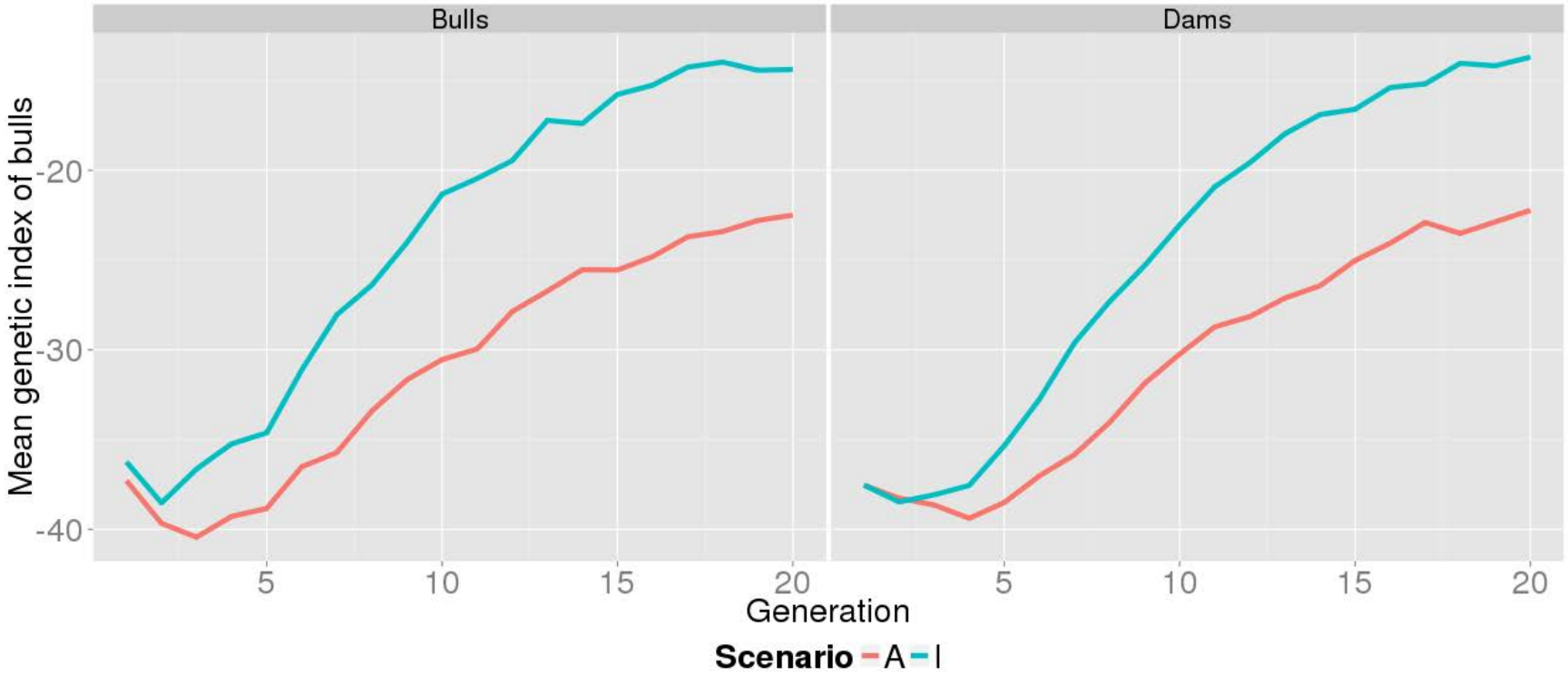

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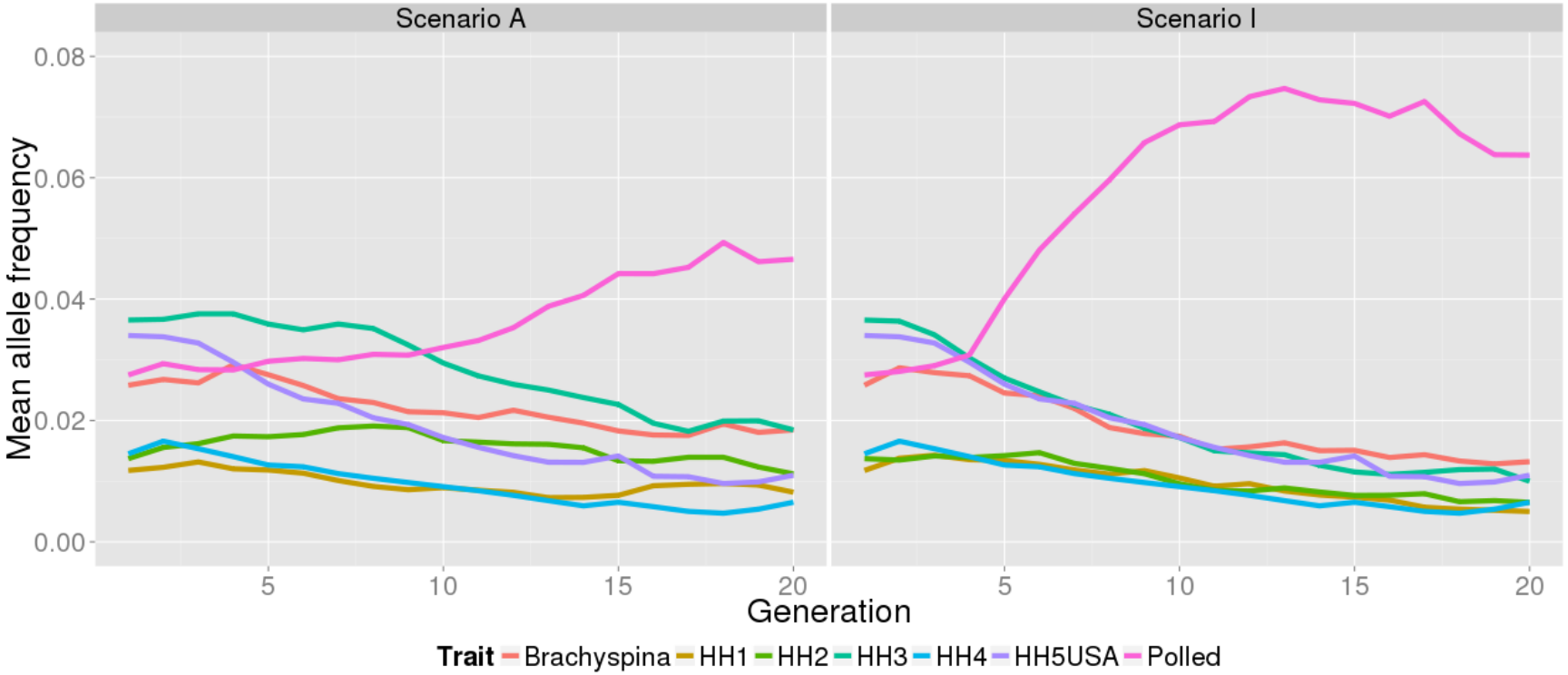

## Conclusion

- Genetic index method to combine different genetic characteristic with different economic values
- Further investigation is needed to determine the correct phenotype (time of embryo loss) and the economic value
- For breeding decisions the index should be used for the female path, bulls should be selected due to breeding values
- Mating recommendations should be calculated using mating programs taking all genetic characteristics of mating partners into account

## Acknowledgements

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# Thank you for attendance!