Who to genotype to improve crossbred performance: Purebreds or Crossbreds?

Hendrix Genetics

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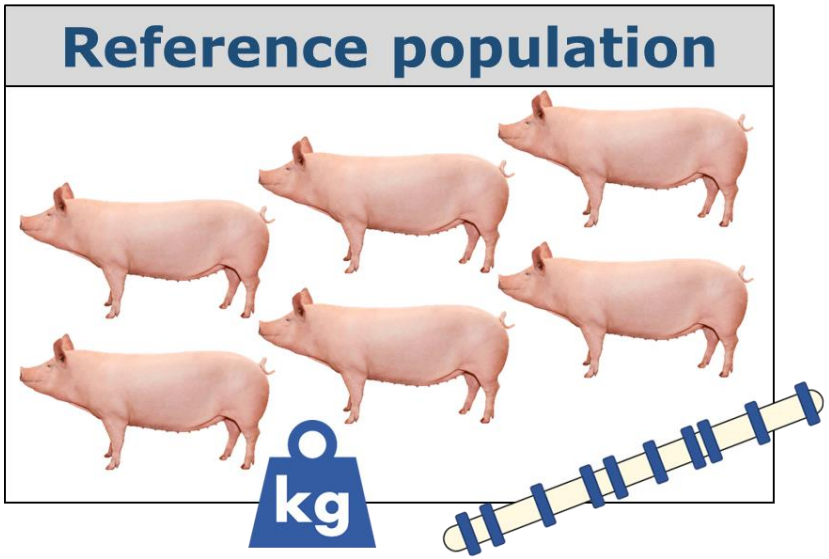
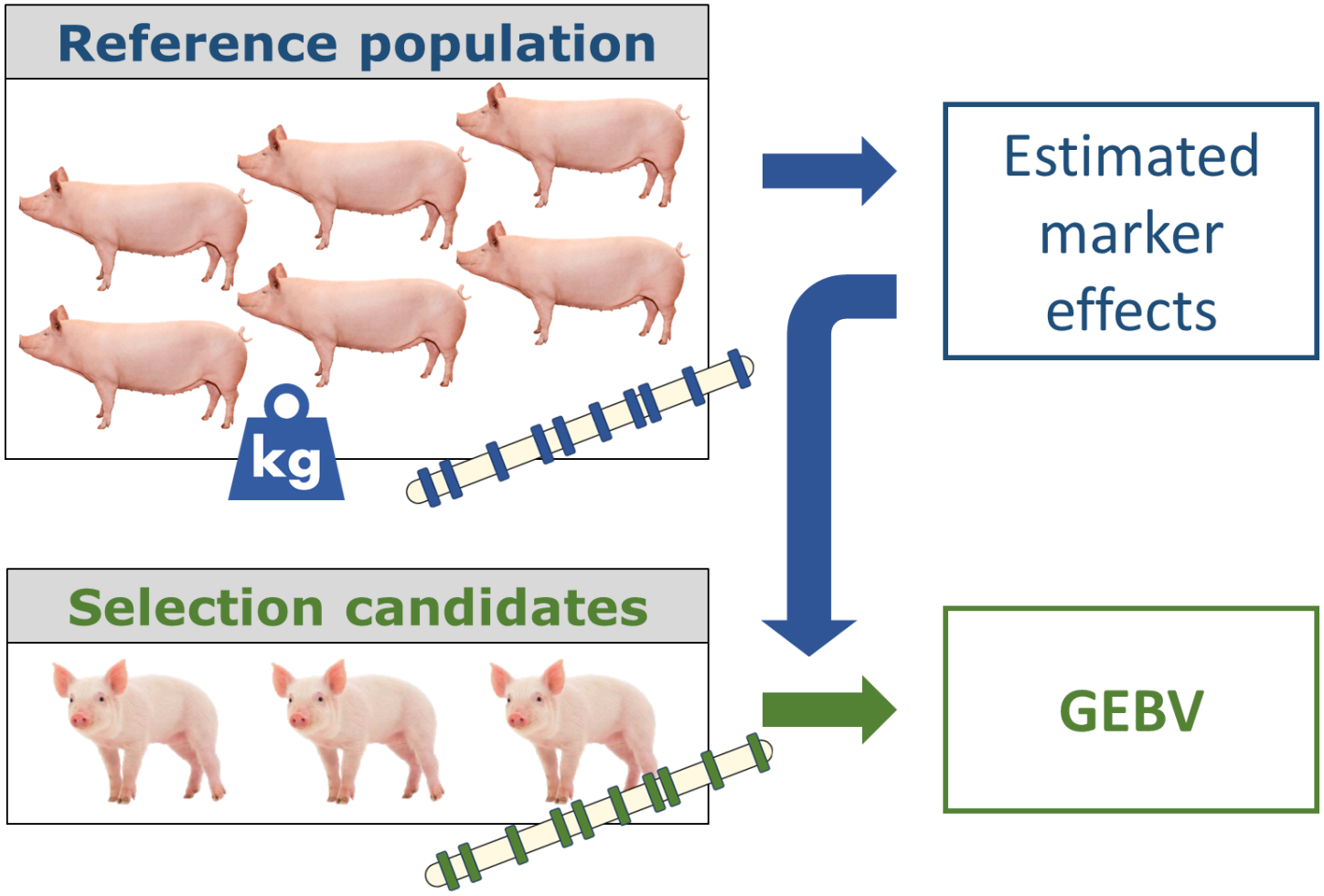
Genomic prediction

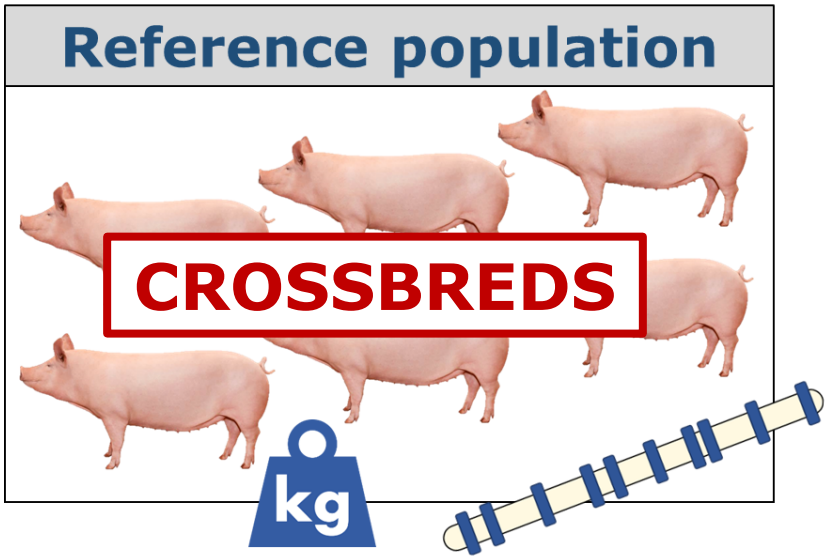


Estimated marker effects

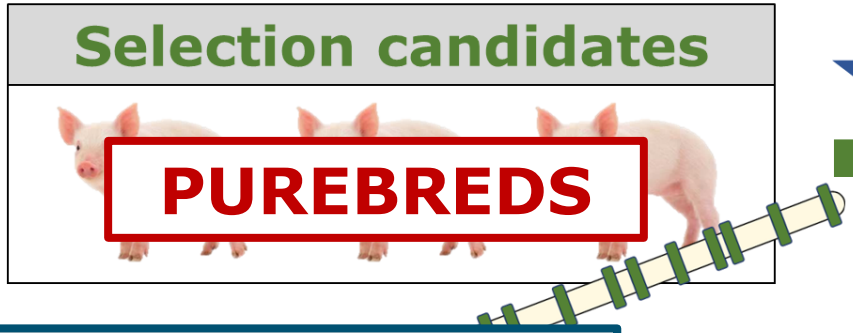
Genomic prediction



Genomic prediction for crossbred performance



Estimated marker effects



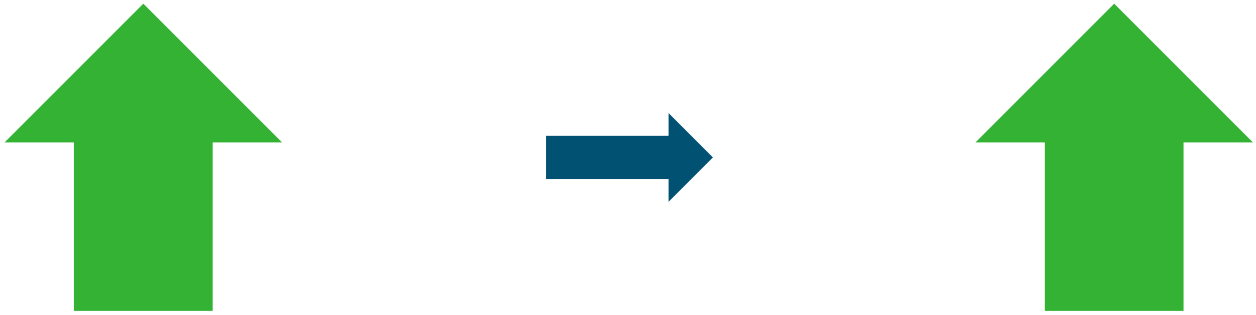
GEBV

FOR CROSSBRED PERFORMANCE

Benefit depends on r_{pc}

Accuracy of genomic prediction

Depends on **relations** between reference and selection individuals



Relatedness

Accuracy

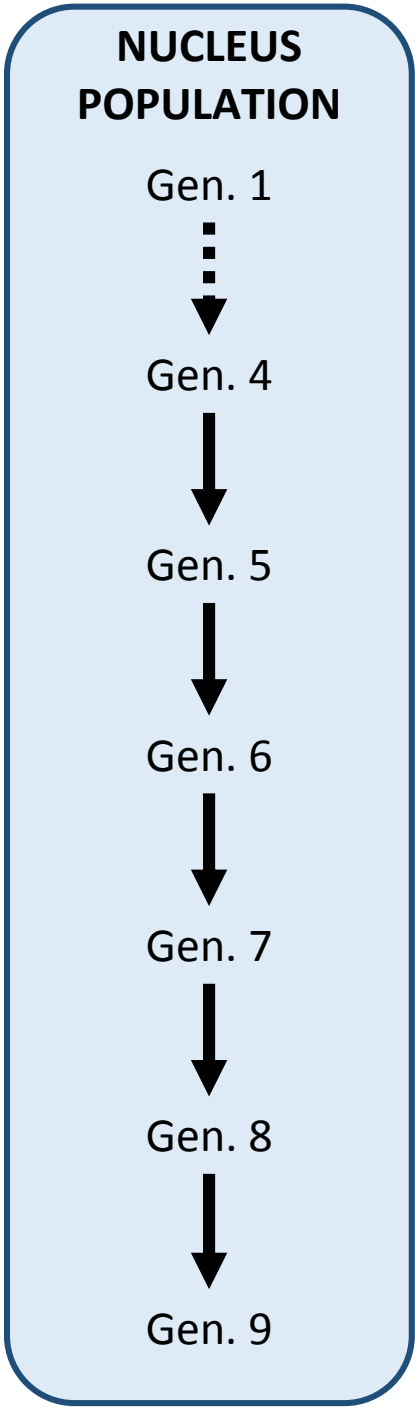
Aim of research

Investigate benefit of using a **crossbred** over a **purebred reference population** for different levels of:

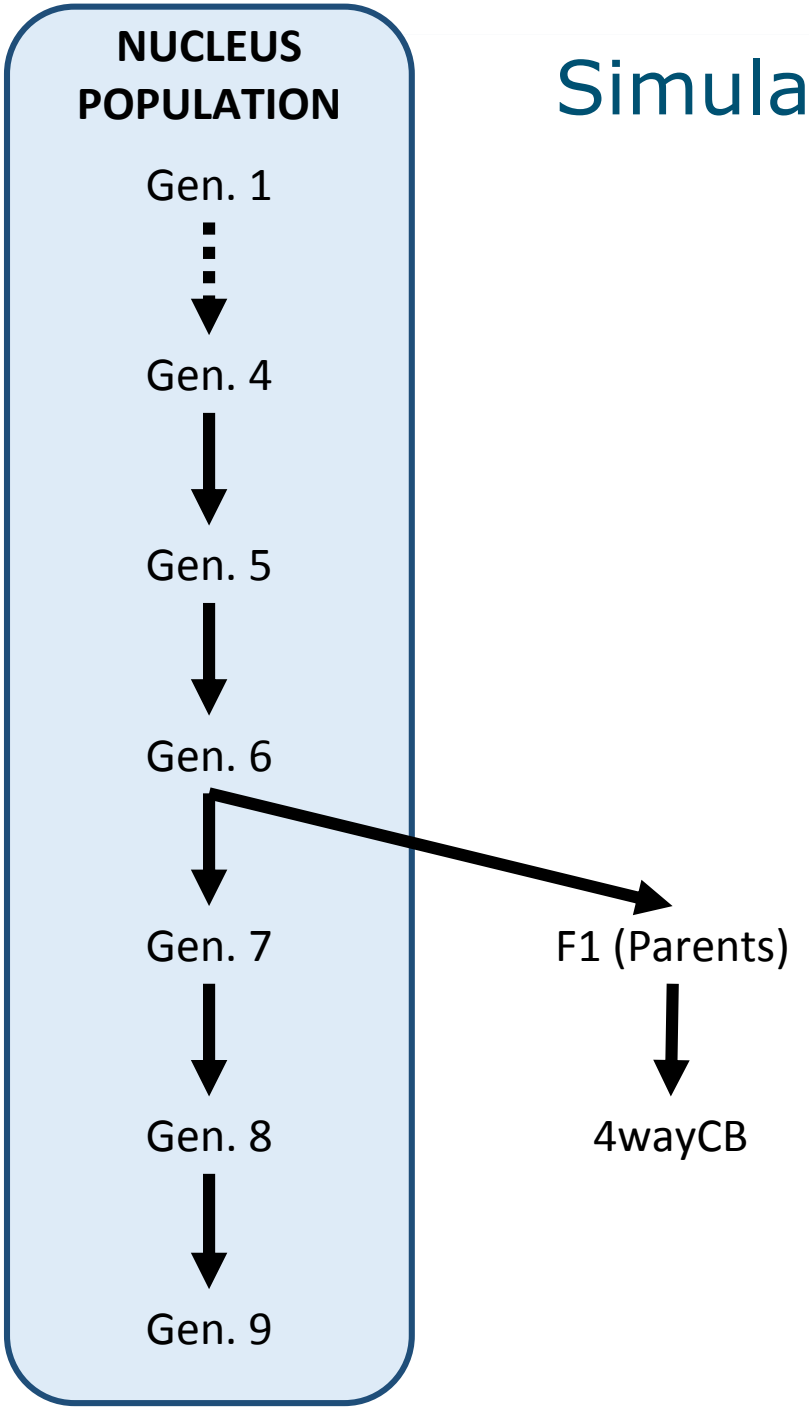
- Relatedness between RP and selection candidates
- Purebred-crossbred correlation (r_{pc})
- Reference population sizes

to predict GEBV for **crossbred performance** of purebred selection candidates

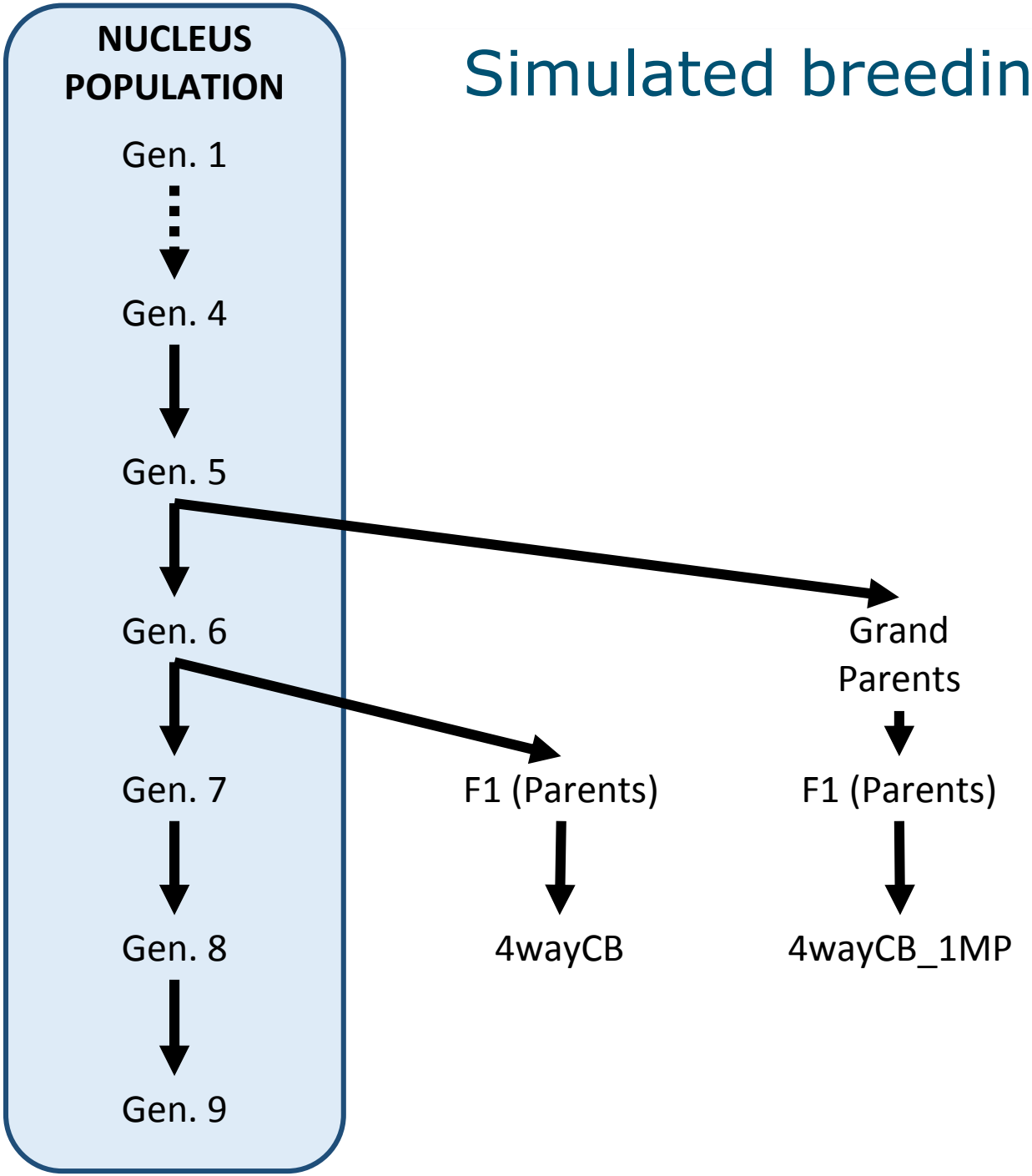
Simulated breeding program



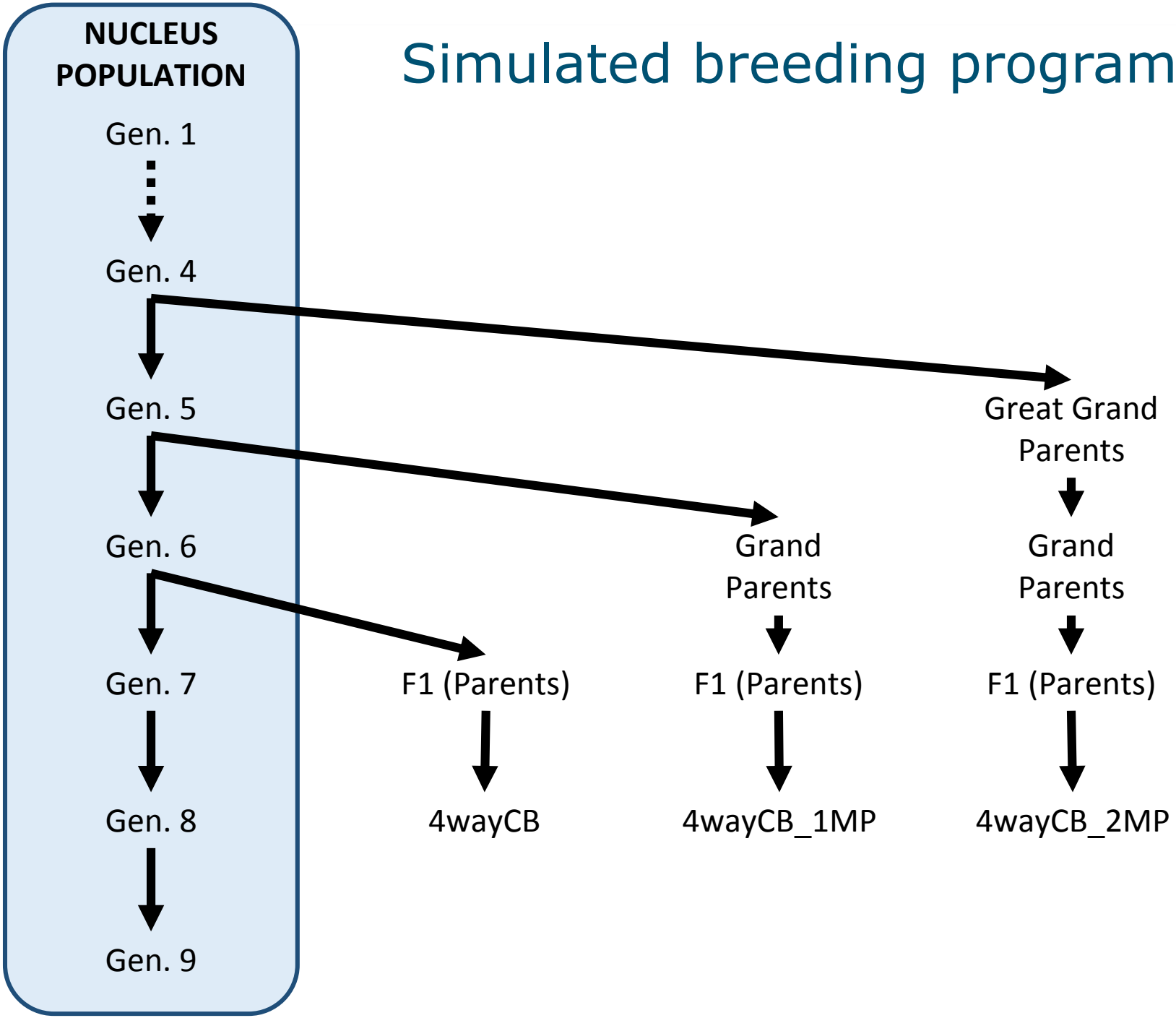
Simulated breeding program



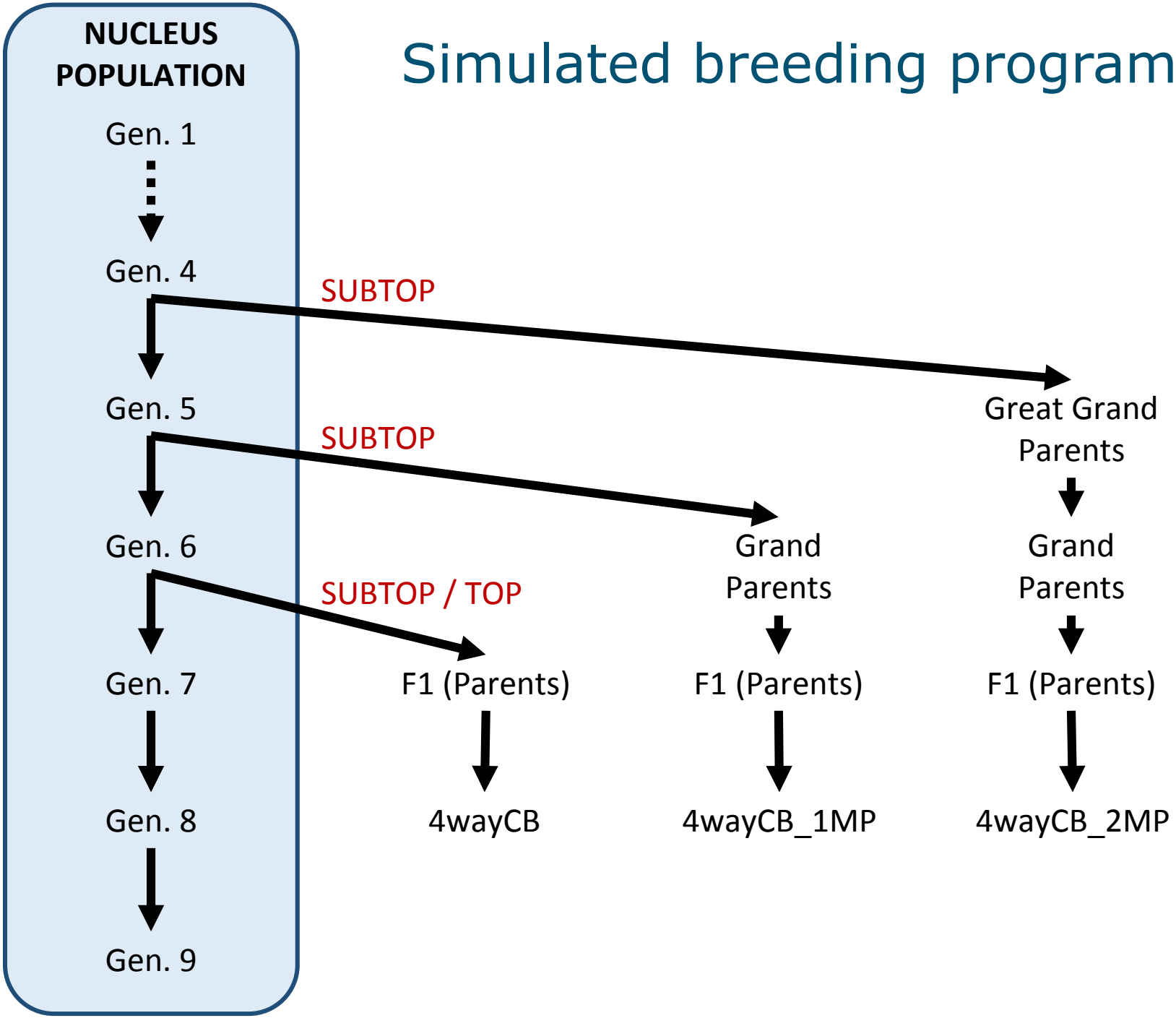
Simulated breeding program



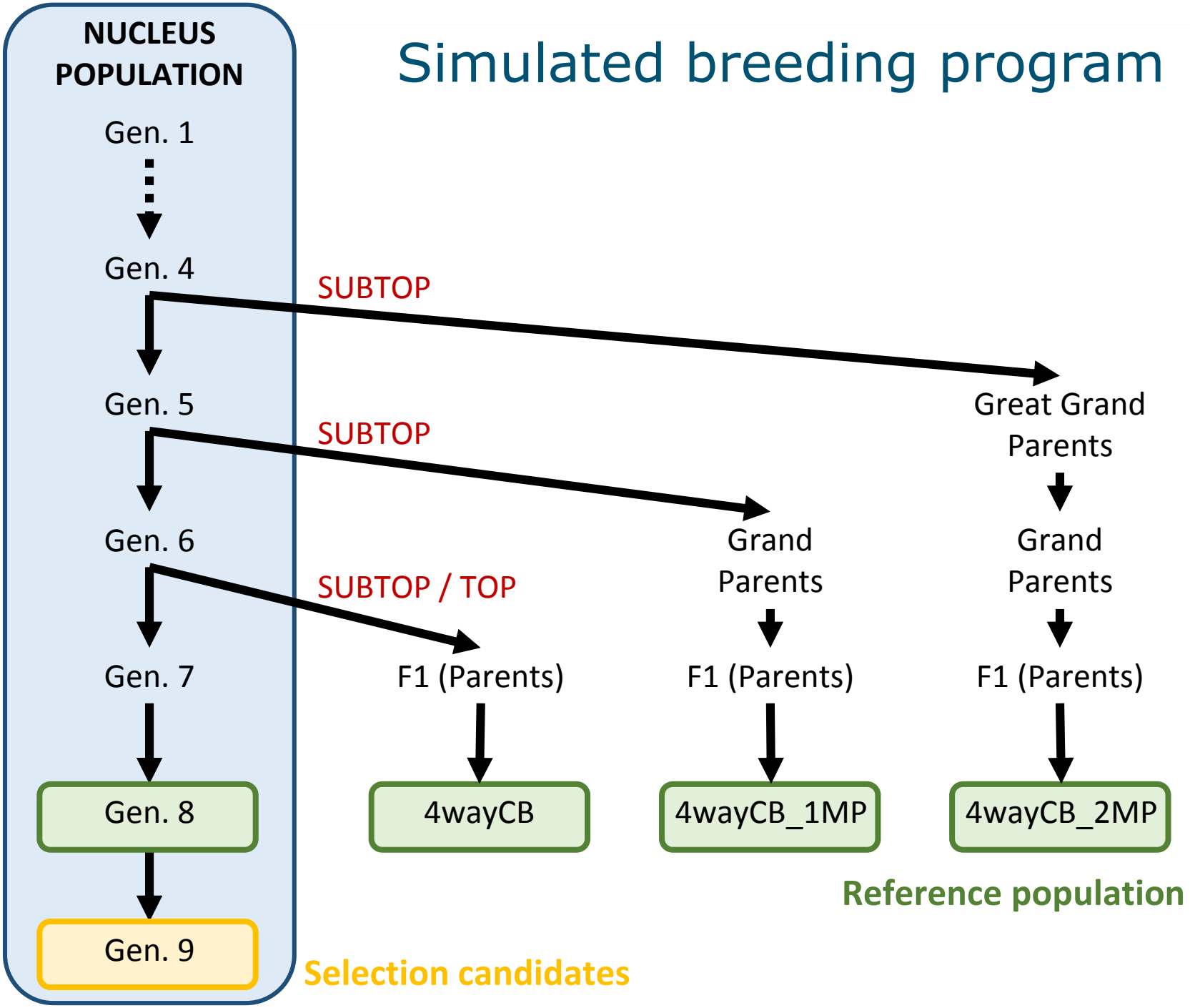
Simulated breeding program



Simulated breeding program

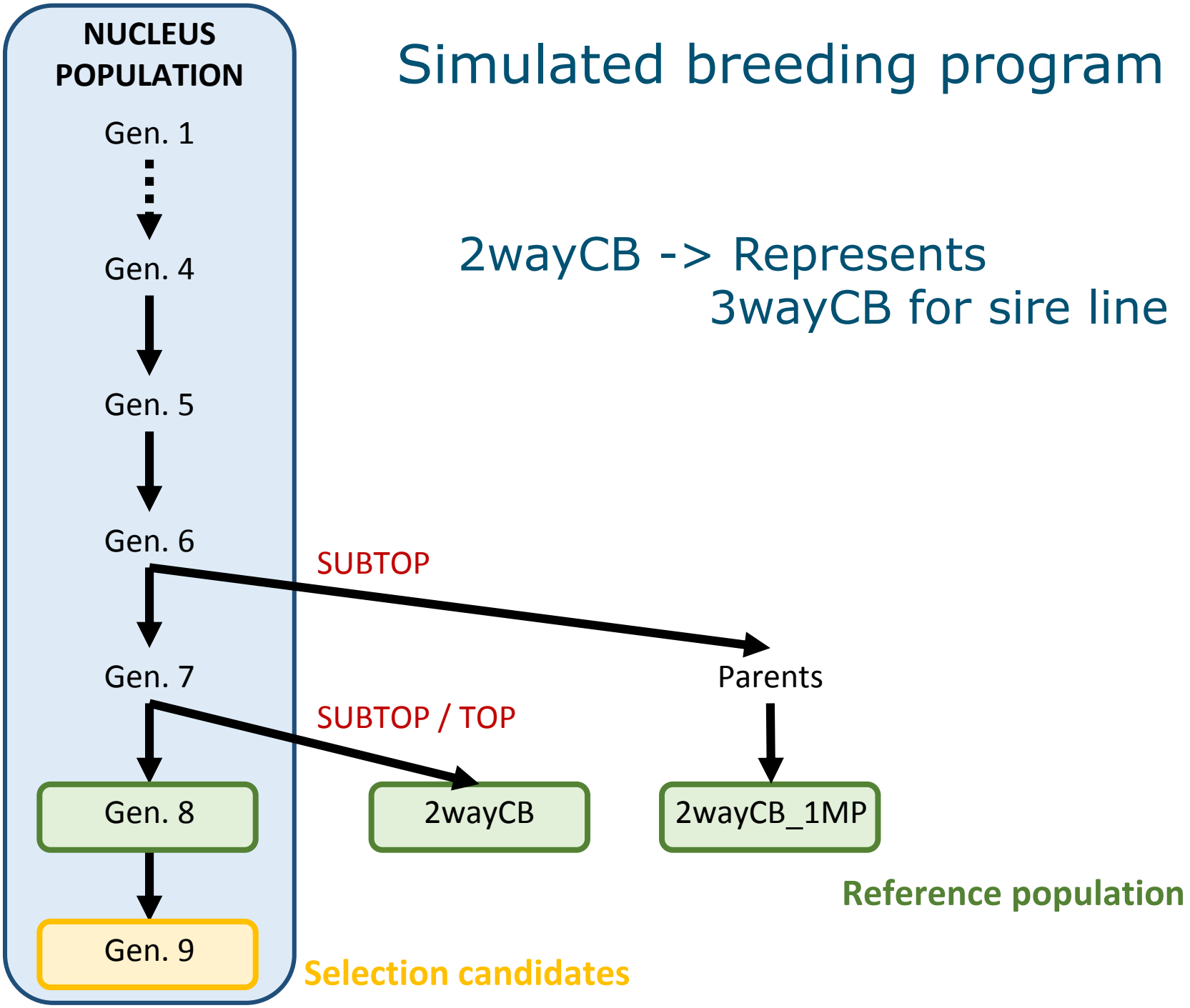


Simulated breeding program

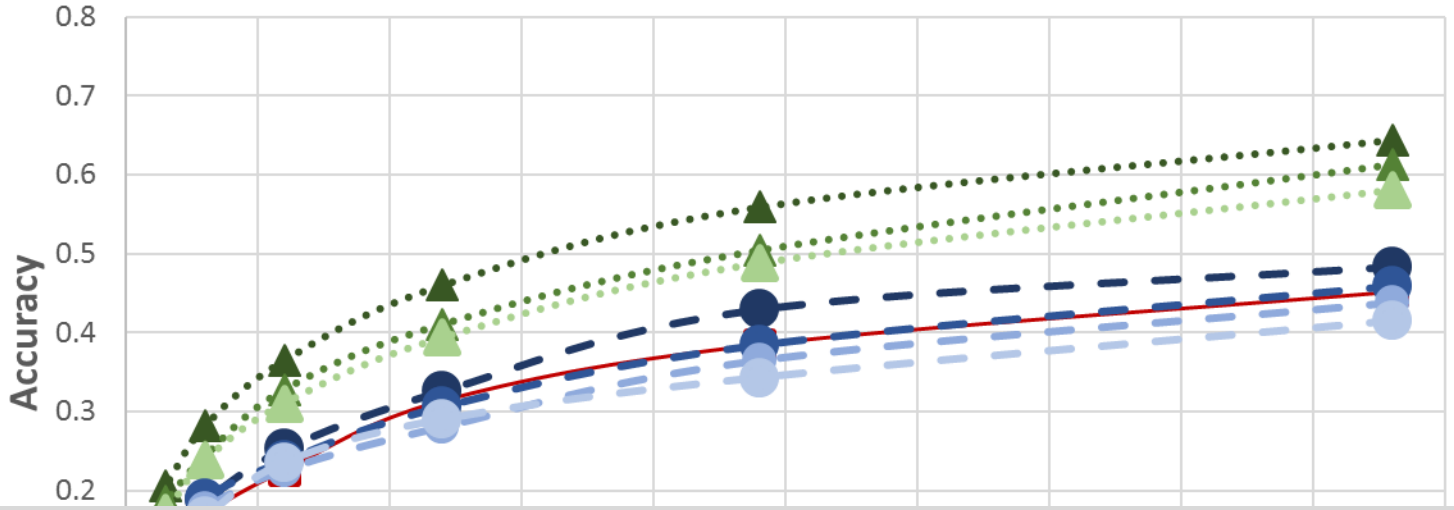


Simulated breeding program

2wayCB -> Represents
3wayCB for sire line



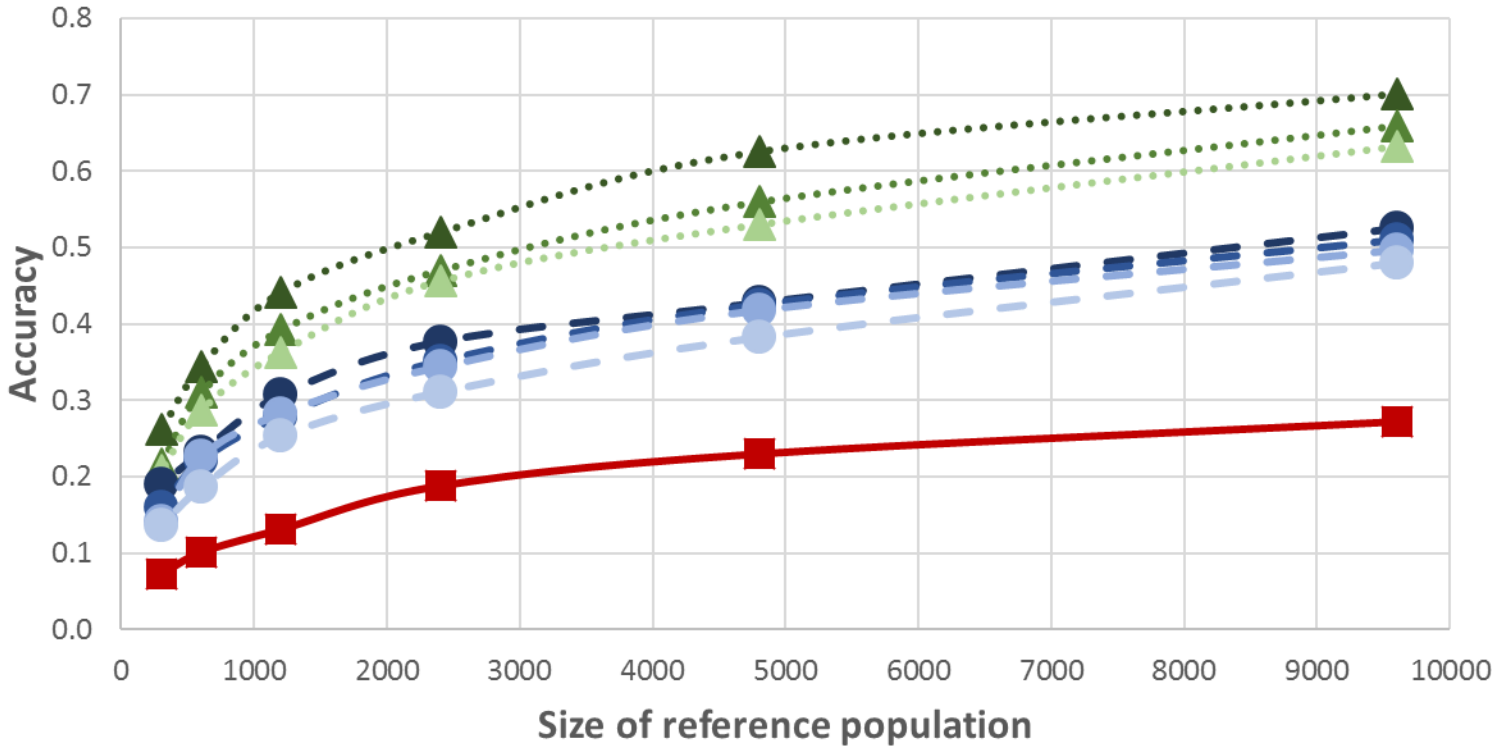
Accuracies with r_{pc} of 0.75



2wayCB > PB

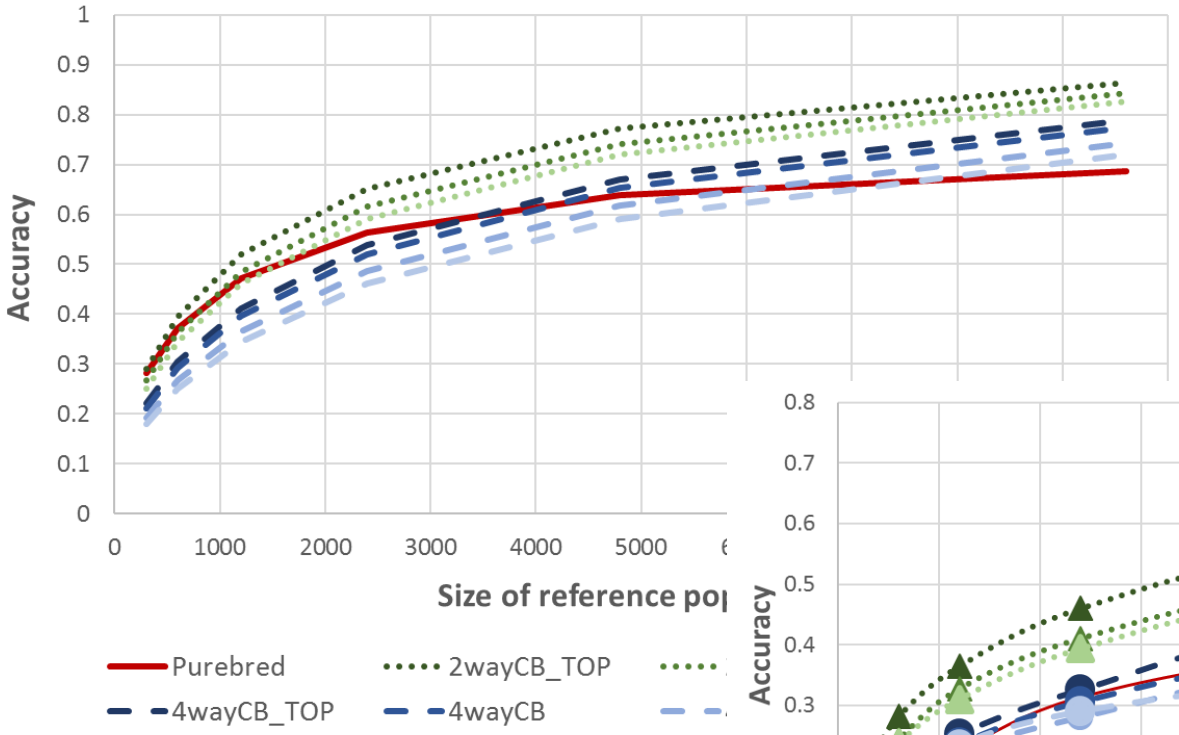
4wayCB > PB, depending on size of RP and relatedness

Accuracies with r_{pc} of 0.5



2wayCB & 4wayCB > PB

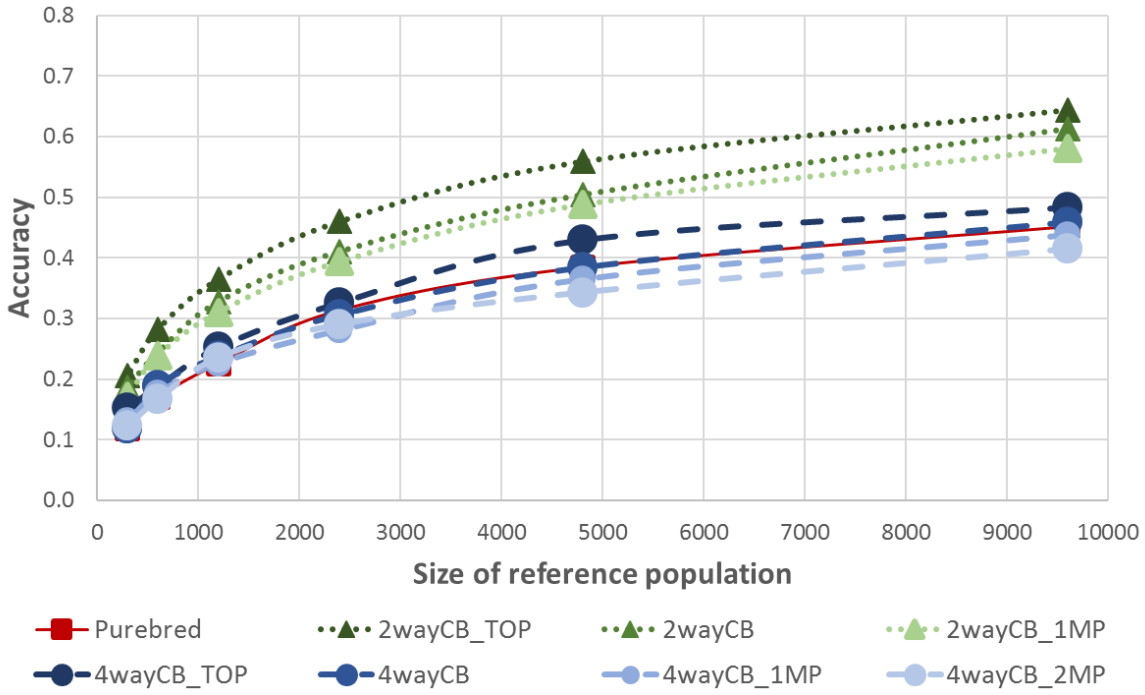
Predicted versus Empirical accuracy (r_{pc}=0.75)



Predicted accuracy

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

Empirical accuracy



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Conclusions breeding program design

Benefit of crossbred information depends on:

- Purebred-crossbred correlation (r_{pc})
  - Lower r_{pc}, more benefit CB
- Relatedness to the selection candidates
  - Higher relatedness (lower M_e), more benefit CB
- Size of reference population
  - Larger reference population, more benefit CB

Prediction equation can predict ranking of scenarios

Back to the beginning

Who to genotype to improve crossbred performance?

- Crossbreds for reference population
- Purebreds as selection candidates