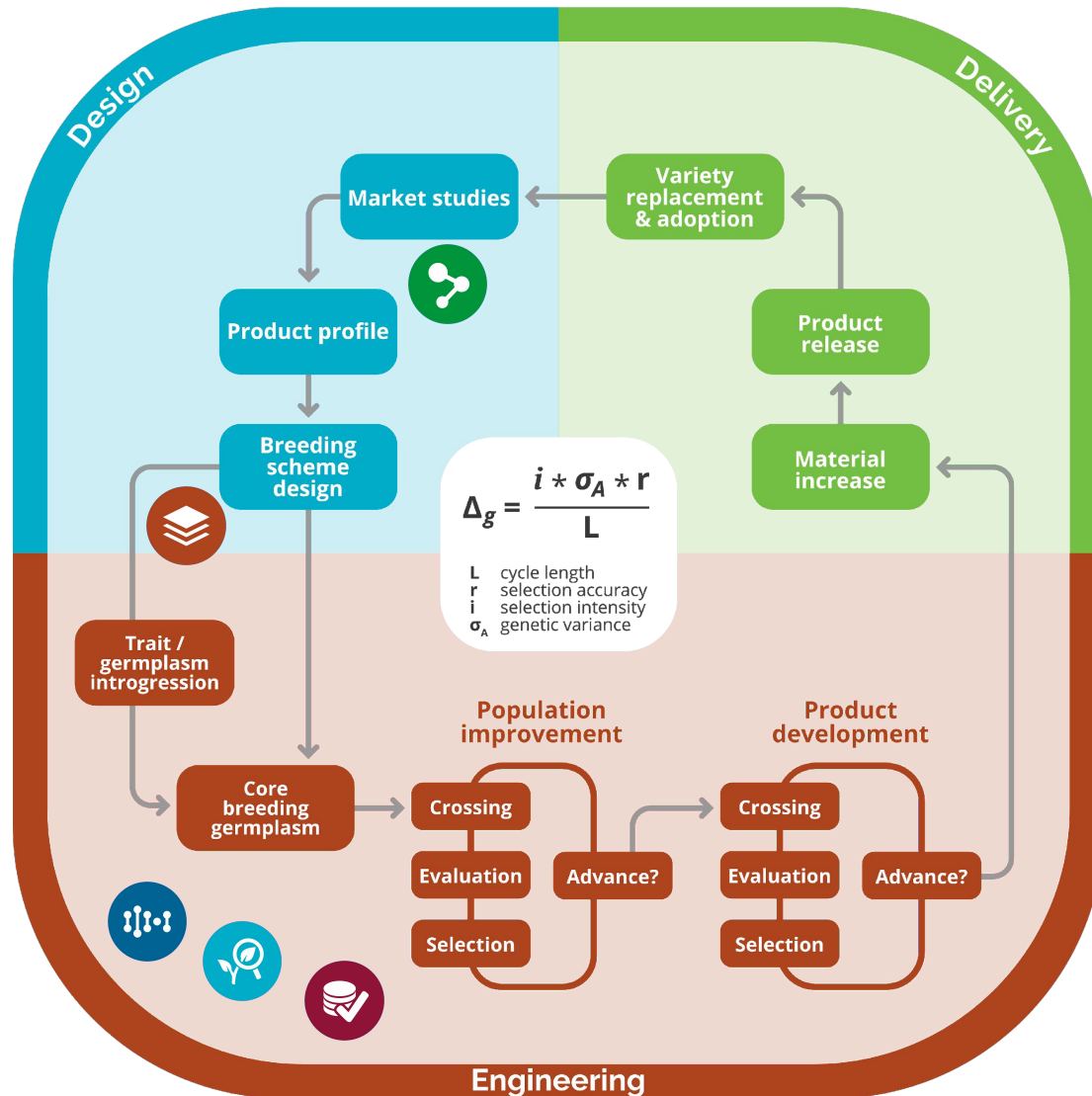


# Breeding scheme optimization

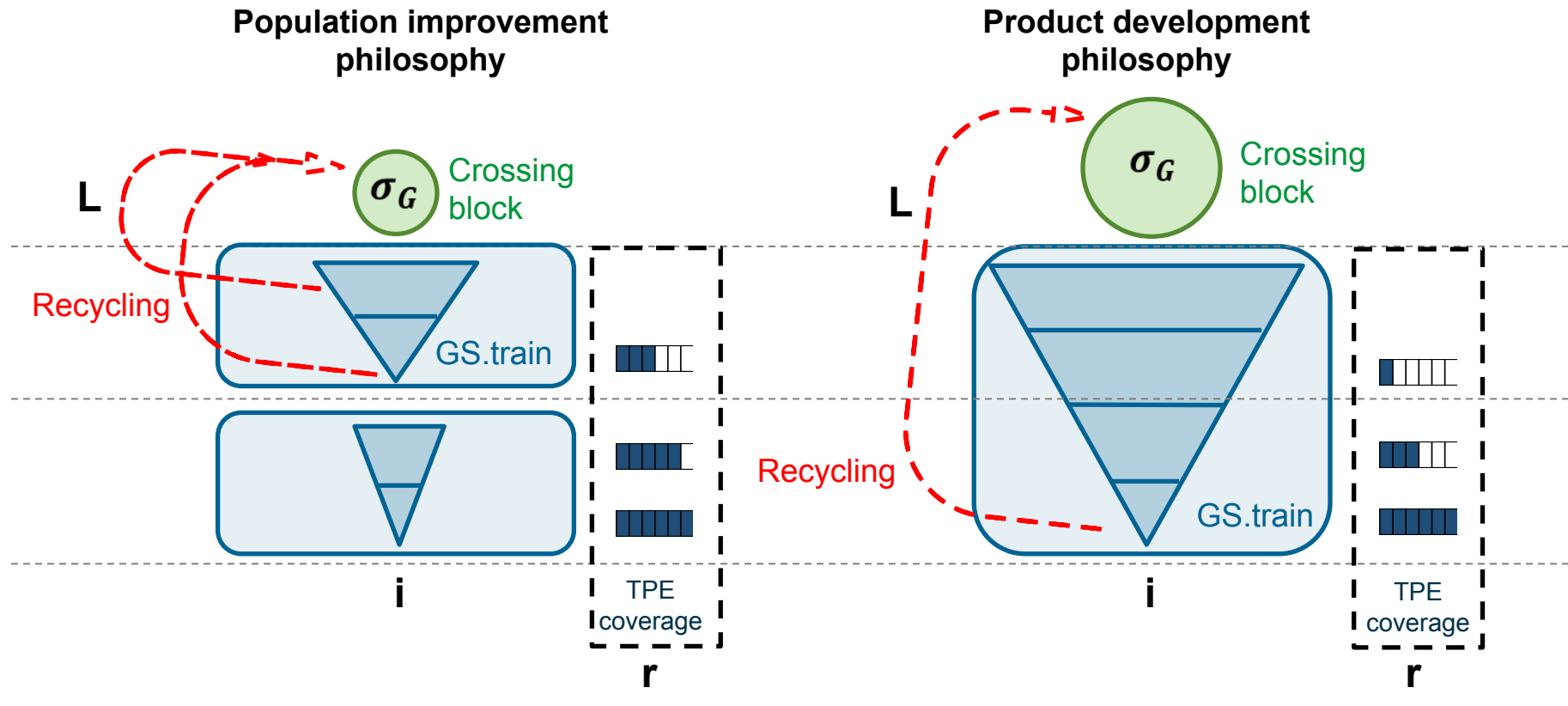
Giovanny Covarrubias-Pazaran

# Where breeding scheme optimization fits?



- Encourage formalization the breeding process.
- Help formalize breeding schemes.
- Design crossing, evaluation, selection strategies.
- Link to pertinent modules.

# Philosophy of breeding scheme optimization



## Features

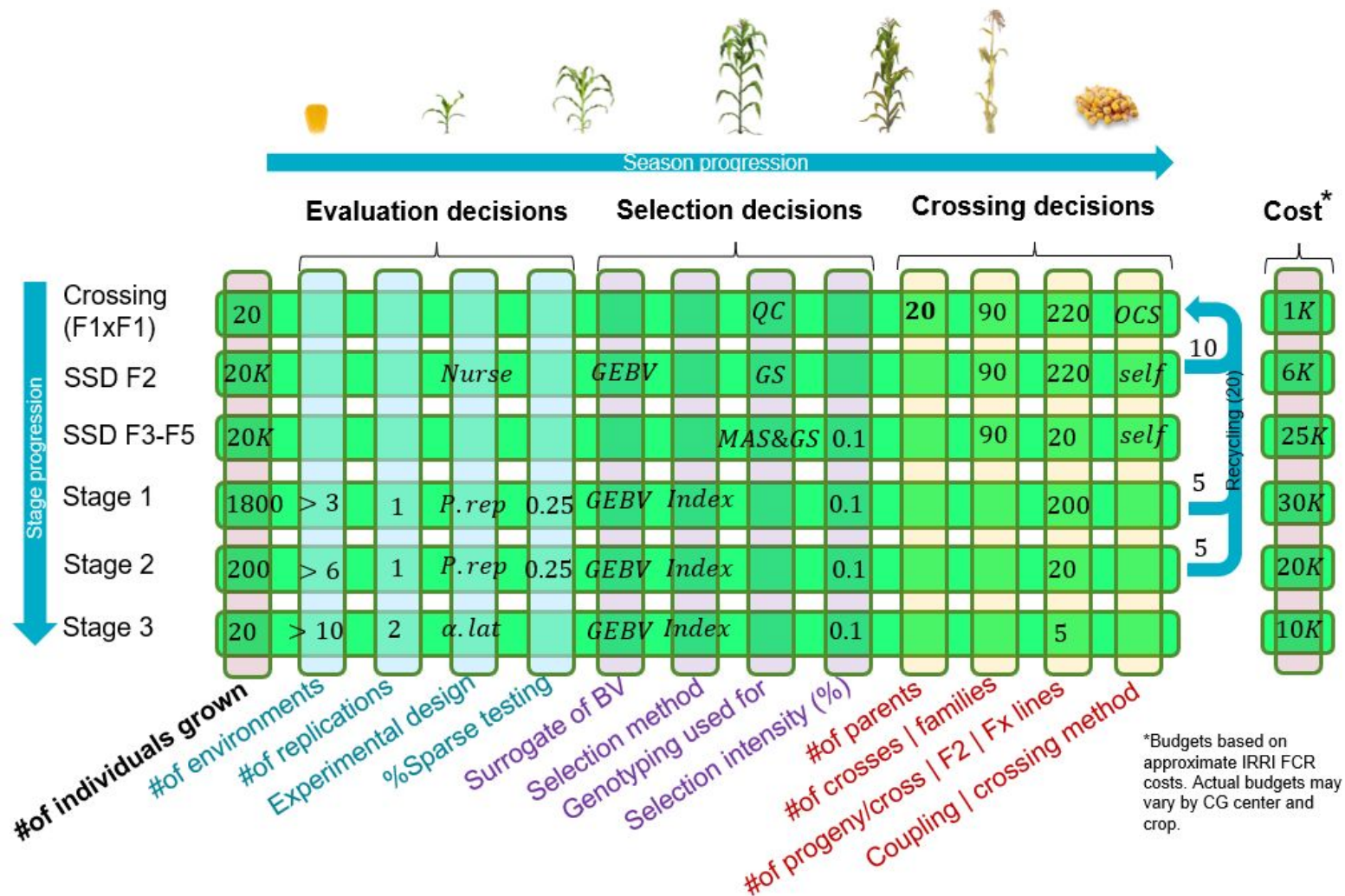
1. Focus on parent selection as early as possible (L)
2. Products are a spin off
3. Moderate size (i)
4. TPE covered early (r)
5. GS focused in recycling

1. Focus on product selection as accurate as possible (i)
2. Parents are a spin off
3. Big size (i)
4. TPE covered until PD (r)
5. GS focused in skipping stages

# What this module offers partners?

- Direct Support
  - Pipeline formalization
  - Opportunity assessment of strategy
  - Simulation support for proper adoption of technology/strategies
  - Retrospective analyses
- Capacity building
  - Forums for sharing ideas (Community of practice)
  - Workshops/trainings
  - “How to” manuals

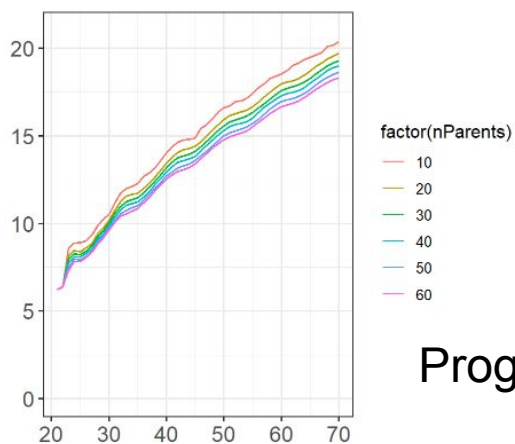
# Achievements 2020: Direct support



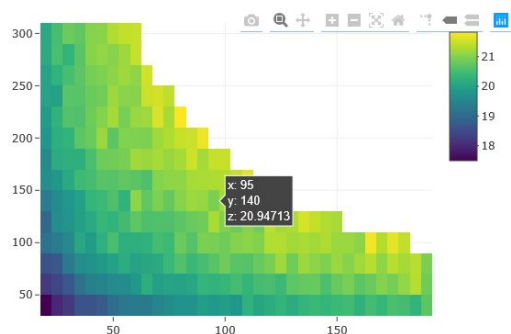
- Formalizing pipelines helps programs addressing structural changes.

# Achievements 2020: Direct support

- Simulations help answer important questions.
- Etc.

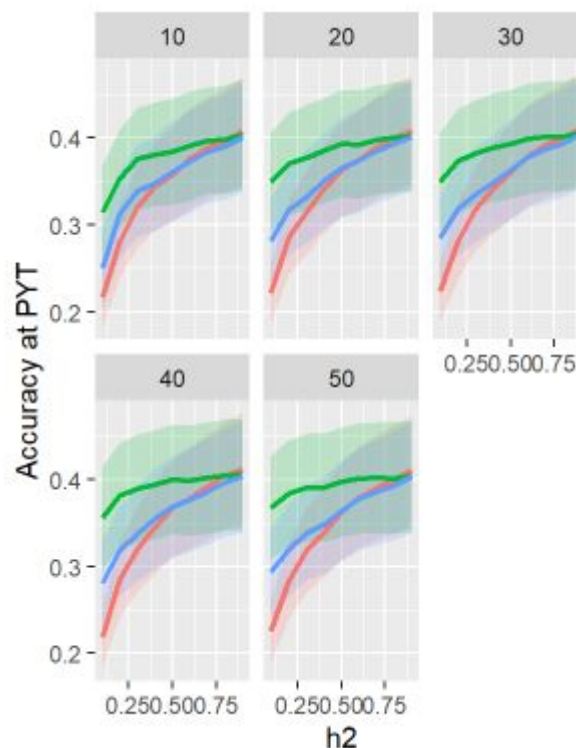


Program size

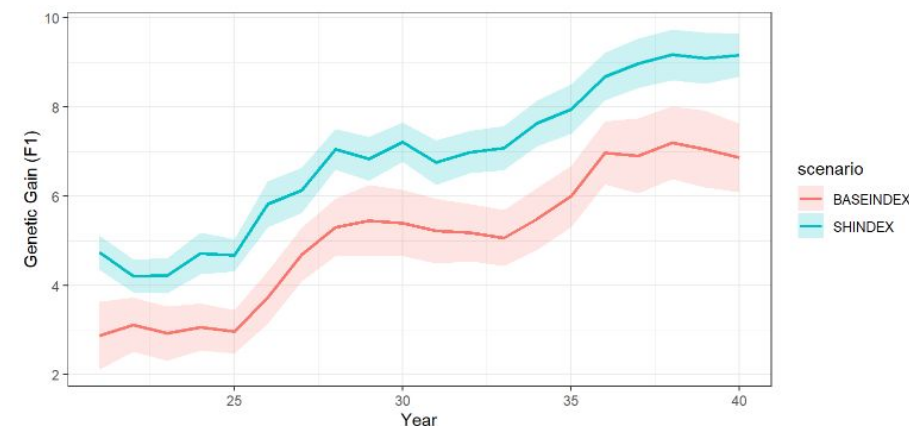


Heterosis

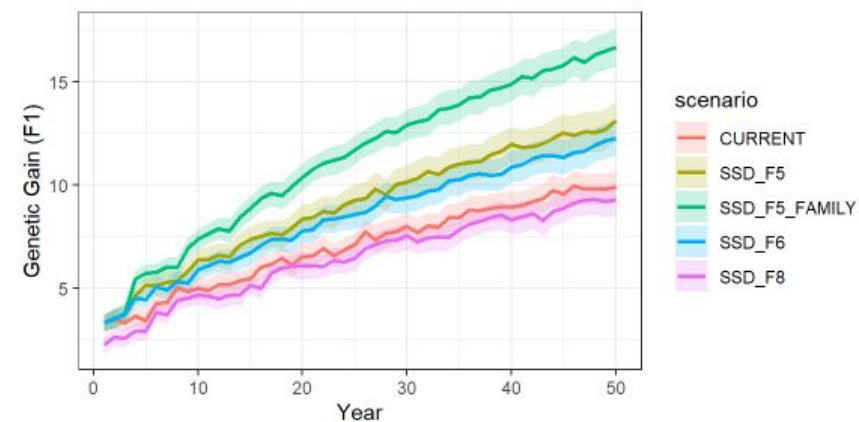
GS implementation



Selection index



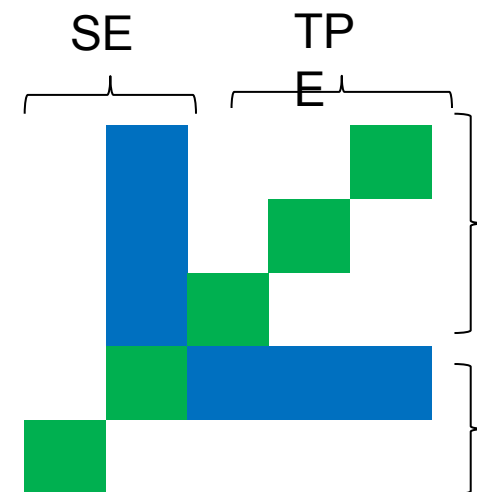
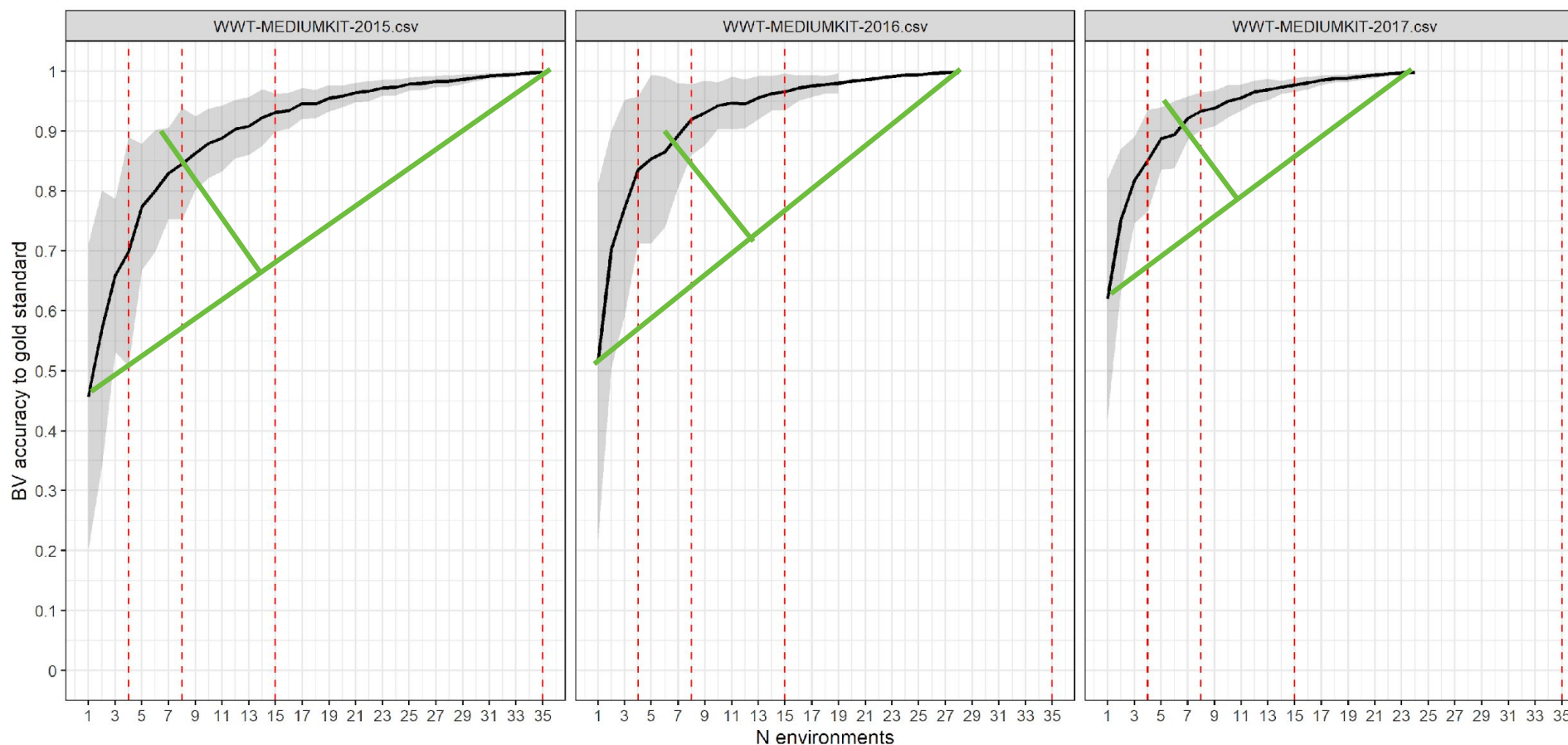
Recycling strategy





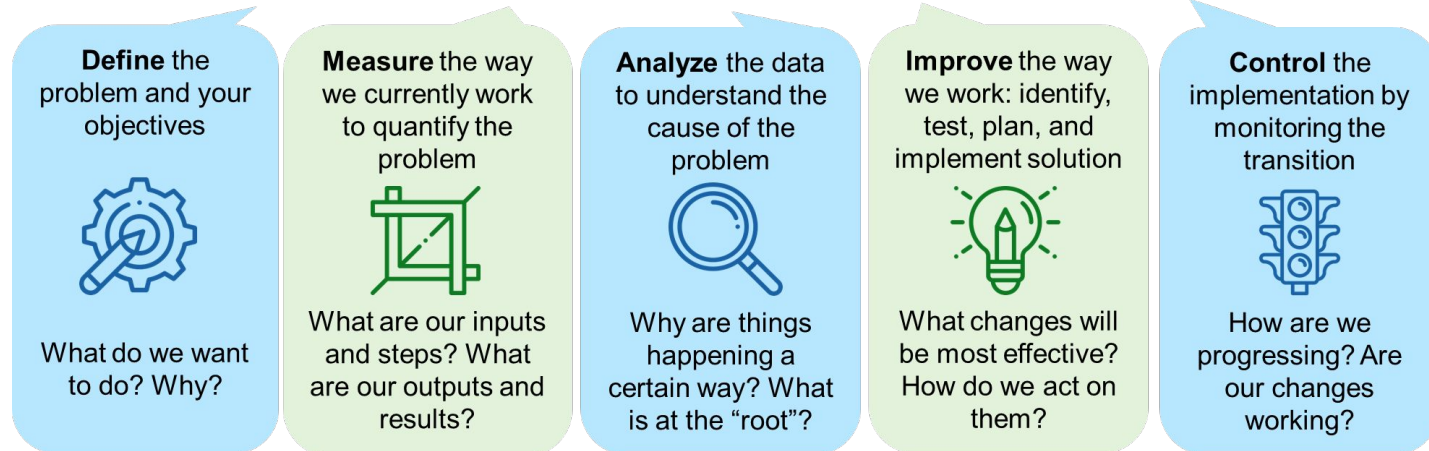
# Achievements 2020: Direct support

- Retrospective analysis help improve decision making.



# Achievements 2020: Capacity building

## D M A I C

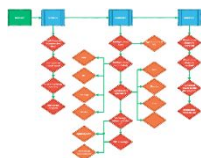


- Training on continuous improvement methods applied to breeding scheme design.

### Project charter

- **Business Case:** where this fits in terms of our overall goals
- **Problem Statement:** the issue we have identified and intend to resolve
- **Goal Statement:** what we hope to achieve
- **Project Scope:** defines the project boundary
- **Project team:** members, descriptions, and roles and responsibilities
- **Milestones:** timelines and key deliverables
- **Benefits:** approximation of what we expect the project will achieve

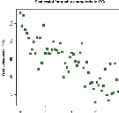
### Process flowchart



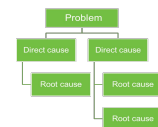
### Value stream mapping



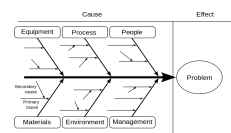
### Correlation analysis



### Problem tree



### Fishbone analysis



### Simulation



### Improvement plan

Item	Responsible	Date
1. Review the current process and identify areas for improvement.	Dr. [Name]	2020-10-15
2. Conduct a root cause analysis for the identified issues.	Dr. [Name]	2020-10-20
3. Develop and implement corrective actions.	Dr. [Name]	2020-10-25
4. Monitor the results and report back to the team.	Dr. [Name]	2020-10-30

### Implementation plan

Item	Responsible	Date	Status	Comments
1. Review the current process and identify areas for improvement.	Dr. [Name]	2020-10-15	Completed	
2. Conduct a root cause analysis for the identified issues.	Dr. [Name]	2020-10-20	In Progress	
3. Develop and implement corrective actions.	Dr. [Name]	2020-10-25	Not Started	
4. Monitor the results and report back to the team.	Dr. [Name]	2020-10-30	Not Started	

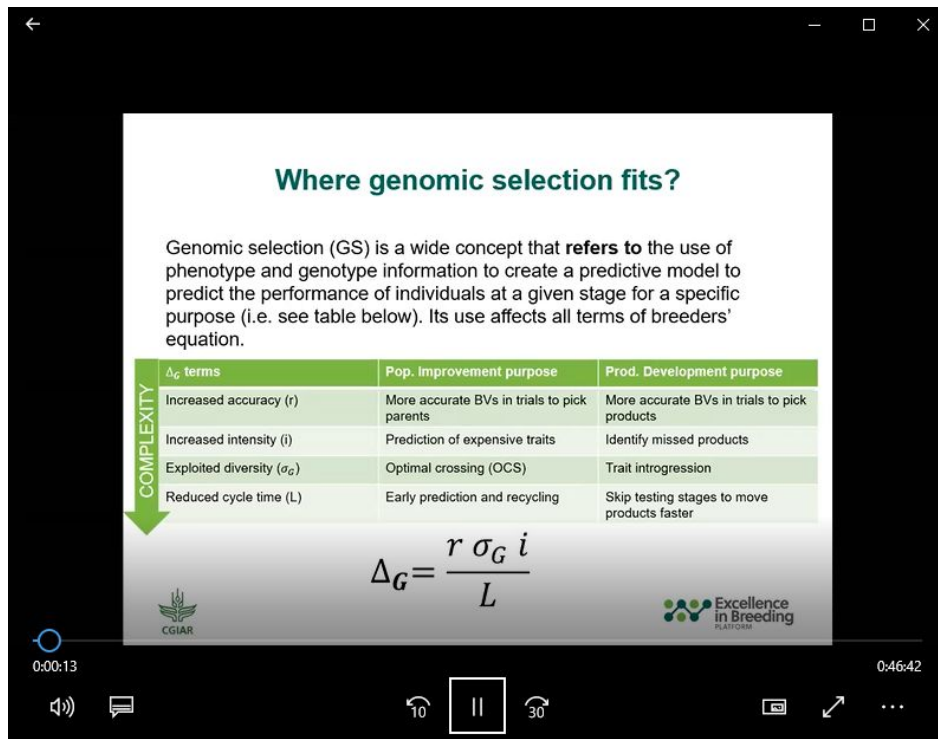
### Control plan



# Achievements 2020: Capacity building

- Knowledge transfer motivates adoption.

## CoP meetings



The screenshot shows a video player interface. The main content is a presentation slide titled "Where genomic selection fits?". The slide defines Genomic selection (GS) and includes a table with three columns:  $\Delta_G$  terms, Pop. improvement purpose, and Prod. Development purpose. Below the table is the formula  $\Delta_G = \frac{r \sigma_G i}{L}$ . The video player has a progress bar at the bottom showing 0:00:13 to 0:46:42.

**Where genomic selection fits?**

Genomic selection (GS) is a wide concept that **refers to** the use of phenotype and genotype information to create a predictive model to predict the performance of individuals at a given stage for a specific purpose (i.e. see table below). Its use affects all terms of breeders' equation.

$\Delta_G$ terms	Pop. improvement purpose	Prod. Development purpose
Increased accuracy ( $r$ )	More accurate BVs in trials to pick parents	More accurate BVs in trials to pick products
Increased intensity ( $i$ )	Prediction of expensive traits	Identify missed products
Exploited diversity ( $\sigma_G$ )	Optimal crossing (OCS)	Trait introgression
Reduced cycle time ( $L$ )	Early prediction and recycling	Skip testing stages to move products faster

$$\Delta_G = \frac{r \sigma_G i}{L}$$


The screenshot shows the Excellence in Breeding Platform website. The top navigation bar includes links for About Us, Modules, Toolbox, Get involved, and Annual Meeting. The main content area is titled "EiB breeding scheme optimization manuals". On the left, there is a "Search Toolbox" sidebar with filters for Keywords, Author /Service provider, Type, and Topic. The "Tools" section is expanded, showing "Optimizing breeding schemes". The main text describes a series of manuals outlining best practices in breeding scheme design and optimization.

**Excellence in Breeding PLATFORM**

About Us ▾ Modules ▾ Toolbox Get involved Annual Meeting ▾

**Search Toolbox**

Keywords

Author /Service provider

Type

Topic

- ☐ Product design and management
- ☐ Optimizing breeding schemes
- ☐ Genotyping / sequencing tools and services

## EiB breeding scheme optimization manuals

**Tools**

**Optimizing breeding schemes**

**A series of manuals outlining best practices in breeding scheme design and optimization.**

In order to deliver higher rates of genetic gain and variety turnover, breeding programs targeting low- to middle-income countries must adopt standard best practices in breeding scheme design in order to enable a continuous process of optimization to deliver on breeding targets (product profiles).

The CGIAR Excellence in Breeding Platform has developed this series of practical and conceptual manuals to set a common terminology and conceptual framework to visualize the main steps in a breeding process.

# Challenges from 2020

- Critical mass of M2 team to attend the #of pipelines
- Lack of culture of data usage in some programs
- Tradition is difficult to beat
- Population improvement vs product development philosophy
- Definition of market segments and targets in progress

# What to expect in 2021?

- Shared services
  - Simulation software, GUIs,
- Direct support:
  - Team expansion for greater 1:1 support
- Capacity building:
  - New trainings (Breeding scheme design)



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Excellence in  
Breeding  
Platform