Report(IP2): Reducing Cycle Length

EIB-Roslin Collaboration
July 21st 2020

Baseline

Crossing	P1 x P2		70 Parents, 600 Crosses, 70 Progeny
Seedling Nursery			25000 = 500 crosses * 50 progeny
F1-CE			6000 (1*5m plots, 2 loc, 1 rep)
F1-PYT		(35)	500(1*10m plots, 2 loc, 2 reps)
F1-AYT		(24)	100(4*7m plots, 2 loc, 3 reps)
F1-UYT		(7)	30 (6*7m plots, 5 loc, 3 reps)
F1-UYT2		(4)	7 (6*7m plots, 8 loc, 3 reps)

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Improvement Plan

A3

Title: Early re- cycle at CET against PYT and Family selections instead of individuals based on QG principles

Name(s): Parkes
FirstName Elizabeth **Date:12/05/2020**

Background:

What is the business reason for choosing this issue? By reducing the cycle time and selecting families instead of best individuals we can increase the genetic gain, and have a robust and sustainable system and the likelihood to delivery better products at faster rate increasing our impact and increasing performance.

Current Conditions:

Where things stand today.
- **What's the problem with that, with where we stand?** We currently evaluate our genotypes in two stages of yield trials (preliminary and advanced) before we recycle individuals to ensure high accuracy of

Proposed Countermeasure(s):

Your proposal to reach the future state, the target condition.
- **What alternatives could be considered?** Recycling after the first yield evaluation by tradding accuracy off. Testing at earlier stages and using sparse testing to cover better the TPE.
- **How will you choose among the options? What decision criteria?** we will go from the least to the most disruptive.

Implementation Plan:

A chart or table that shows actions/outcomes, timeline and responsibilities.

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1. Introduction to the problem

Crop by Region
IITA-WABIOCassava

Problem Specification
Currently, parents are selected from PYT, AYT, and both UYTs. Although selection is more accurate at these stages, it increases cycle length, and delays genetic gains

Breeding strategy component tackled
Crossing / *Evaluation* / Selection

Breeders' equation terms tackled
r, L

Hypothesis
Trading off accuracy for speed will increase the rate of genetic gain

2.0. Materials and Methods

MET data from 13 environments-used to calculate genetic correlation among traits

nTraits = c("sprouting", "TC", "CMD", "fyld")

Weights from the base index : econWt = c(5,20,10,20)

	Sprouting	TC	CMD	fyld
Sprouting	1	-0.74496	-0.13764	0.872833
TC	-0.74496	1	0.044876	-0.63143
CMD	-0.13764	0.044876	1	-0.23009
fyld	0.872833	-0.63143	-0.23009	1

Based on results from IP1, we stuck with the base index currently used by the program.

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2. Materials and Methods

Treat	Description
T1 (BASELINE)	Current recycling (PYT-UYT)
T2 (CE)	Early recycling at CE
T3 (CE_4reps)	Early recycling at CE with 4 reps instead of 2
T4 (CE_FAM)	Early recycling at CE with family selection
T5 (PYT)	Recycling at PYT
T6 (PYT+CE)	Recycling at CE and PYT
T7 (AYT)	Recycling at AYT
T8 (PYT+AYT)	Recycling at PYT and AYT

- Simulation: 20-year burnin based on the current scheme (Baseline), and followed by 20-year period of breeding for each treatment
- varGxE assumed = 2(varG)
- Plant H^2 = 0.01, row H^2 = 0.2 and plot H^2 = 0.5
- Genetic gain and relative variance tracked at F1

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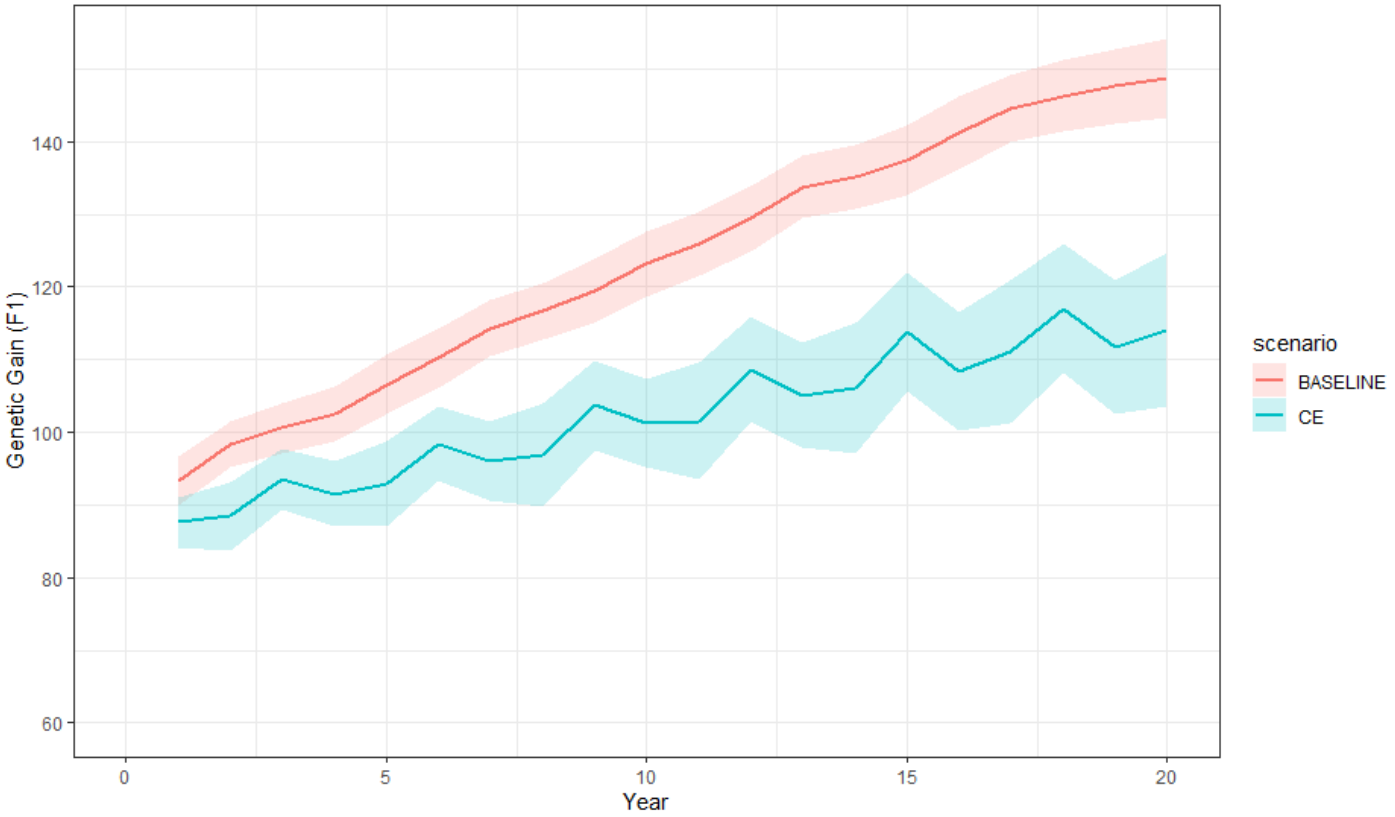
3.0. Results

Parents from PYT+AYT+ UYT1+ UYT2 vs Parents from CE



The current strategy was better by about 33%

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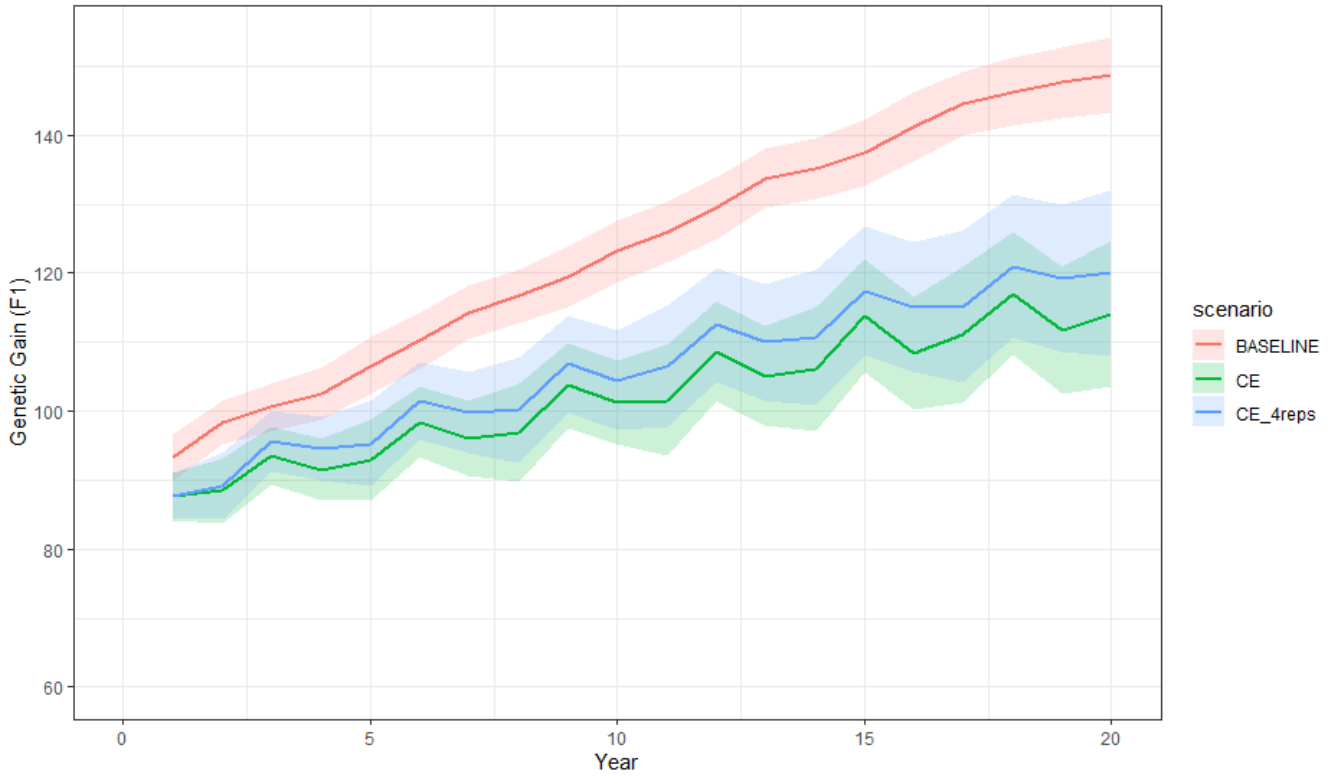
3.1. Results

Baseline vs Parents from CE with 4 reps



The current strategy was better by about 24%

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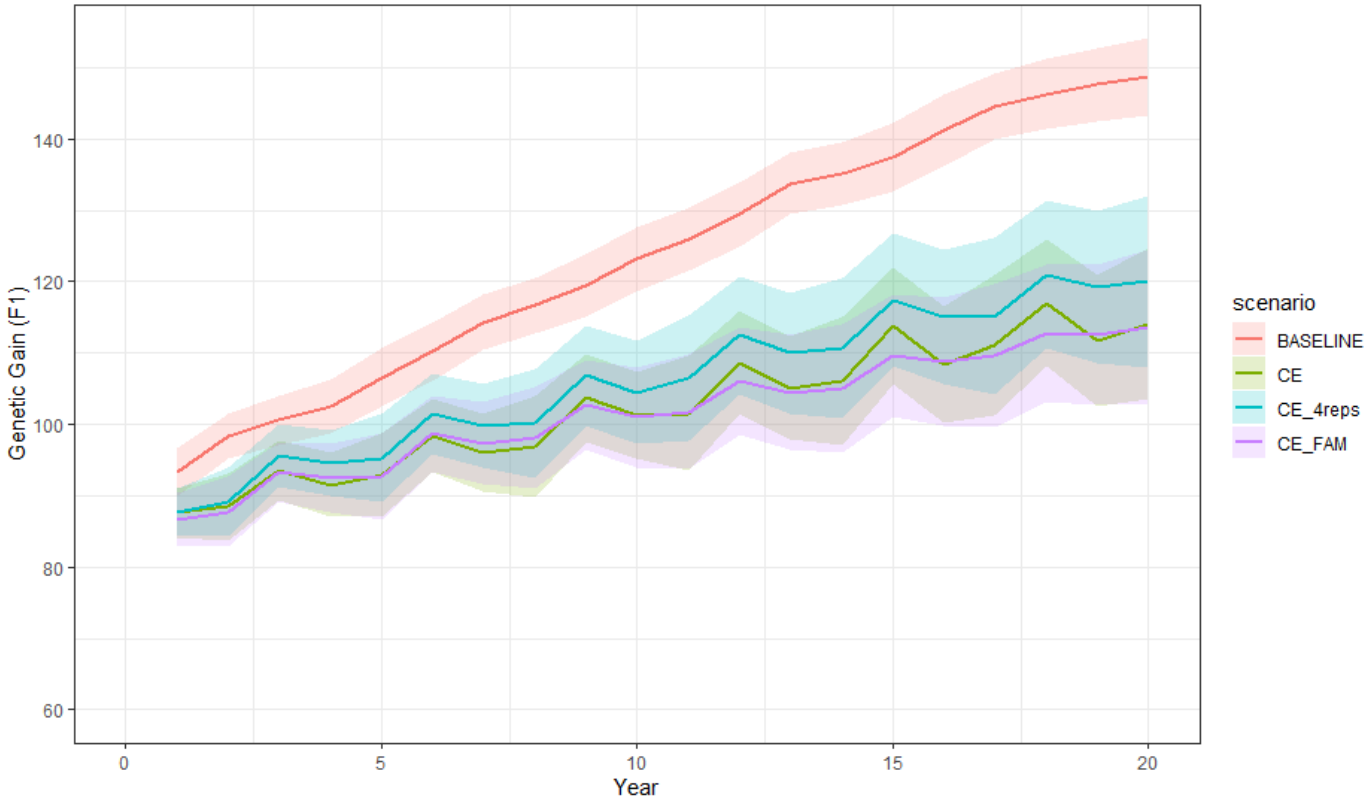
3.2. Results

Baseline with Parents from CE and family selection



Of all the modifications at CE, Increasing accuracy was the best, but this accuracy was still too low to compare with the baseline.

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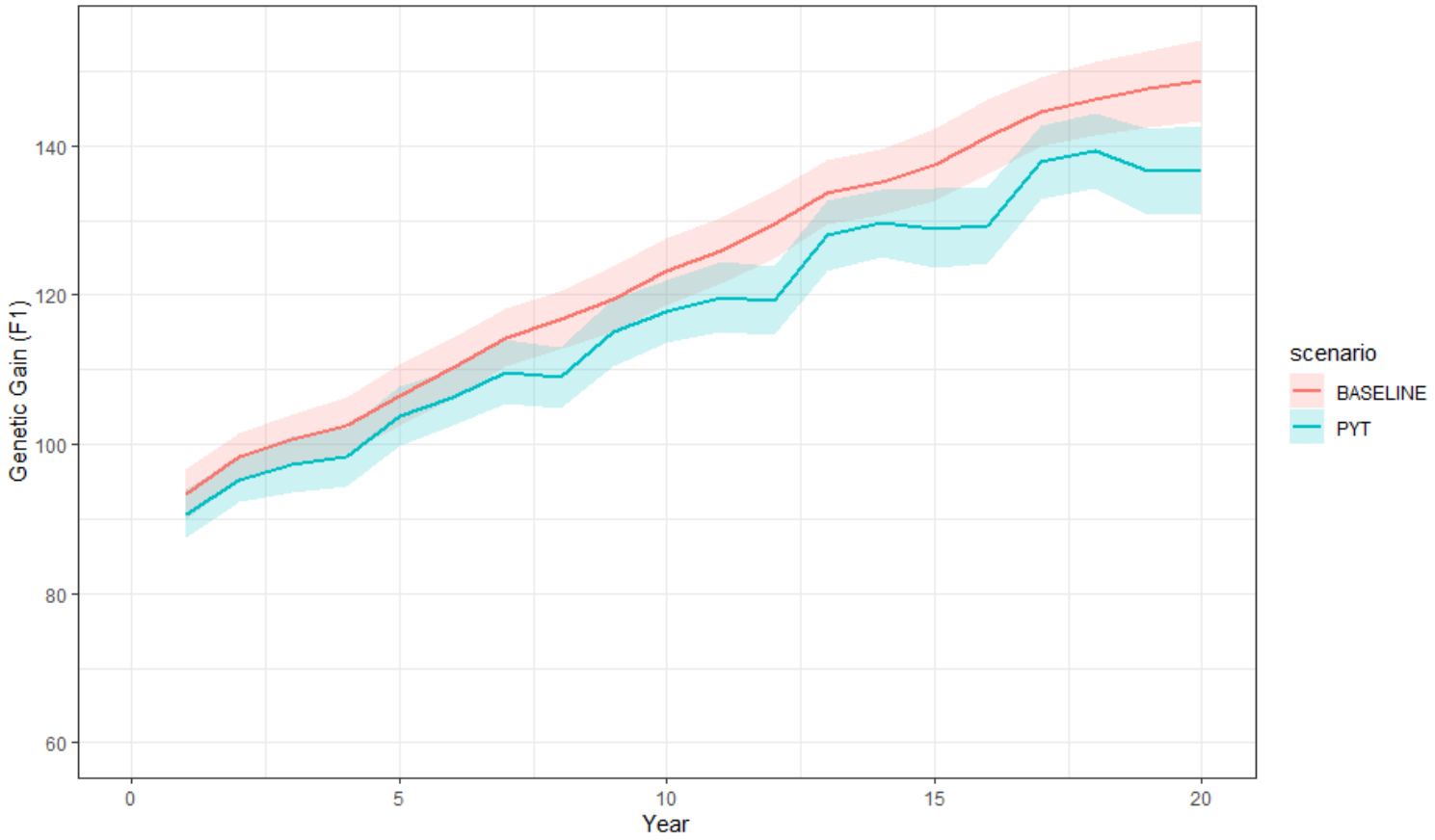
3.3. Results

Baseline vs Parents from PYT



The baseline was still about 8% better than early recycling at PYT

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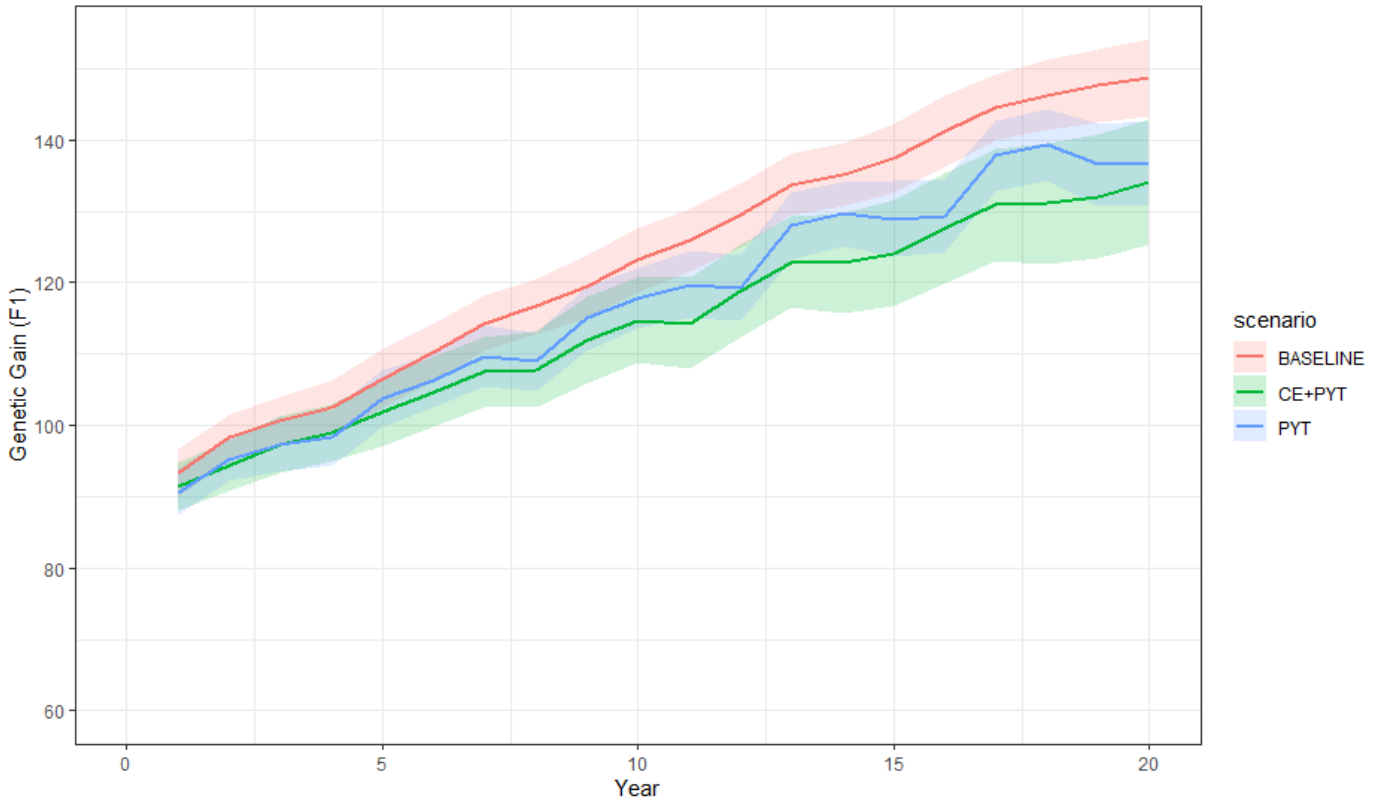
3.4. Results

Baseline vs Parents from CE+PYT



The accuracy at CE is too low to confer any advantage to a mixed crossing block

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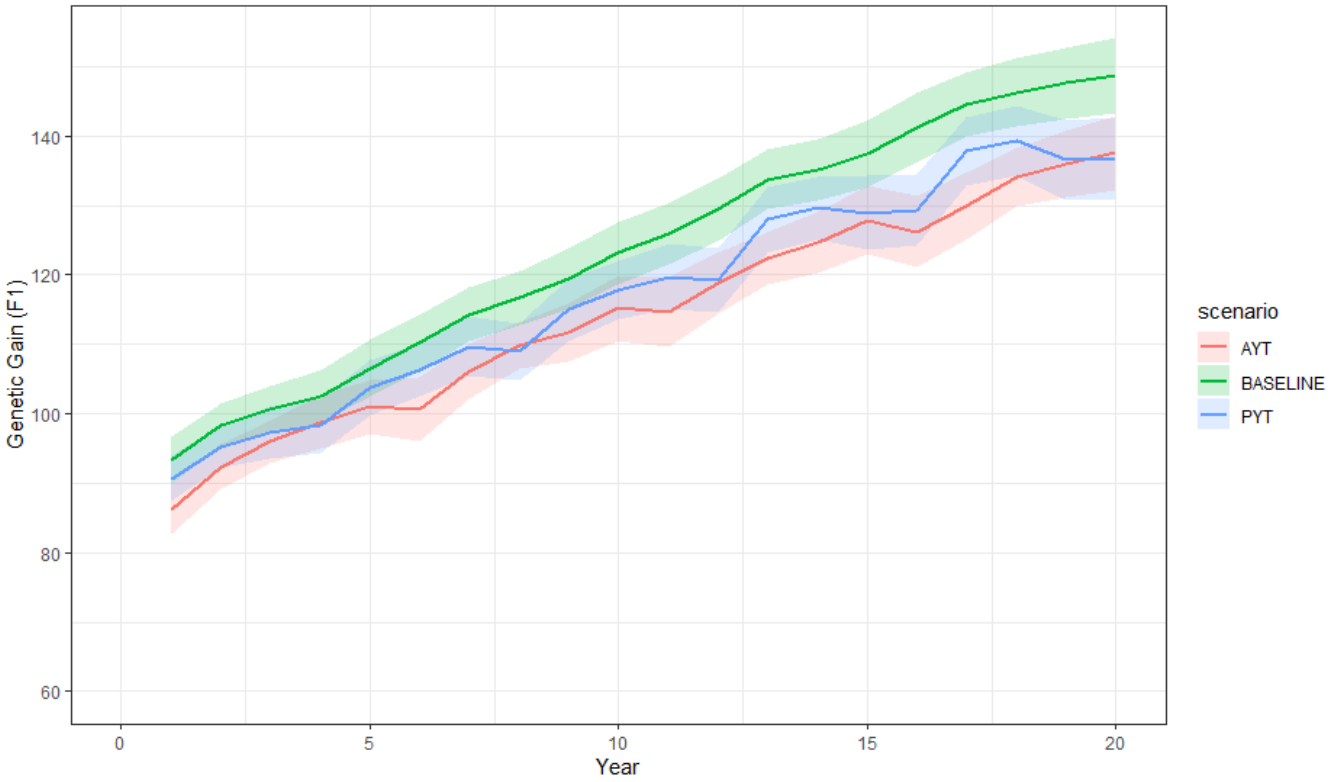
3.5. Results

Baseline vs Parents from PYT or AYT



Between PYT and AYT, trading off accuracy for speed is better

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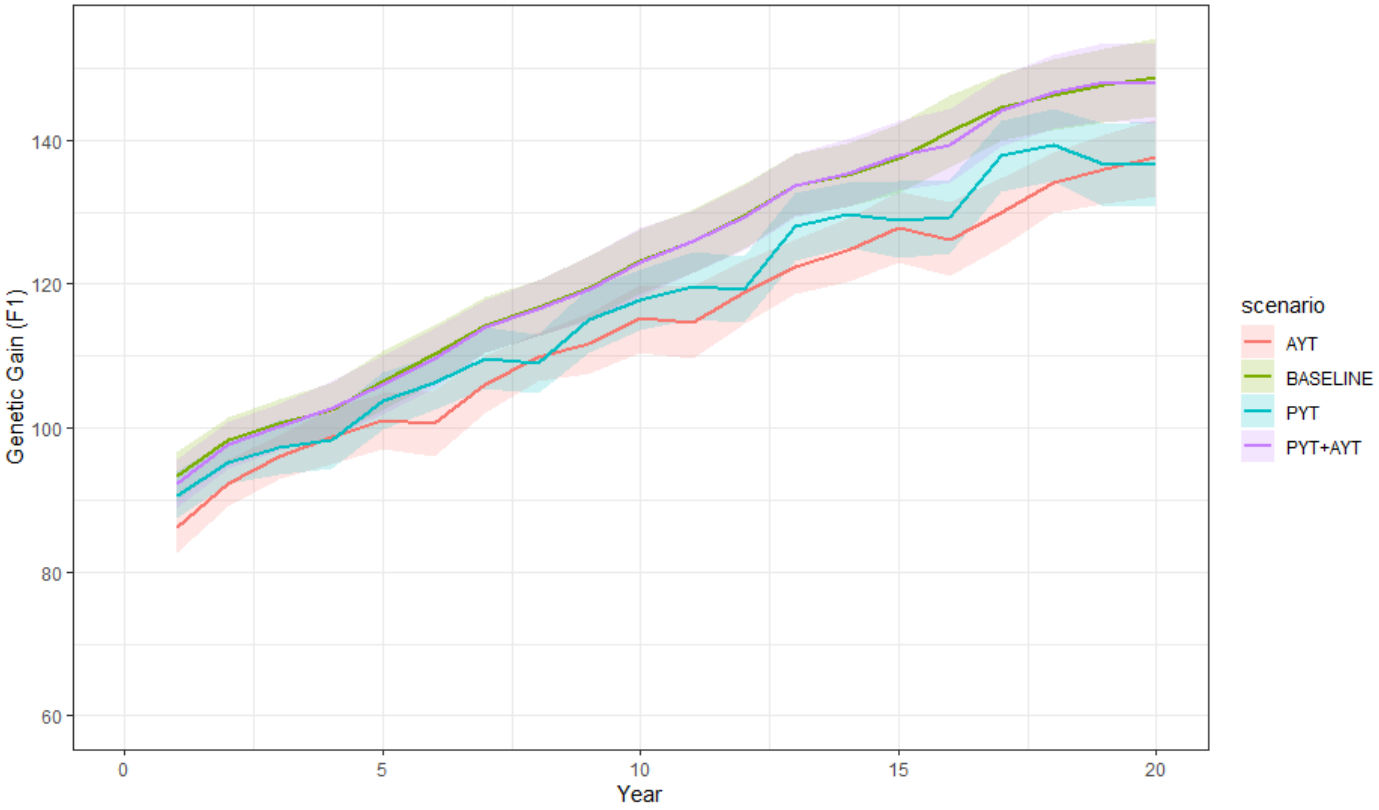
3.6. Results

Baseline vs Parents from PYT + AYT



A mixed crossing block between PYT and AYT are as good as the baseline

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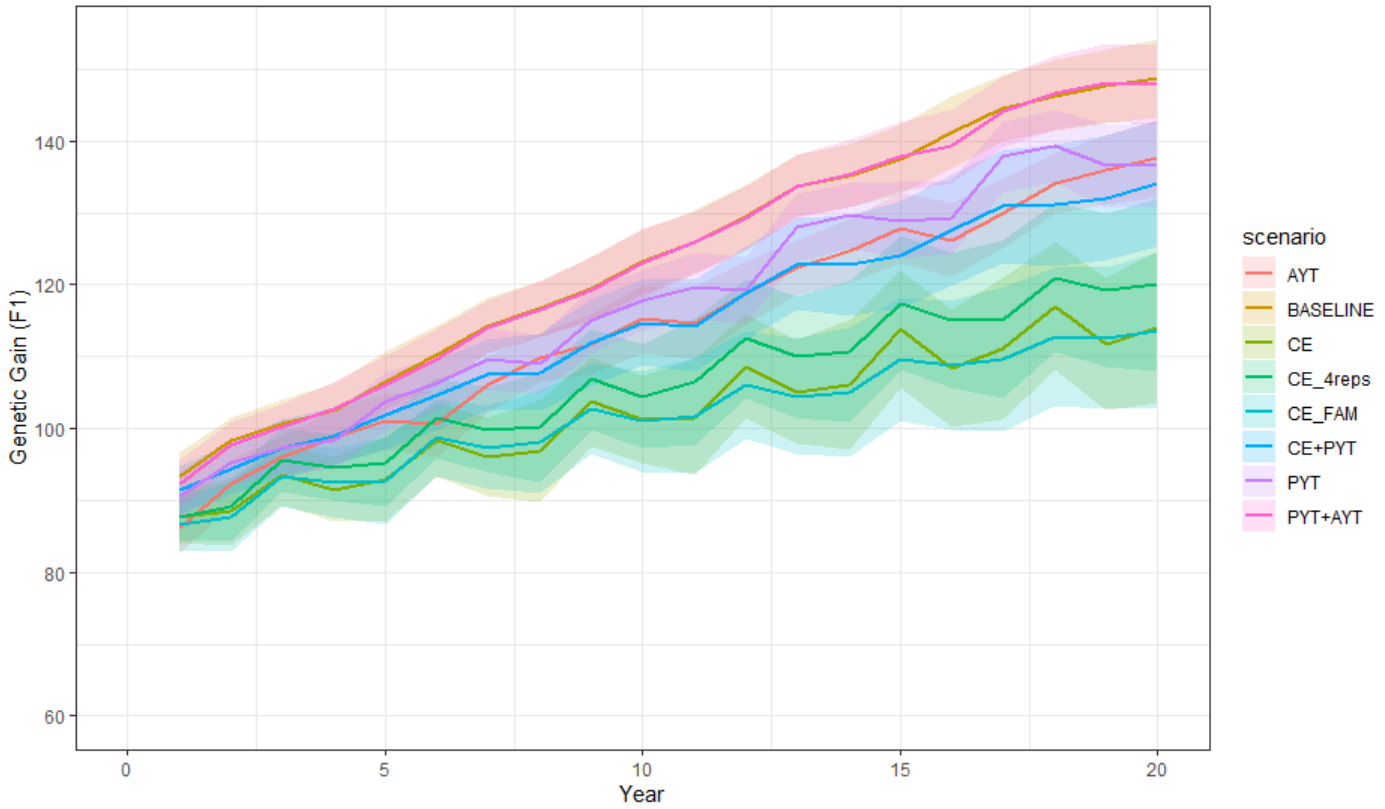
3.7. Results Summary

All scenarios



A view of all treatments together

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4. Conclusion

Going early is a low hanging fruit to increase genetic gains as has been shown for other crops. However, it requires a certain level of accuracy.

Given these results, we recommend recycling using a mixed block of PYT and AYT. This will remove the UYT stages but still retain enough accuracy for selection.

Going faster than this will require substantial increase in accuracy at CE and/or PYT, which would require answering additional questions like the optimal number of locations(reps) required for earlier recycling.

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Thank you for your interest!

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