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# A Two-Part Strategy for using Genomic Selection in Hybrid Crop Breeding Programs

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## Hybrid breeding programs deliver two goals: 1) New inbreds as parents of hybrids; 2) New inbreds as parents of the next generation.

❖ **Conventional** breeding programs achieve both goals simultaneously with testcross selection within the Product Development component.

❖ **Two-Part** breeding programs explicitly separate the two goals:

1. Testcross selection within Product Development component;
2. Rapid Reciprocal Recurrent Genomic Selection (RRRGS) on outbred plants within Population Improvement component.

## Methods

**Stochastic simulations of 6 entire hybrid crop breeding programs** were used to compare:
- a conventional breeding program not using genomic selection;
- three conventional plus genomic selection breeding programs, and;
- two breeding programs implementing the two-part strategy.

**Genomic Selection:**
- 15,000 records, genotyped at 20,000 SNP, from Testcross Stages over multiple years were used as the training set. Inbreds selected on General Combining Ability (GCA).

**Results are shown for a single trait** controlled by 3000 QTL, with a mean dominance degree ($\delta$) of 0.92. Genotype-By-Year variance was set to twice the genetic variance ($GxY = 2\sigma_G^2$).
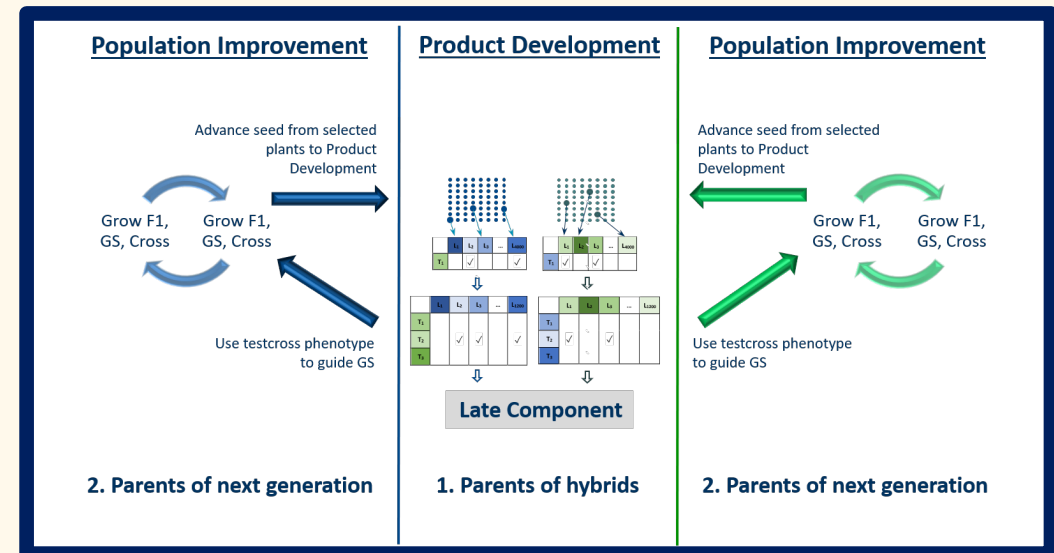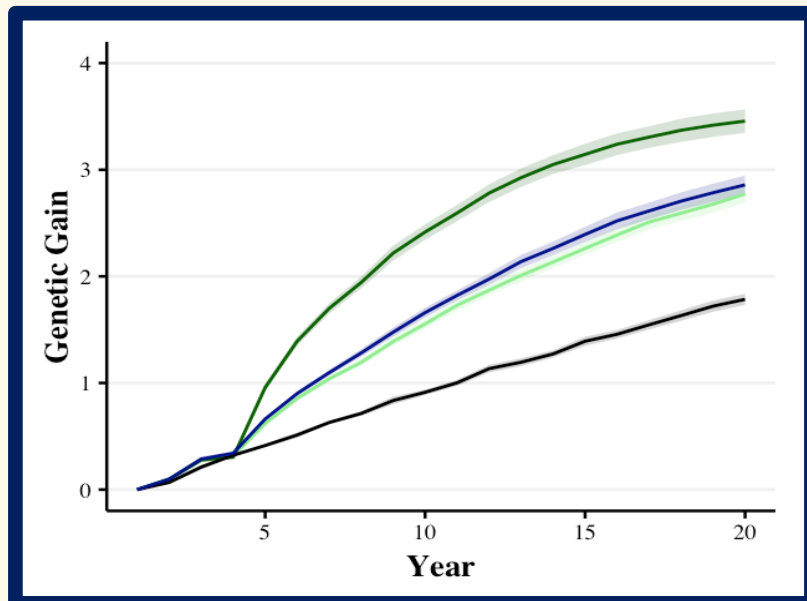




| Scenario | Performance Ratio | |
|---|---|---|
| | **10 yrs** | **20 yrs** |
| **CONV** | 1.00 | |
| **GS-DH** | 1.81 | 1.54 |
| **TP – 1 Cycle/Yr** | 1.70 | 1.56 |
| **TP – 3 Cycle/Yr** | 2.58 | 1.92 |