# Report(IP2): Finding testers for the sweetpotato population in Uganda

**EIB-Roslin Collaboration**
July 23rd 2020

# Baseline

Par/CB PA x PA nParents=20, nCrosses=150, nProgeny=10 PB x PB Par/CB

F1/OT 2Season*2Locs nF1 = 1500@each 2Season*2Locs F1/OT

F1/CB

PA x PB, nInd=200, nTesters=3, nProgeny=10

F1/CB

TC/OT nHybrids=6000,2Season*2Locs TC/OT

ParentSelect=GCA(20)

ParentSelect=GCA(20)

HybridPT(TC/PT):3*2*1.3*2*3 (600)

HybridAT(TC/AT): 6*2*3*4*3 (60)

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# 1. Introduction to the problem

## Crop by Region

CIP-ECASweetpotato

## Problem Specification

Currently, breeding values are estimated based on interpopulation offspring which needs many offspring from each parent to estimate BV. This may affect the rate of genetic gain

## Breeding strategy component tackled

*Crossing* / *Evaluation* / ***Selection***

## Breeders' equation terms tackled

***r, (L)***

## Hypothesis

Using optimal number of testers will increase genetic gain

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# 1. Questions

1. Does hybrid breeding make sense in terms of rates of genetic gain in a heterozygous polyploid?

2. Do we have clear pools in simulations?

3. What would be expected of a similar program but using inbred, diploid parents?

4. Does ploidy change these expectations?

5. Does selecting parents for hybrids using either per se performance or GCA make a difference?

6. If GCA, how many testers for GCA estimation?

# 2.0. Materials and Methods

| Treat | Description |
|---|---|
| T1 | Baseline (Hybrid breeding with three testers); 6x, No nTesters scenarios |
| T2 | Perse performance (one pool): 6x |
| T3 | Hybrid breeding; 2x; Scenarios(6): nTesters (1:5) + perse selection of parents (two pools) |
| T4 | Hybrid breeding; 6x; Scenarios(6): nTesters (1:5) + perse selection of parents (two pools) |

- Simulation: 20-year burnin based on the current scheme (Baseline), and followed by 30-year period of breeding for each treatment
- For 6x, 80% bivalents, 20% multivalents
- 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 AT

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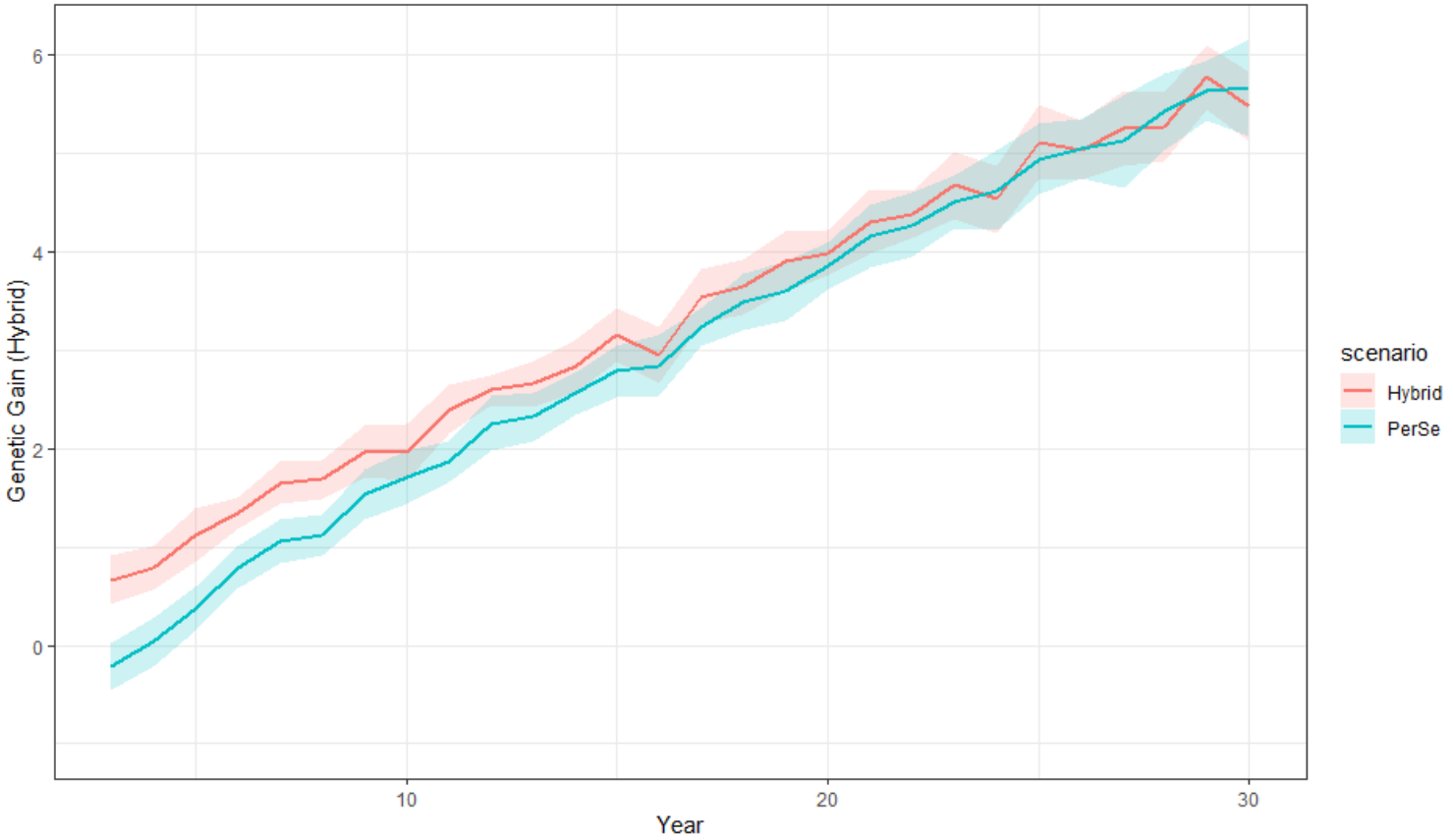
# 3.0. Results

## Hybrid vs Perse Breeding




- Hybrid breeding makes sense
- Perse breeding has a shorter cycle: When to testcross for the hybrid?

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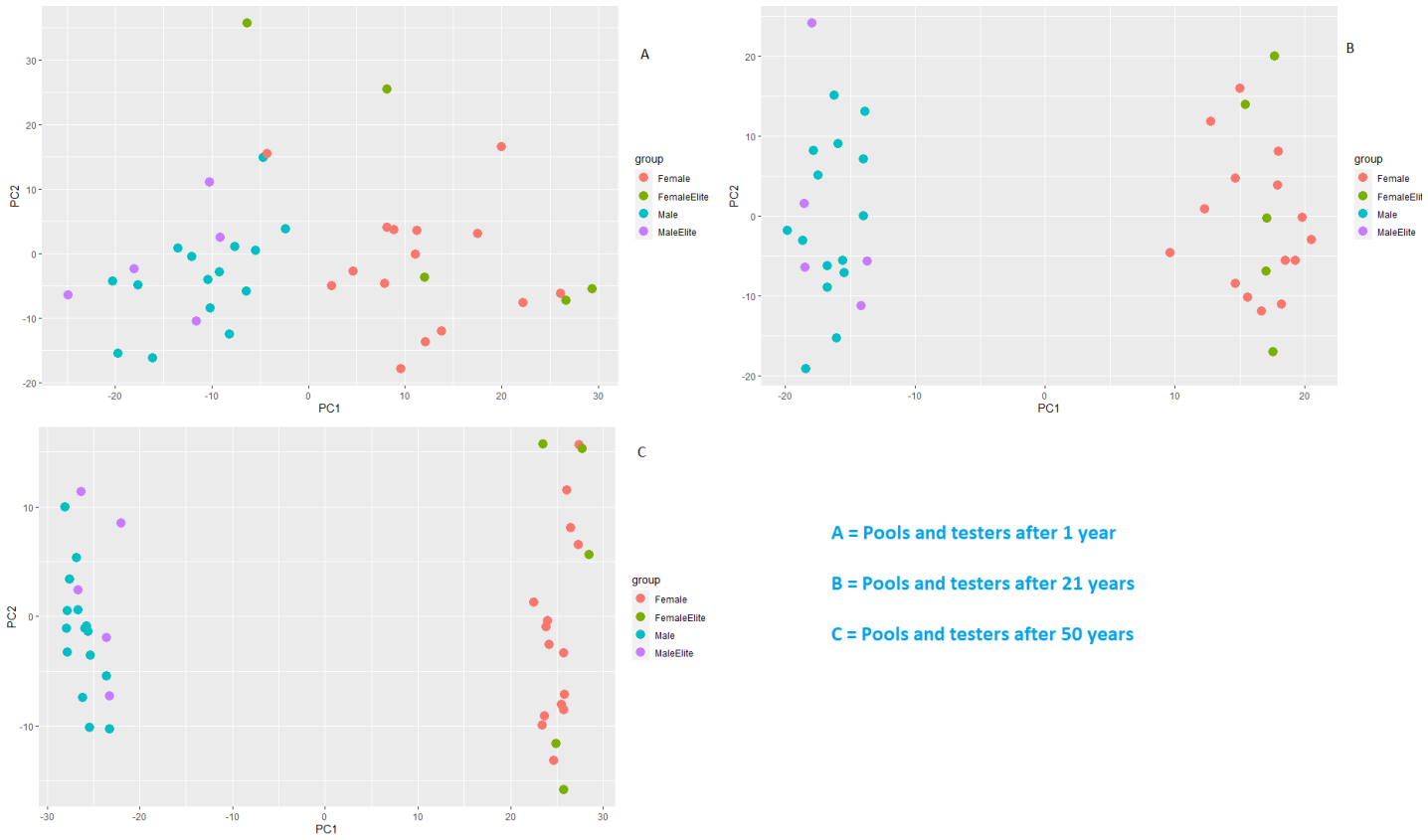
# 3.0. Results

## How are pools separating in relation to testers




A = Pools and testers after 1 year

B = Pools and testers after 21 years

C = Pools and testers after 50 years

- Pools have clearly separated over the simulation period
- Testers updated after every cycle: Very representative; Qn: How often to update?

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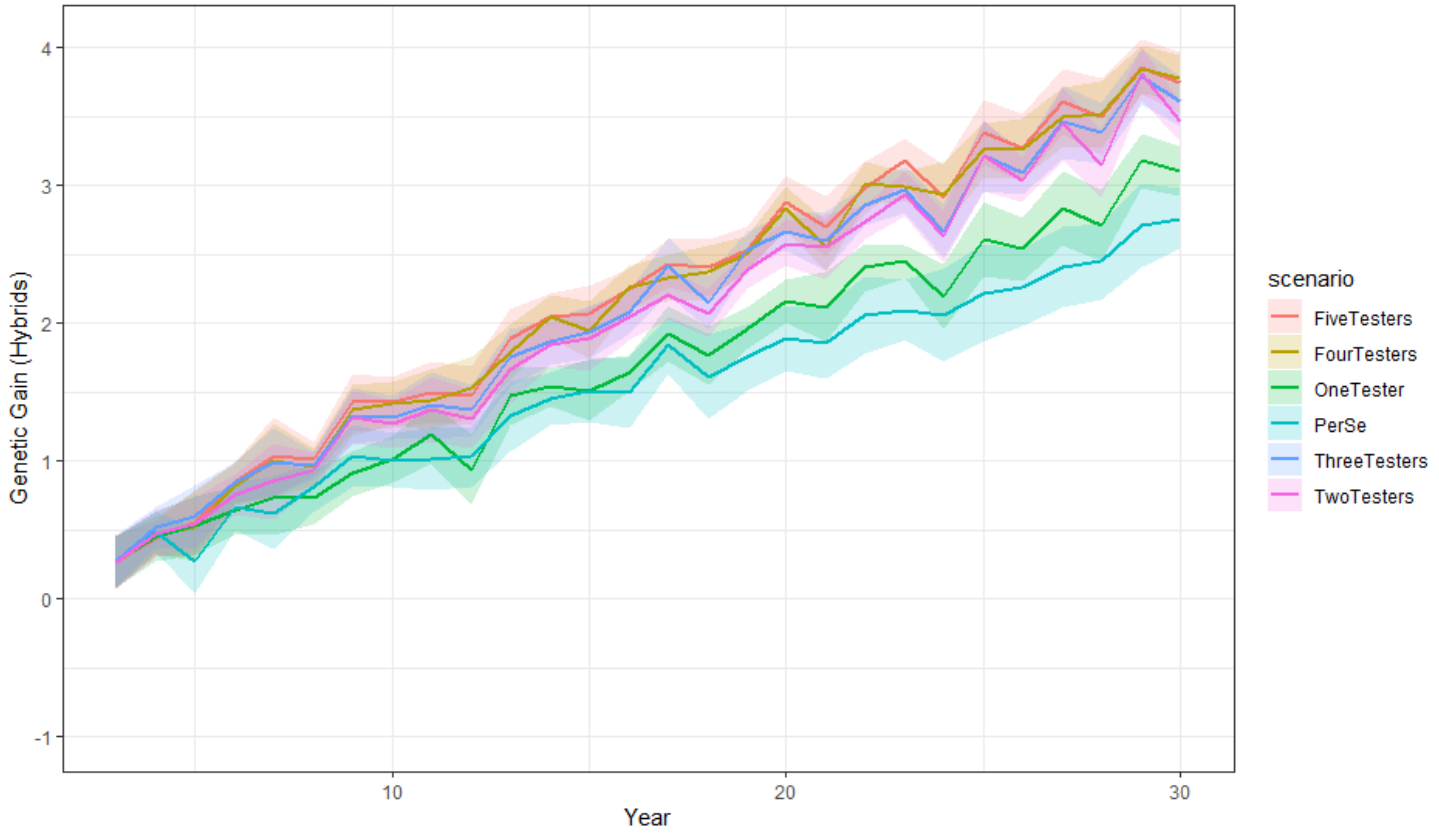
# 3.0. Results

## Scenarios in 2x hypothetical




- Use of one tester is not too bad compared to the scenarios with more testers
- Selecting parents for hybrids using perse performance is the worst scenario
- Worst scenario of testcrossing about 18% better than perse performance
- Advantage according to >nTesters

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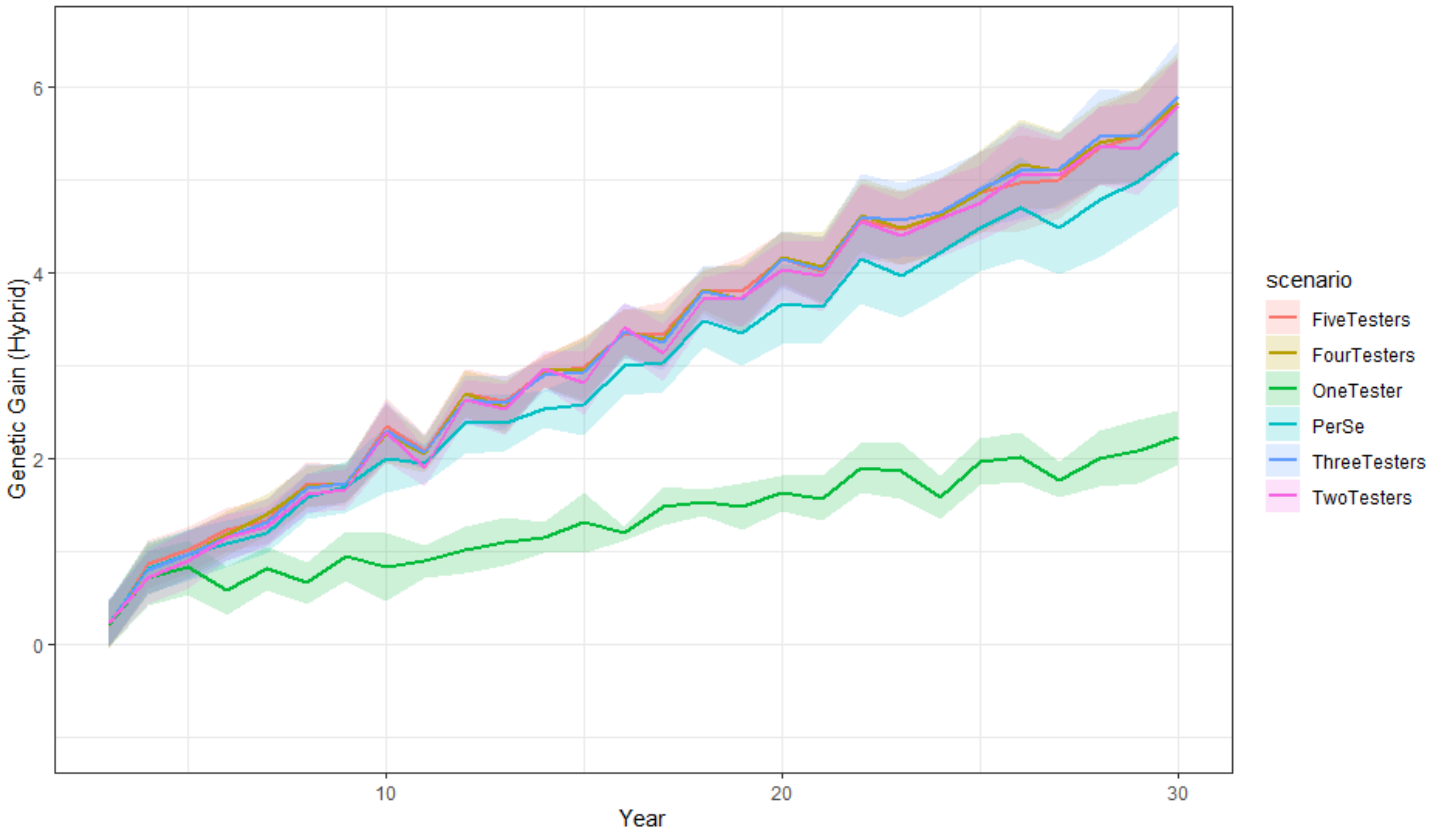
# 3.0. Results

## Scenarios in 6x reality(meanDD=0.5)




- Use of one tester is the worst scenario
- Perse performance not a very bad predictor of GCA due to heterozygosity
- nTesters >1 is good for this pipeline.

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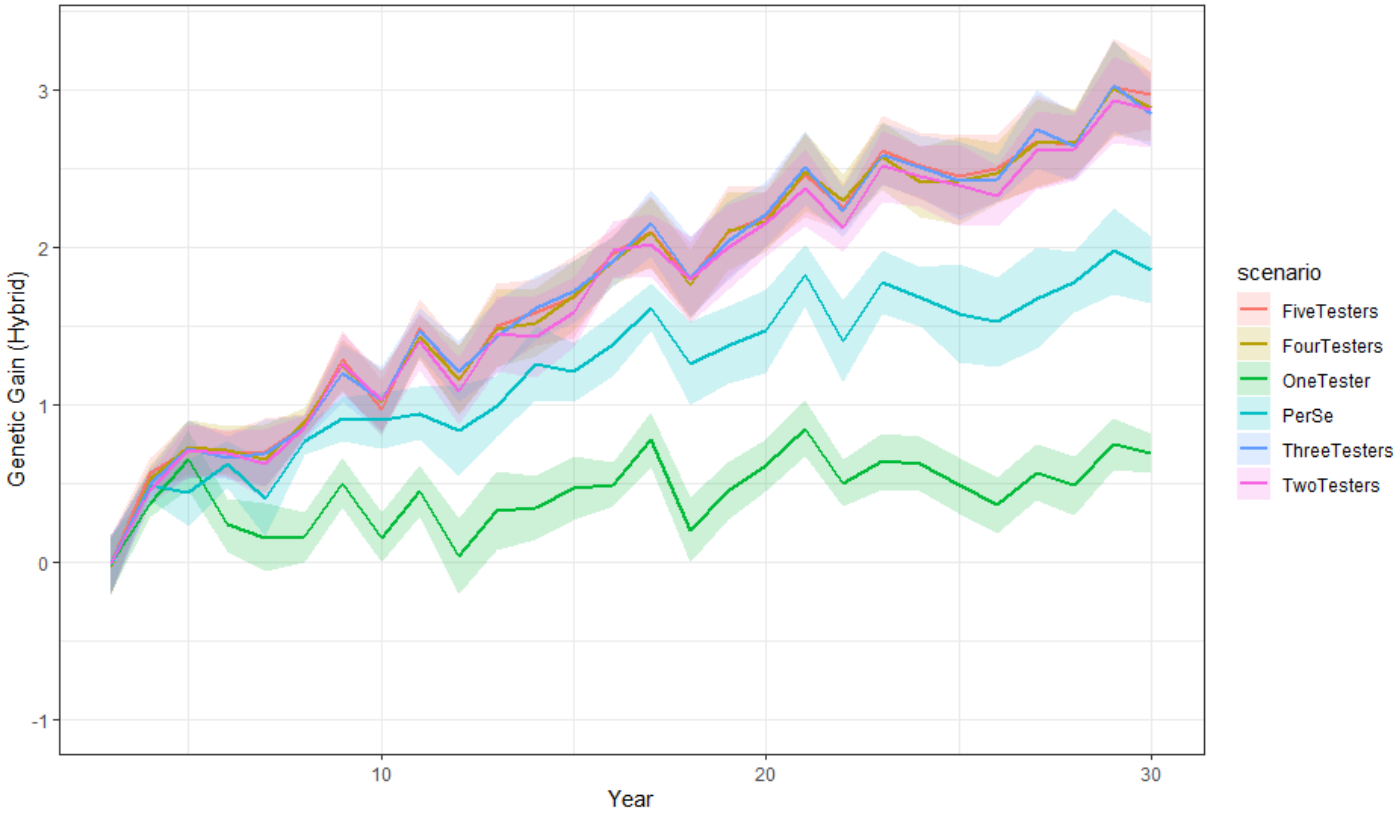
# 3.0. Results

## Scenarios in 6x reality (meanDD=6)




- Use of one tester is the worst scenario
- Perse performance not a very bad predictor of GCA due to heterozygosity
- nTesters >1 is good for this pipeline.

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# 4. Conclusion

- Use of testcrosses for hybrid breeding is a good option for this pipeline
- nTesters between 2 and 5 can be used
- Additional questions to be answered: when to testcross in order to reduce the generation cycle and the advantage of perse breeding in the medium term.

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# Thank you for your interest!

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