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Genetic Selection Against Cannibalism in Laying Hens

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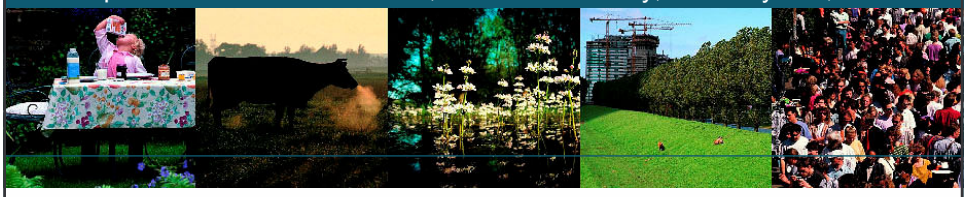

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Introduction

- Cannibalism is a world wide problem
- Selection against cannibalism is difficult
- Group selection is a solution
- Problem: selection candidates are kept individually

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Aim

To predict response against cannibalism with individually-housed selection candidates using phenotypes of group-kept relatives

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Methods

- $P_{group\ member}$ $$P_i = P_{d,i} + \sum_{j=1,n-1} P_{a,j}$$
$$= A_{d,i} + E_{d,i} + \sum_{j=1,n-1} \left(A_{a,j} + E_{a,j} \right)$$
- Breeding goal on CB $$H = A_d + (n-1)A_a$$

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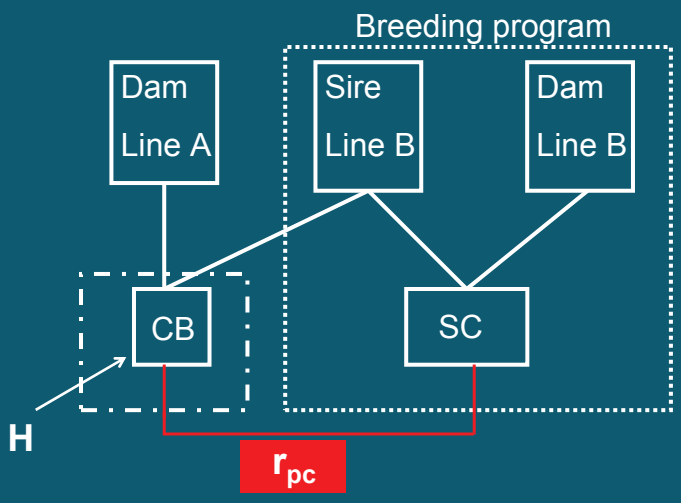
Breeding goal



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Methods

- Classical group selection

  Selection criterion : $S = \overline{P}_{group,PB}$

  Selection response: $\Delta H \propto [(n-1)r+1]r_{pc}$

- Selection based on group housed relatives

  ΔH: regression of H on $\overline{P}_{\text{relatives}} \rightarrow \Delta H = b_{H,\overline{P}rel} i \sigma_{\overline{P}_{rel}}$

  Selection response: $\Delta H \propto nr(r_{PC})$

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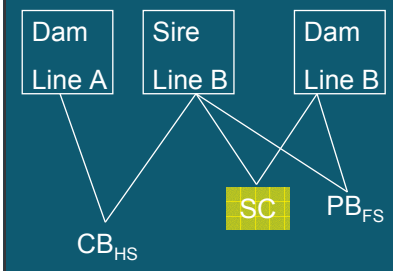
Response



Method	ΔH
Classical	$[(n-1)\frac{1}{2}+1]\ r_{PC}$
CB_{HS}	$\frac{1}{4}n$
PB_{FS}	$\frac{1}{2}nr_{PC}$
$CB_{off.}$	$\frac{1}{2}n$

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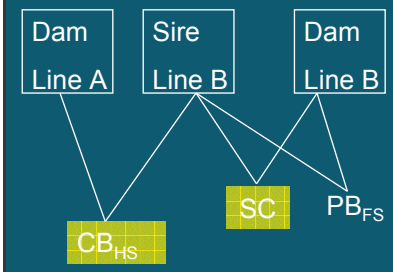
Response



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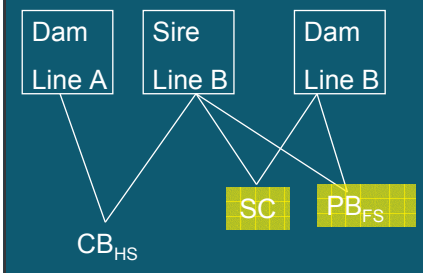

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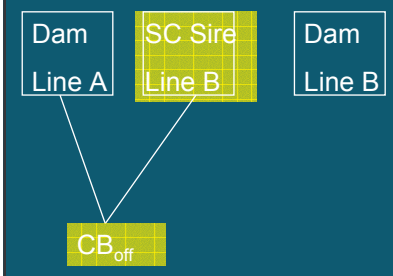

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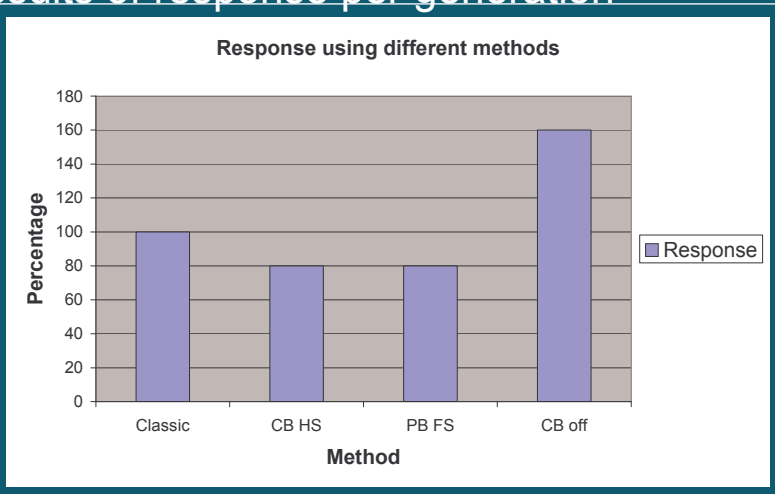
Results of response per generation



$n = 4$, $r_{pc} = 0.5$

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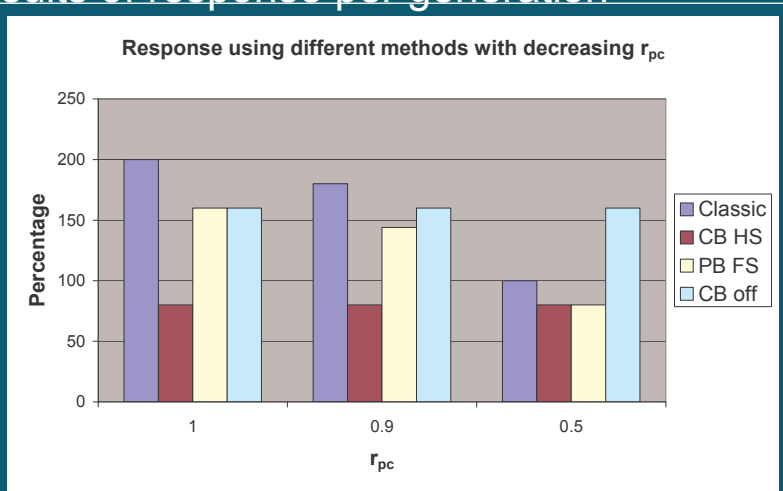
Results of response per generation



$n = 4$

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Discussion

- Classical method good response, but not possible in commercial breeding
- CB_{off} good response, but increase in generation interval
- CB_{HS} good response if r_{pc} is low
- Multiple HS and progeny groups → higher accuracy

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Conclusion

- Use of group-kept relatives of selection candidates enables efficient breeding against cannibalism.
  - Make direct use of CB info especially with low r_{pc}
- A selection experiment applying this method in chicken lines is currently executed.

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- Han Mulder

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