

Crossbred information: relevant for all species or for none?

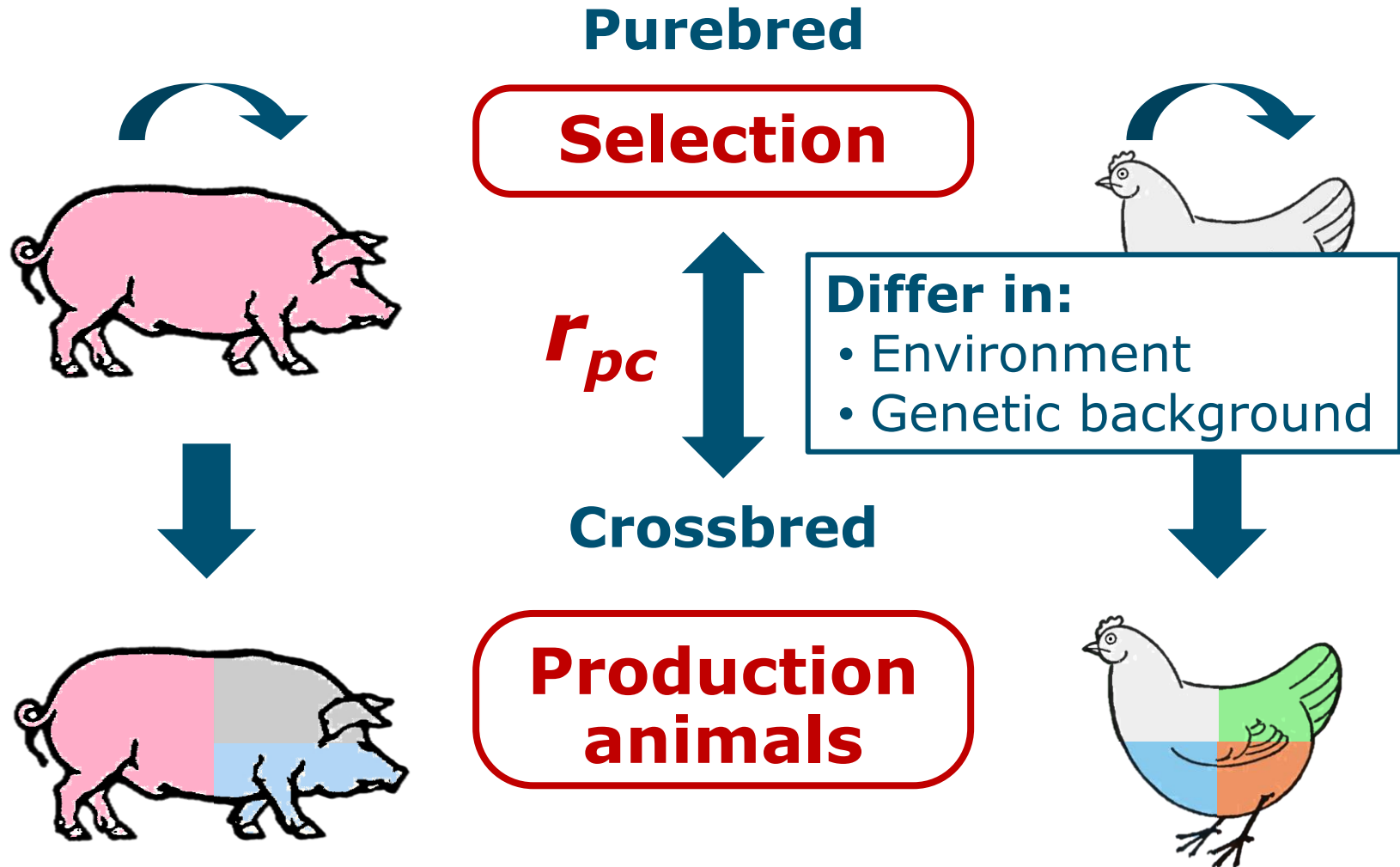
STW – Breed4Food partnership program meeting

Yvonne Wientjes

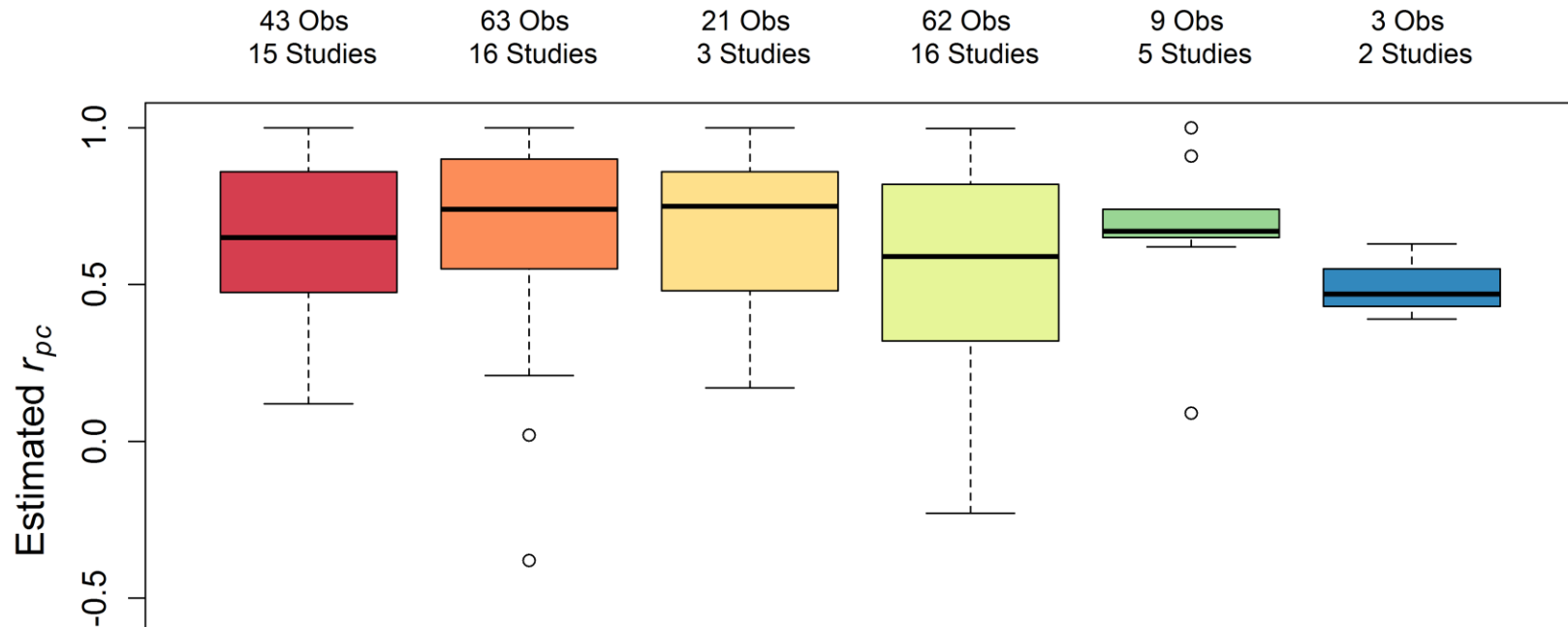
May 22, 2019



Purebreds *versus* crossbreds



r_{pc} estimates in pigs



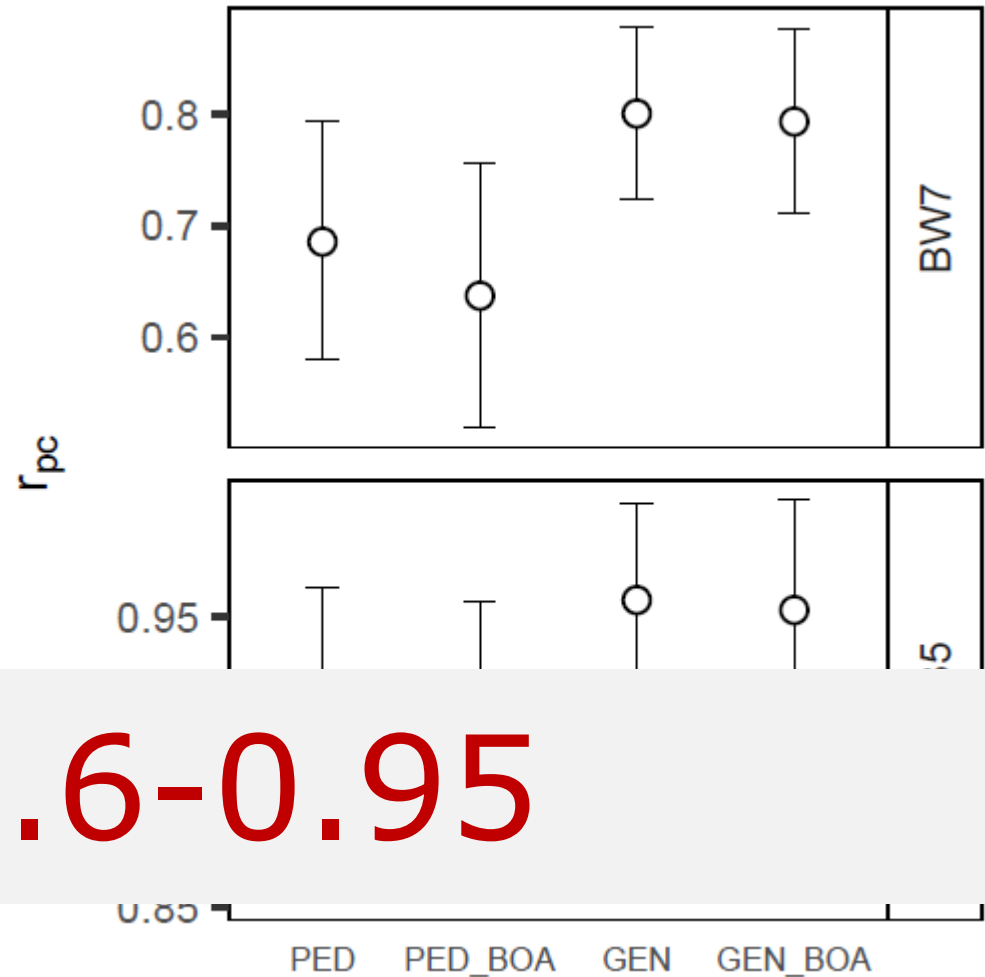
$r_{pc} : \sim 0.6$

Trait category

r_{pc} estimates in chicken

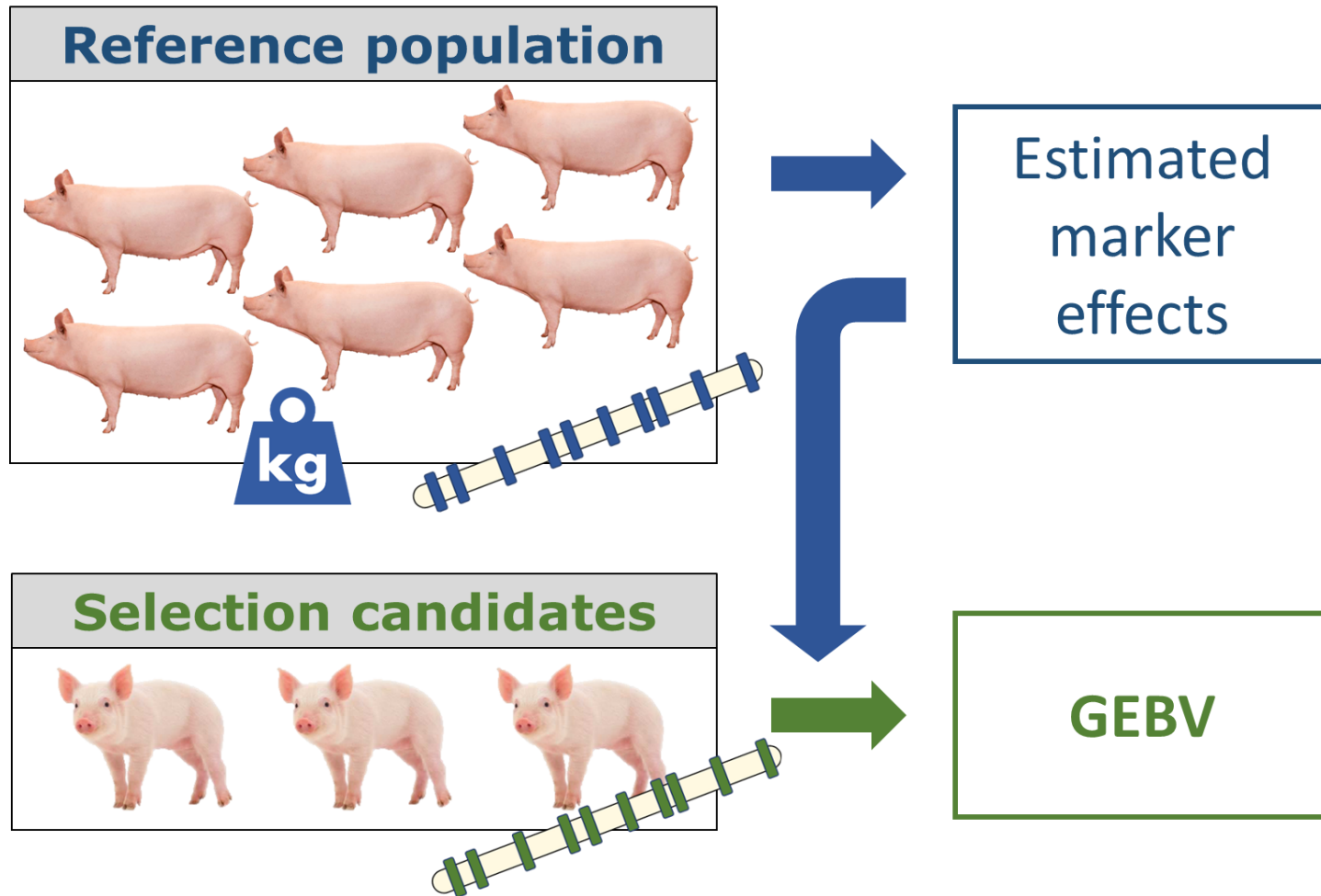
Broilers

Different methods to estimate r_{pc}

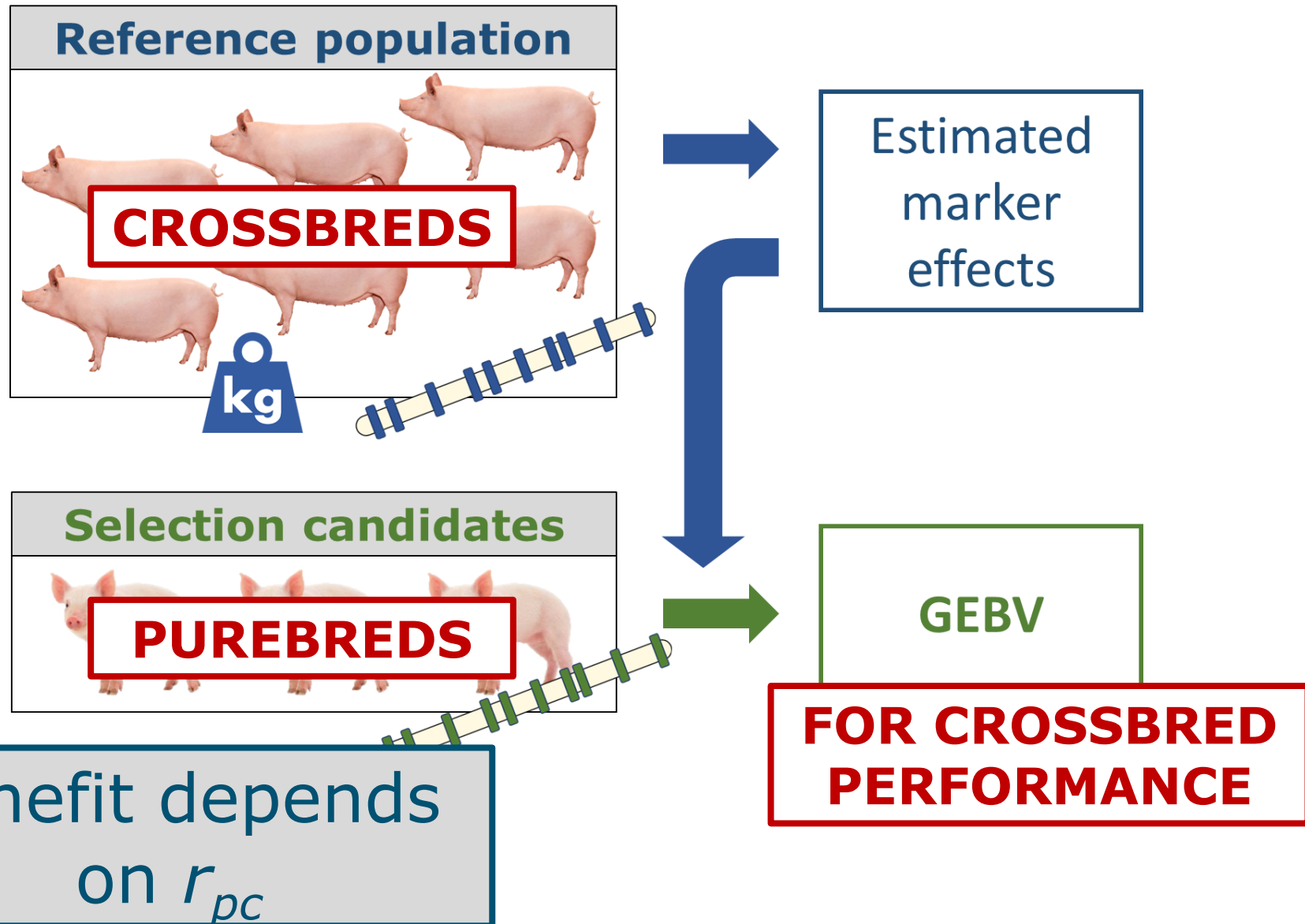


r_{pc} : 0.6-0.95

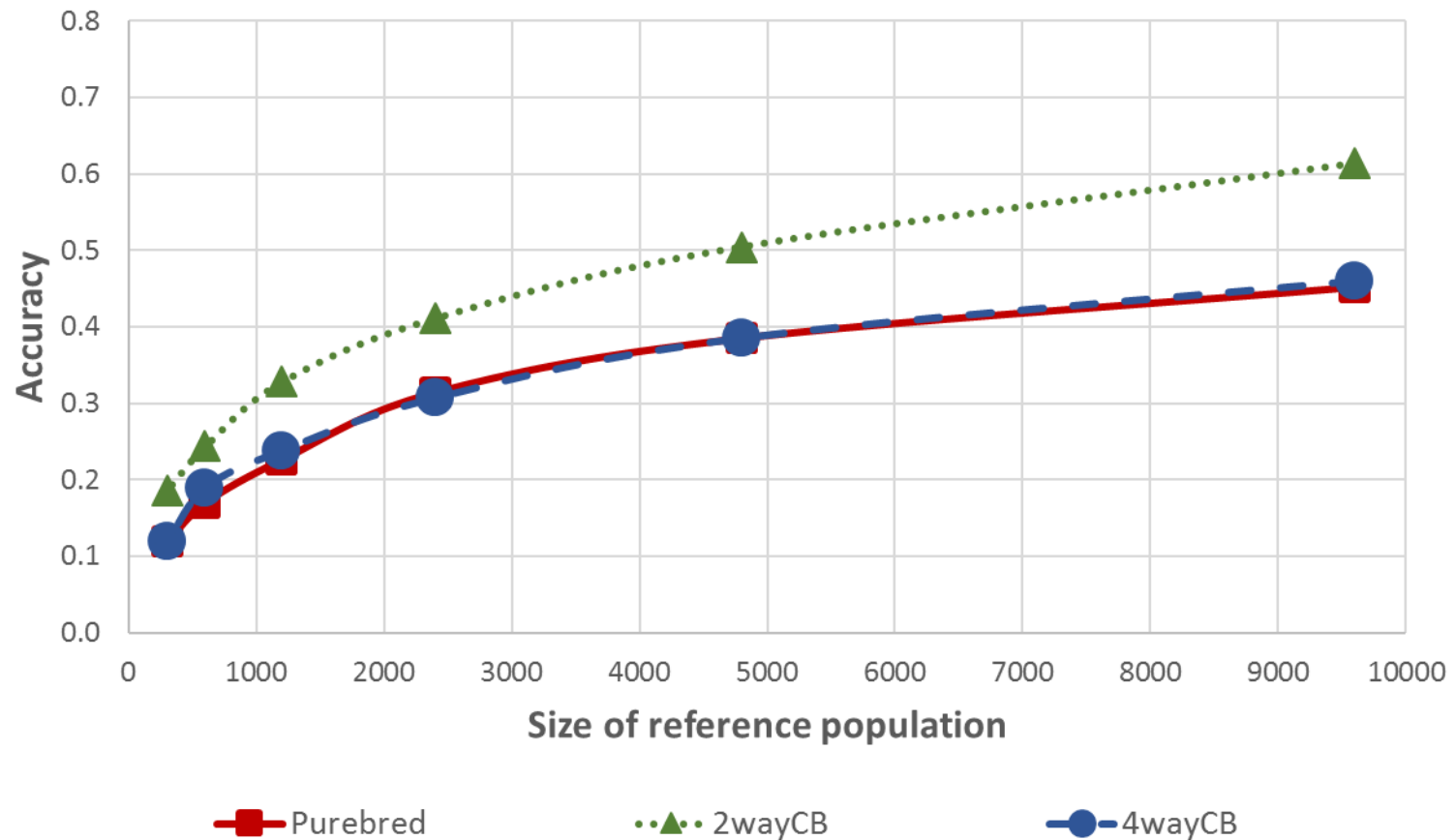
Genomic prediction



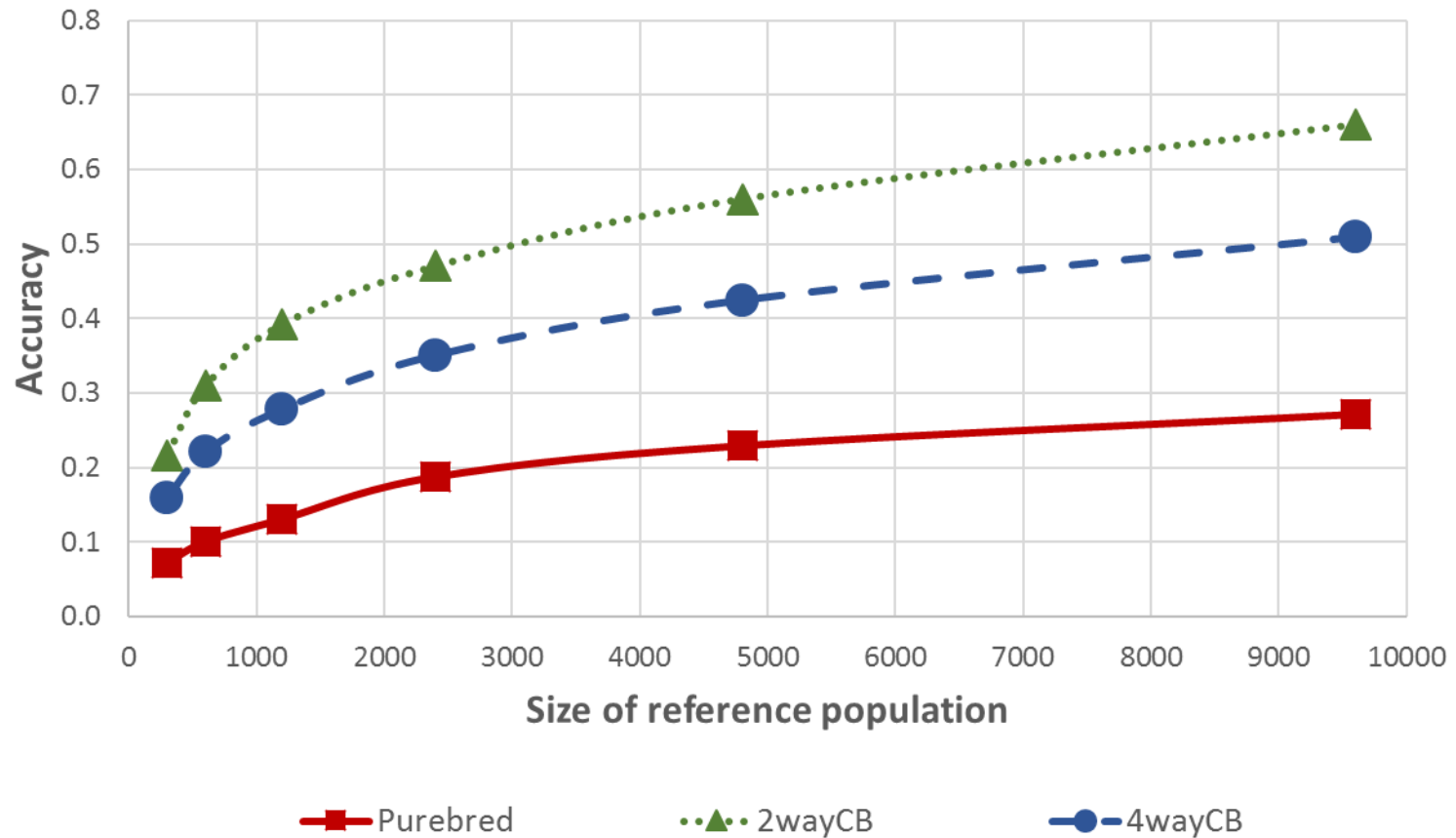
Genomic prediction for crossbred performance



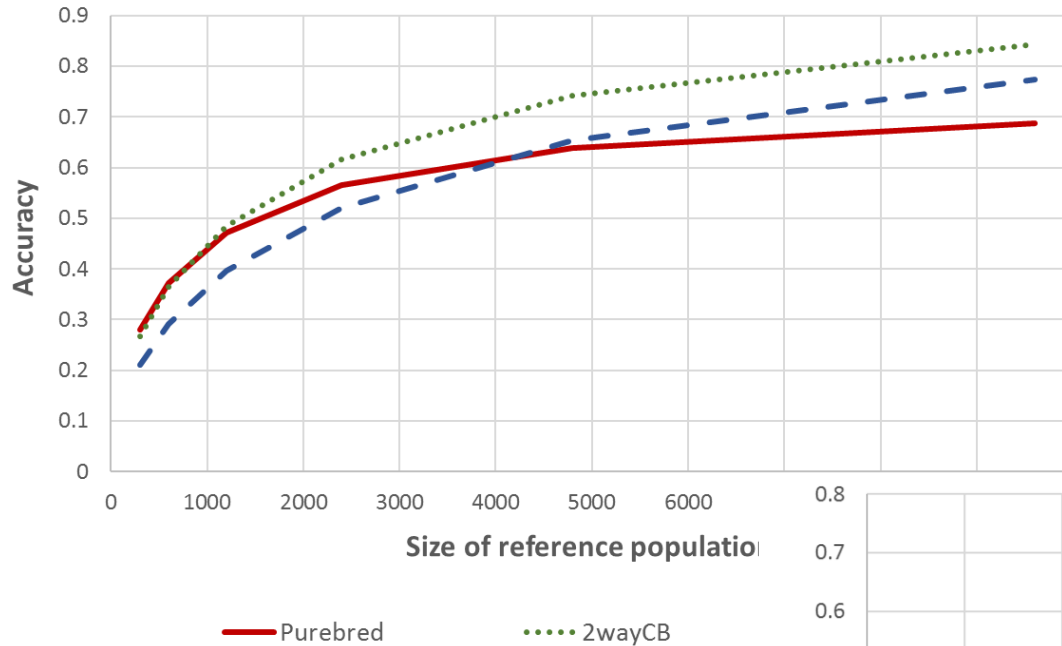
Accuracies with r_{pc} of 0.75



Accuracies with r_{pc} of 0.5



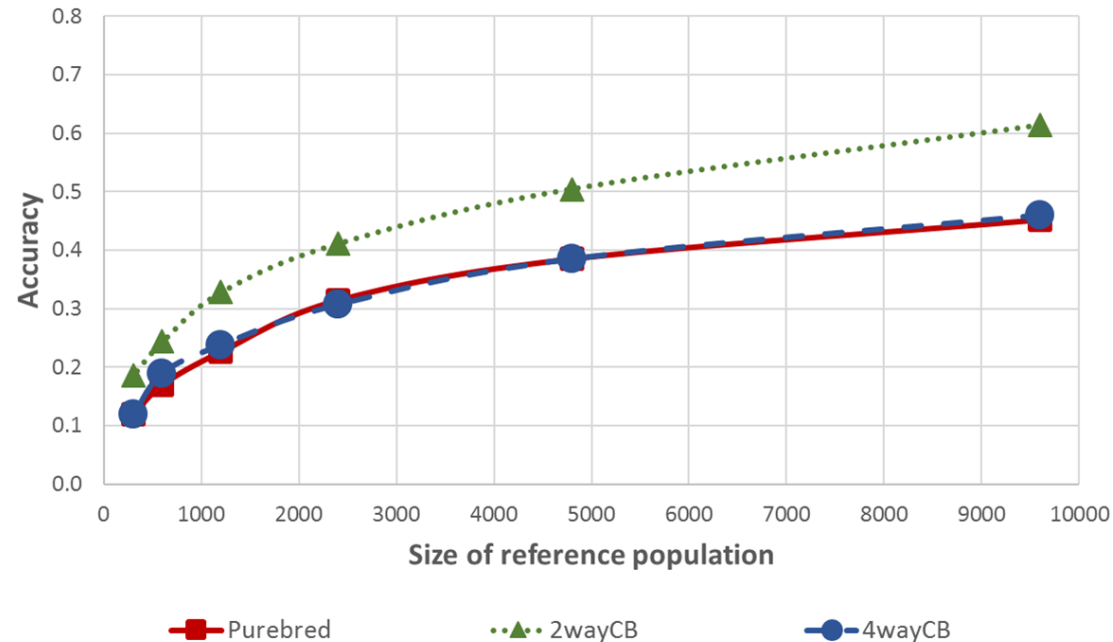
Predicted versus Empirical accuracy ($r_{pc}=0.75$)



Predicted accuracy

$$r = r_{pc} \sqrt{\frac{Nh^2}{Nh^2 + M_e}}$$

Empirical accuracy



Number of independent chromosome segments (M_e)

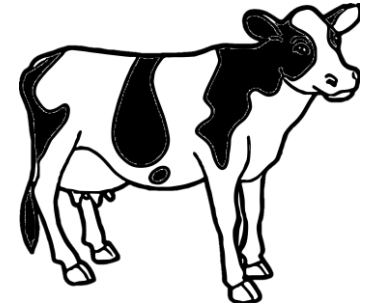
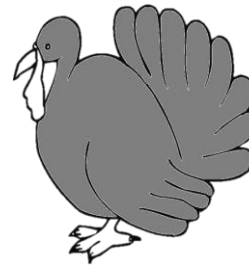
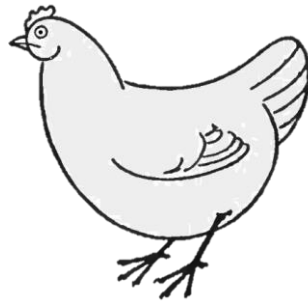
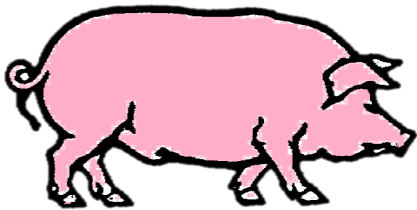
Me with selection candidates in generation 9



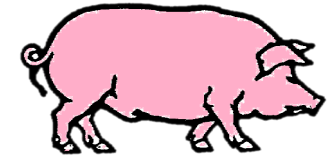
M_e 2wayCB $\sim 2 M_e$ PB

M_e 4wayCB $\sim 4 M_e$ PB

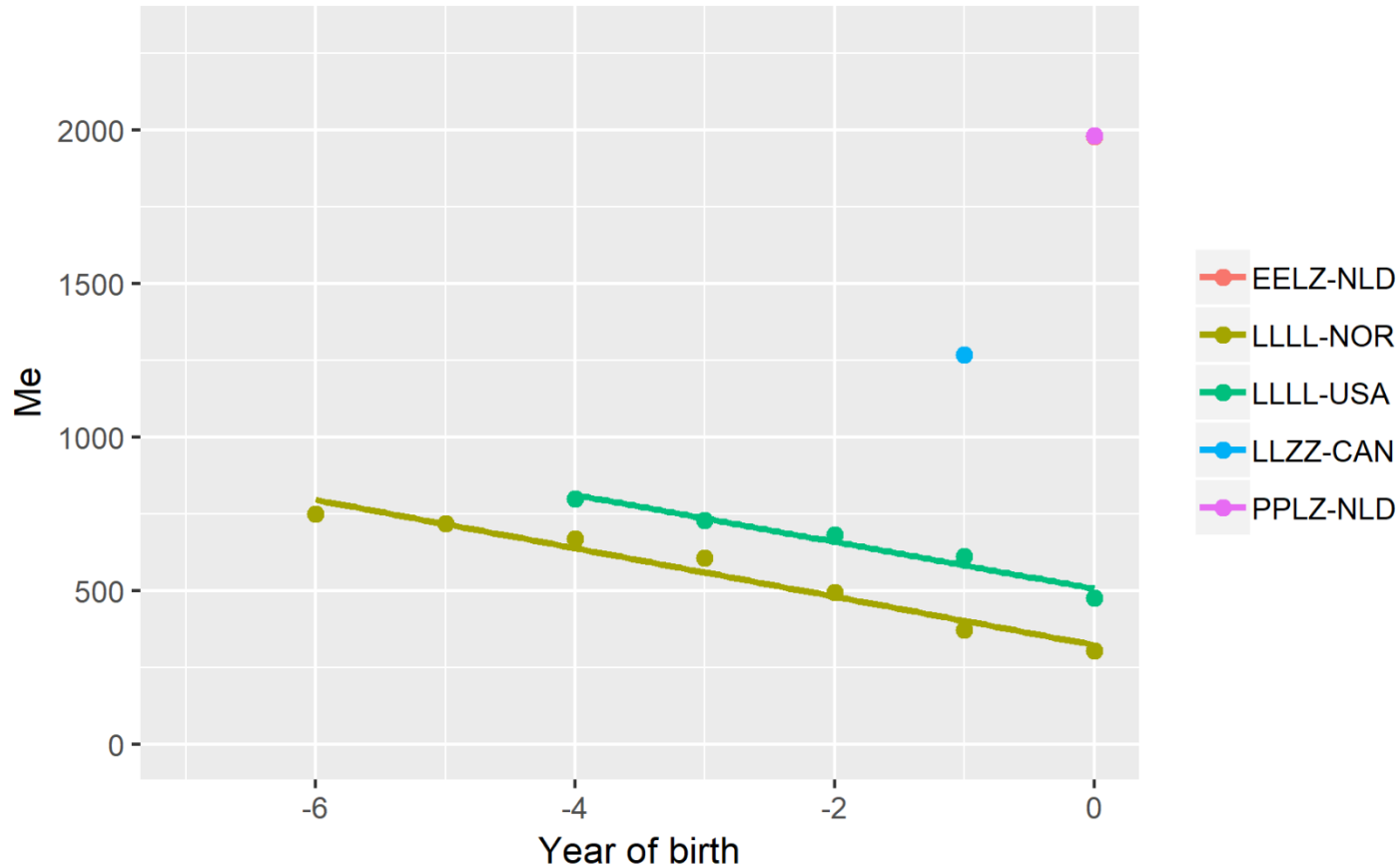
Based on simulations, but what about actual populations?



M_e in pigs



Number of chromosome segments (core=LLLL_2017_NOR)



Pigs – 2way Crossbreds

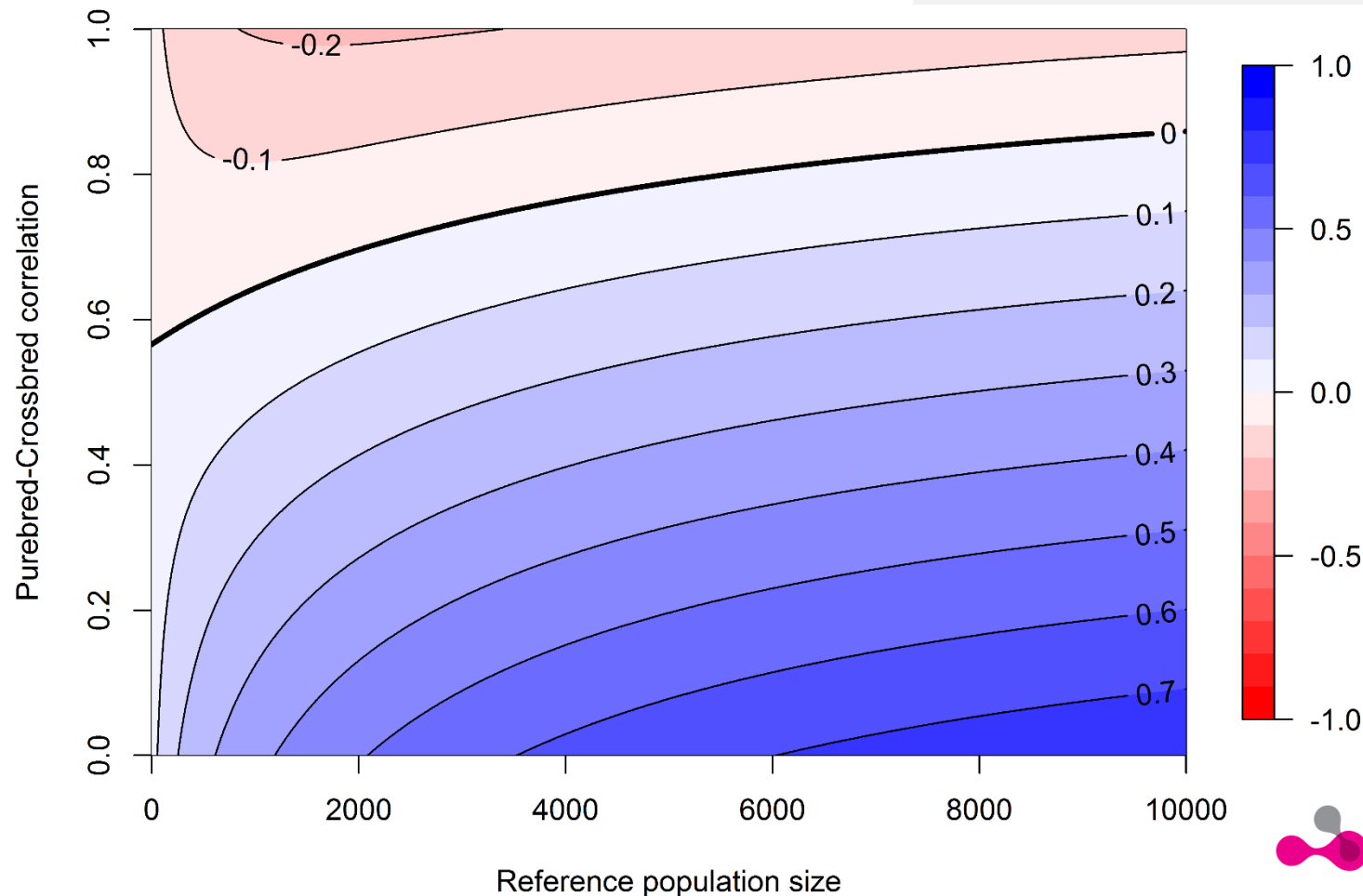
Assumptions

$M_{e, PB} = 500$

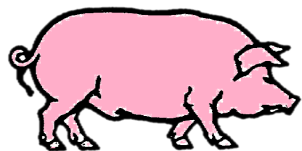
$h^2, PB = 0.25$

$M_{e, PB-CB} = 1250$

$h^2, CB = 0.2$



Pigs



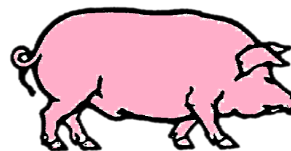
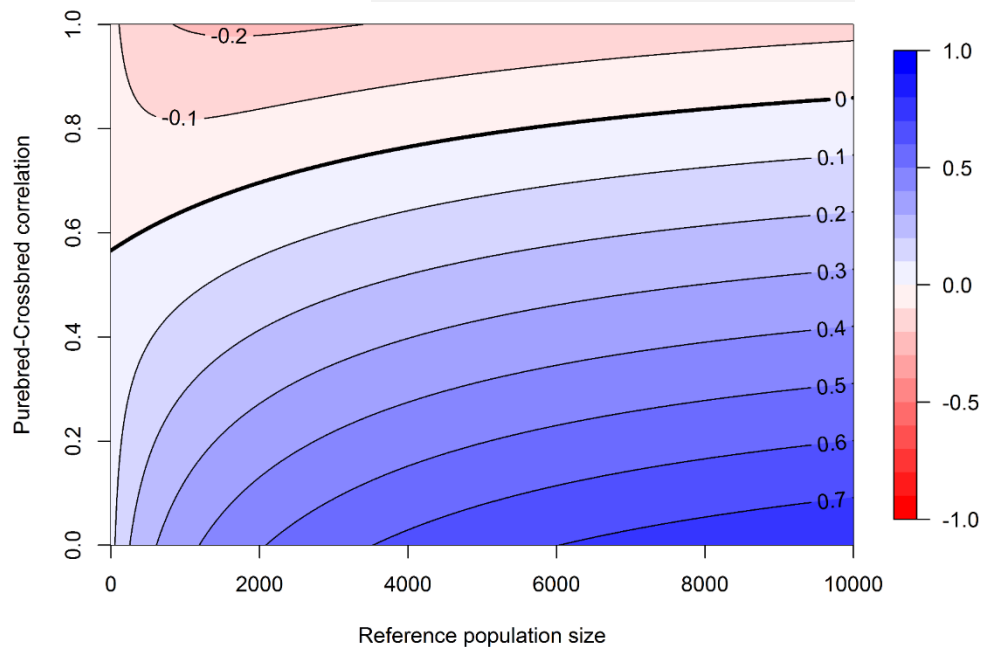
2way CB

M_e , PB = 500

M_e , PB-CB = 1250

h^2 , PB = 0.25

h^2 , CB = 0.2



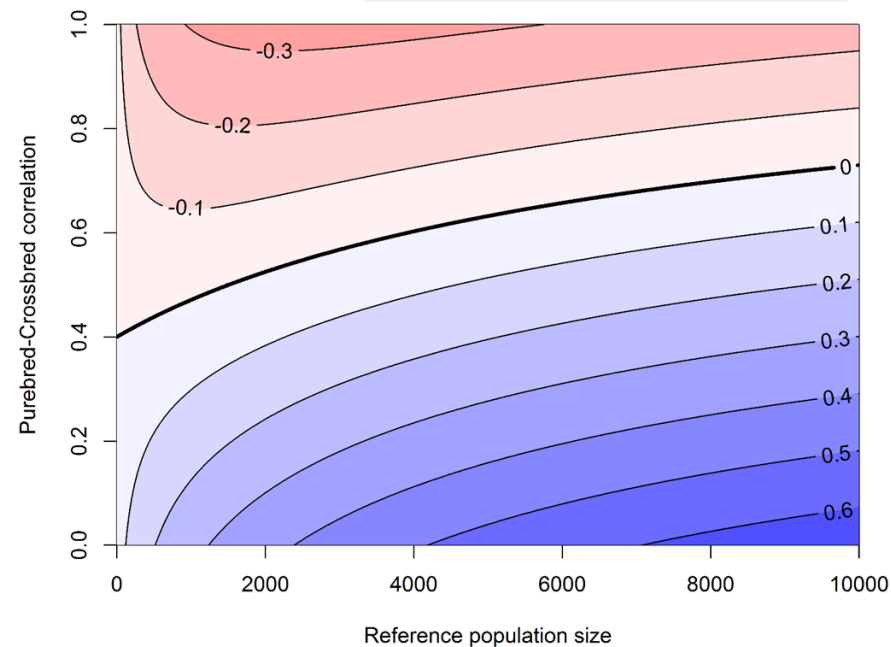
3way CB

M_e , PB = 500

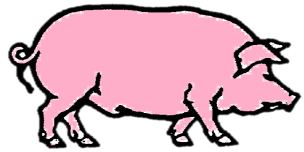
M_e , PB-CB = 2500

h^2 , PB = 0.25

h^2 , CB = 0.2



Pigs, effect h^2



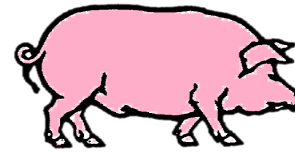
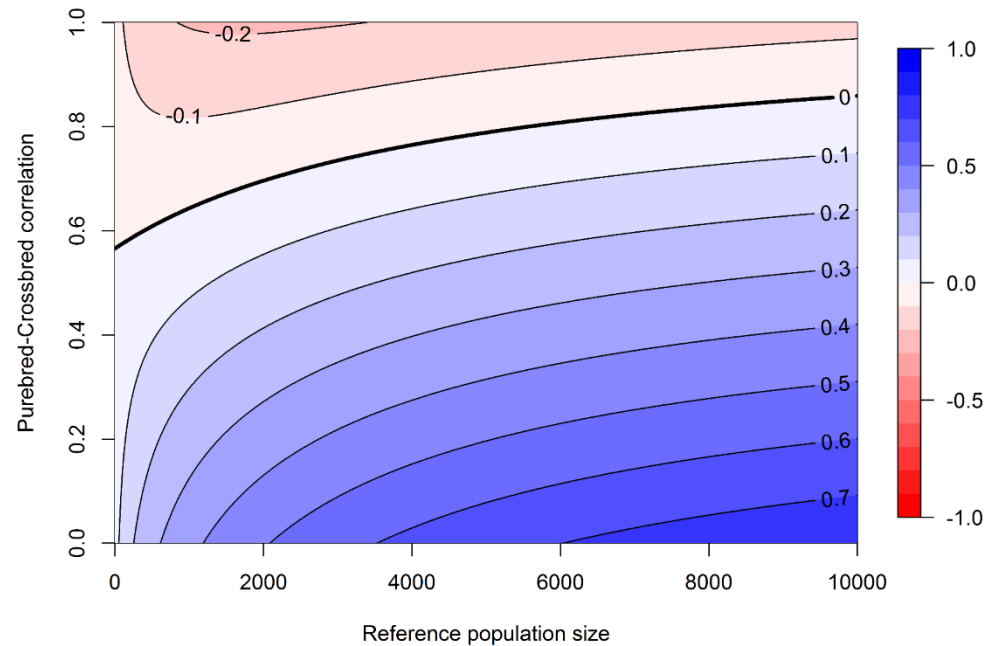
High h^2

M_e , PB = 500

M_e , PB-CB = 1250

h^2 , PB = 0.25

h^2 , CB = 0.2



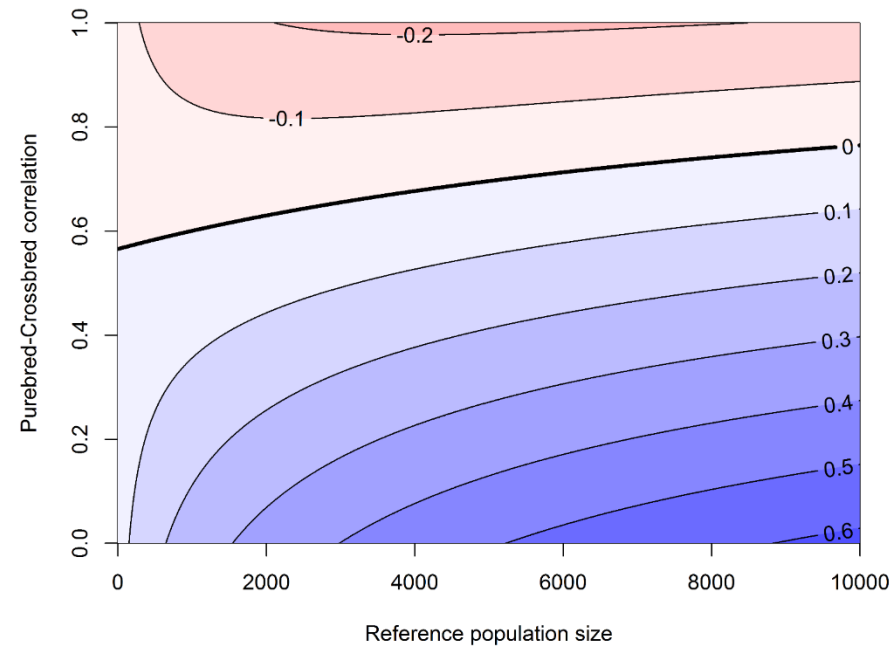
Low h^2

M_e , PB = 500

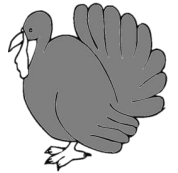
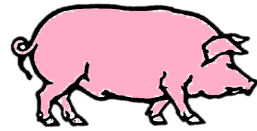
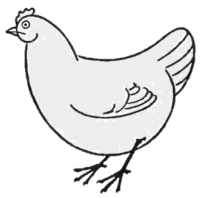
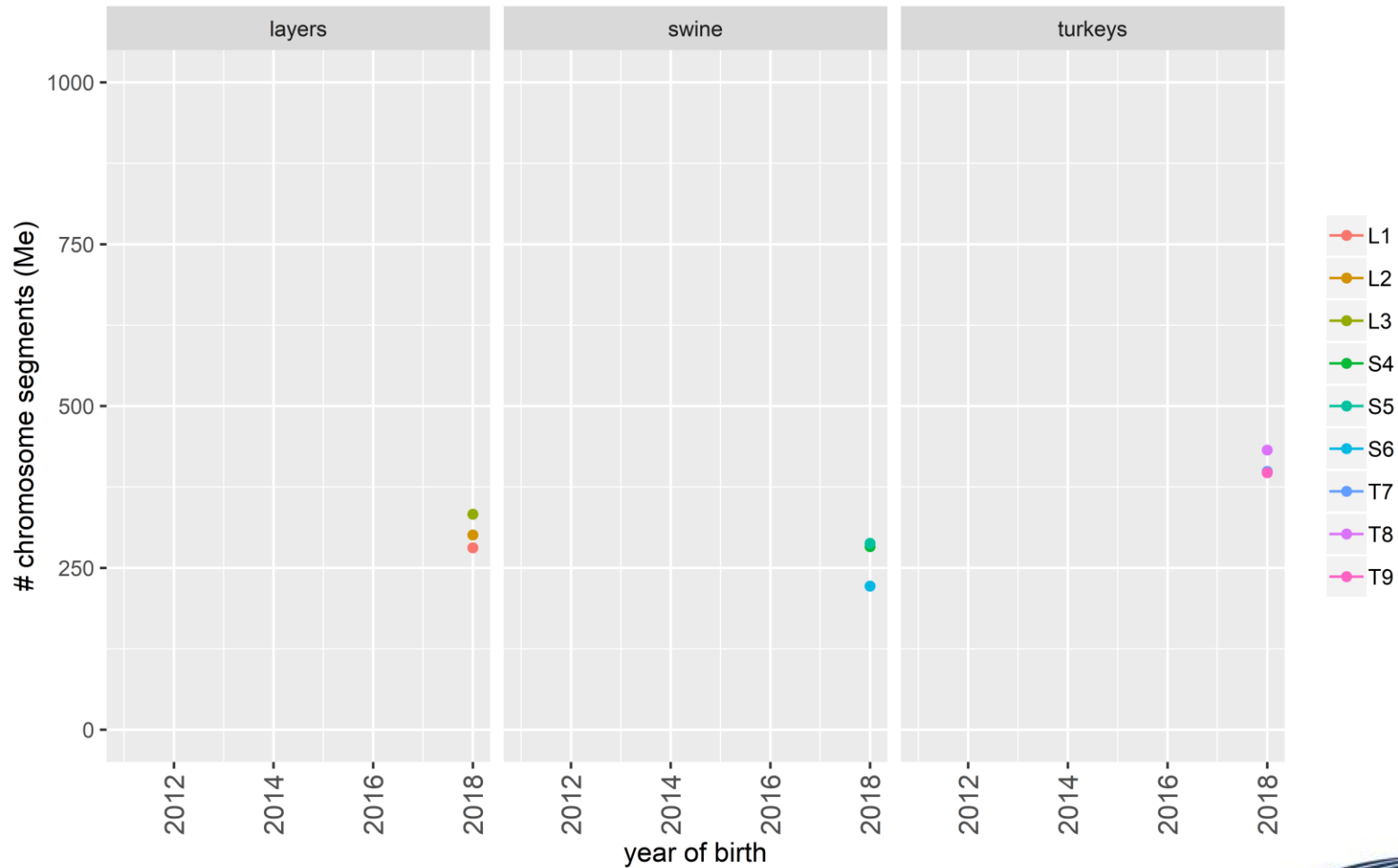
M_e , PB-CB = 2500

h^2 , PB = 0.10

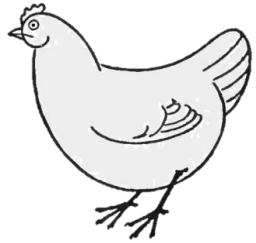
h^2 , CB = 0.08



M_e in layers, swine and turkey



Chicken & Turkey – 2way Crossbreds



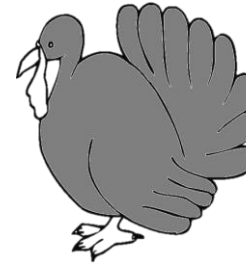
Layers

M_e , PB = 300

M_e , PB-CB = 750

h^2 , PB = 0.25

h^2 , CB = 0.2



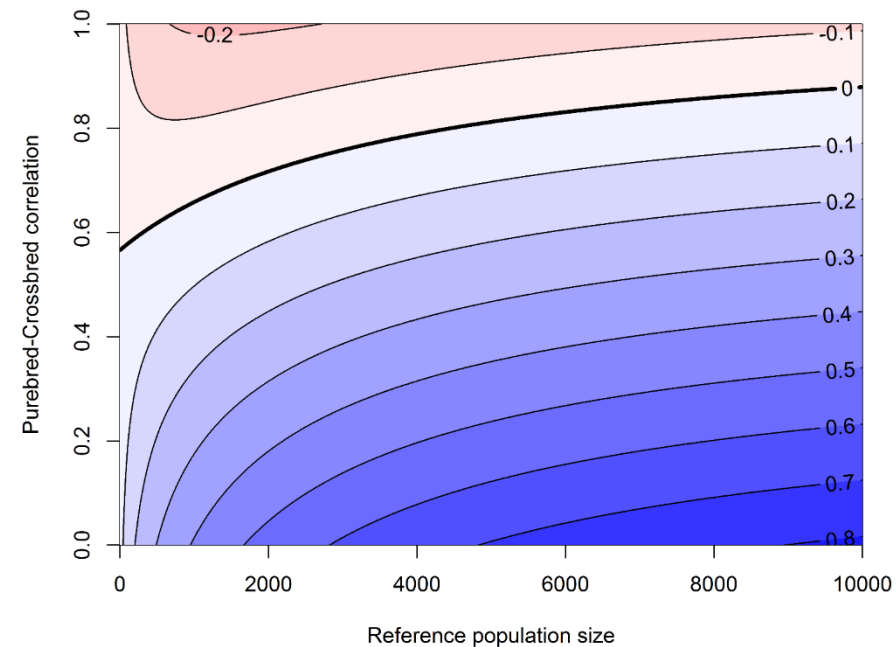
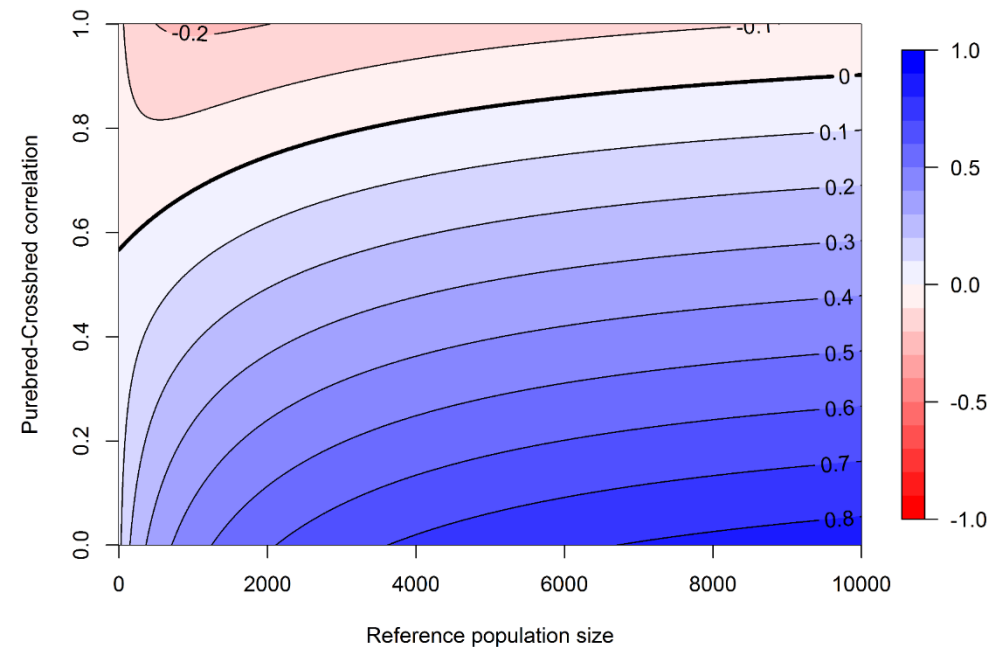
Turkey

M_e , PB = 400

M_e , PB-CB = 1000

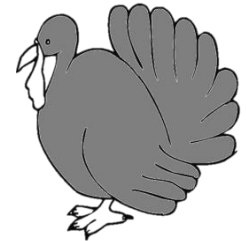
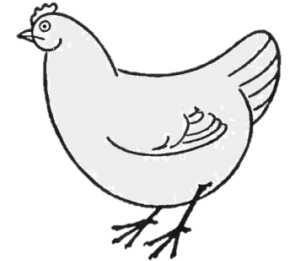
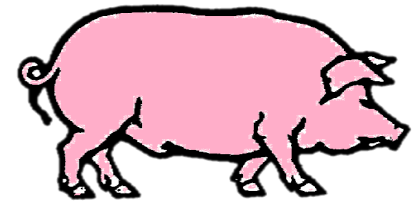
h^2 , PB = 0.25

h^2 , CB = 0.2



Benefit of crossbred information?

YES!!!

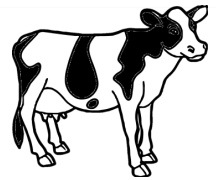


And benefit is higher when:

- r_{pc} is lower
- Reference population is larger
- h^2 is higher
- M_e is lower (RP and SC more related)

One 4wayCB can be used for 4 lines

Cattle



Kiwi-cross



Girolando

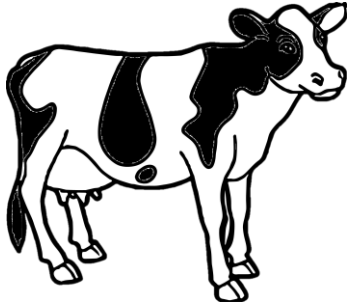


Breeding goal: Purebred and crossbred performance

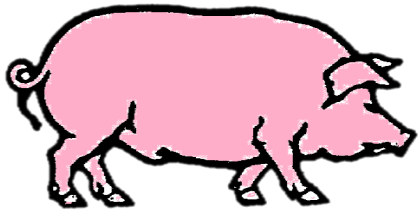
Selection: Purebreds and crossbreds

Breeding value: Purebred and crossbred info

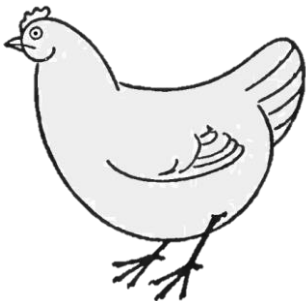
Status: Use of crossbred info?



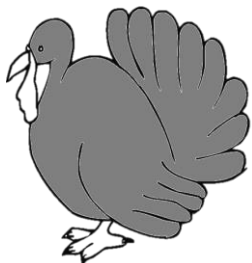
Yes



No



No



No



What is still needed?



Challenges for using CB info

- €€€
- Genotyping PB also as selection candidates
- Validation not yet convincing
 - How to validate?
- Time for breeding value estimation
- More accurate phenotypes of purebreds
- Development of appropriate methods
- ...

Thanks for your attention

Remarks/ Questions?



Acknowledgements:

Marco Bink
Egiel Hanenberg
André Hidalgo
Piter Bijma
Mario Calus
Pascal Duenk

