Accelerated Breeding 2025 Goals: Goal #1 Deep dive

Accelerated Breeding Team

4th June 2025

Meeting Design

Purpose

- An **Information sharing** meeting on goal #1 of Accelerated Breeding (AB) high level goals for 2025

Outcomes

- Breeding teams across programs understand AB goal #1, what is expected of them, levels of engagement and where to seek support

Agenda

- Opening remarks: Michael; 5mins
- Presentation: Dorcus, Peter, Bish; 35mins
- Discussion: All; 50mins

Breeding Strategy

Breeding Program

Breeding Pipelines

Market Segments each with a unique TPP

Breeding effort focused on a market segment

Breeding Schemes

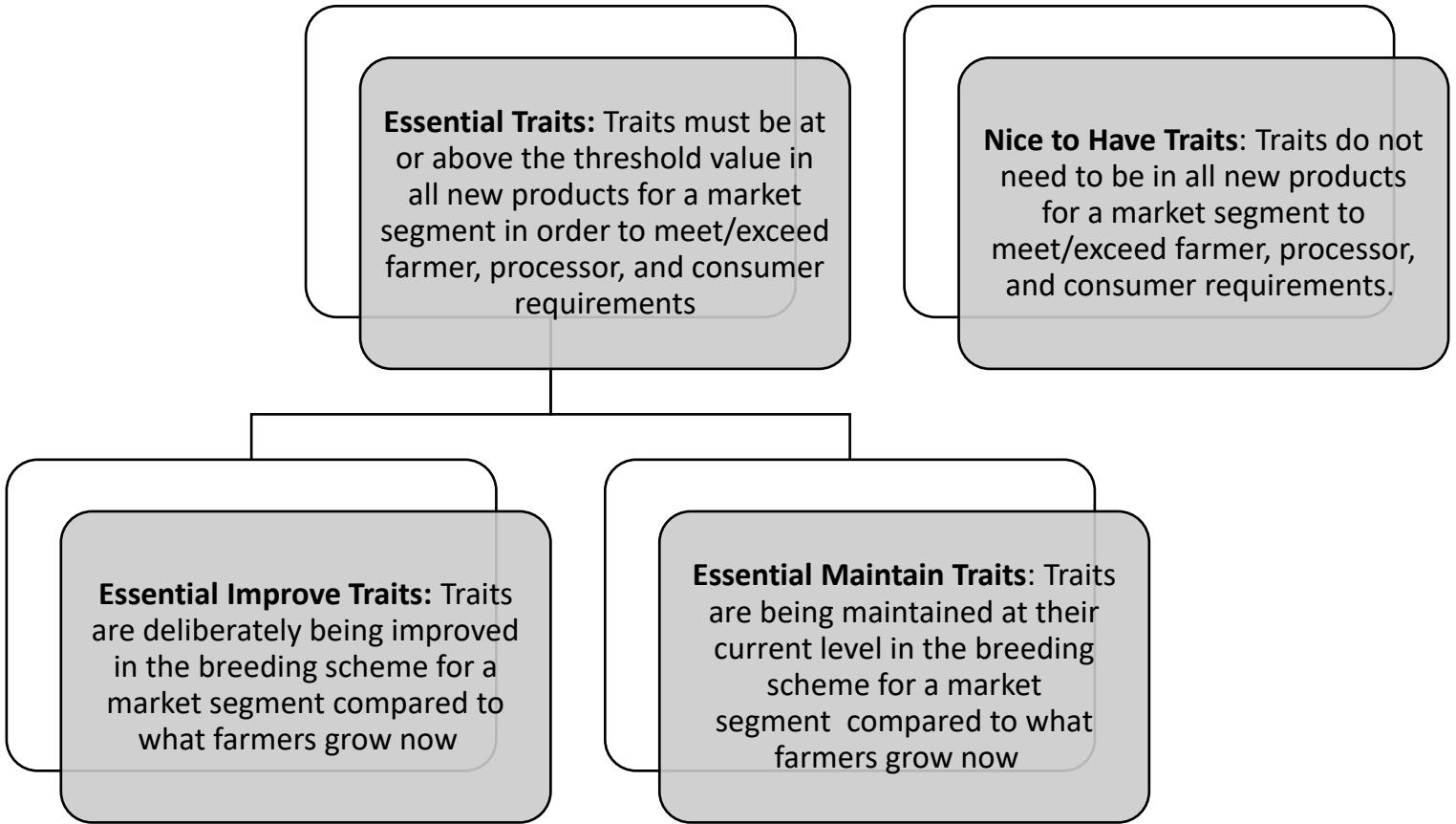
Goal #1: Breeding Strategy-Product Design

- While we have many good quality Target Product Profiles (TPPs; ~65%), some TPPs contain too many essential improve traits.

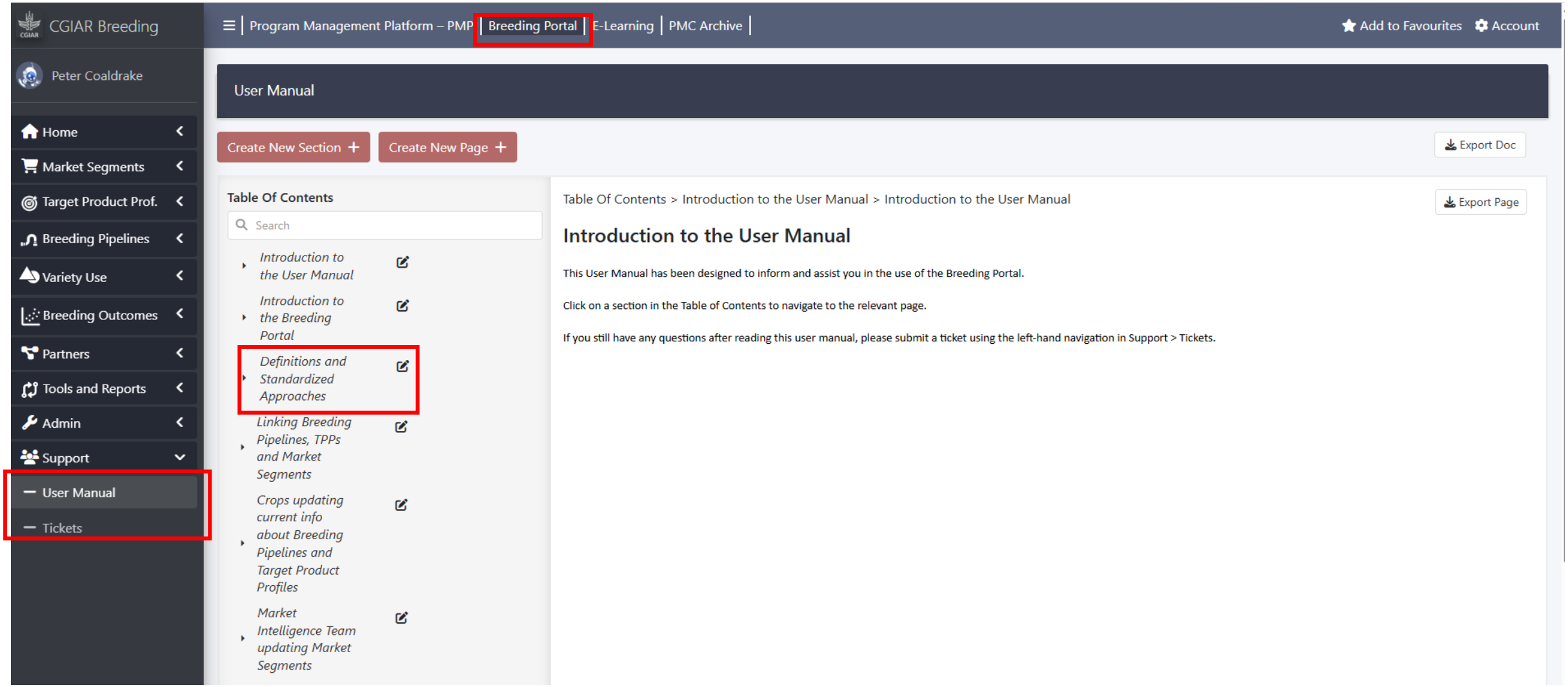
- Trying to improve too many essential traits will lead to negligible breeding progress.
  - Need to review and refine these (About 35% TPPs to be feasible via a cycle(s) of breeding

Product Design: Definitions

Target Product Profile: The set of essential and nice-to-have traits, the scale used to measure each trait and the threshold score for each trait that is required in a new product to meet or exceed the needs of farmers, processors and consumers in a crop market segment



Where to find definitions



Product Design: What is a good TPP

A good TPP needs to be at the same time feasible, impactful and in-demand

Feasible: The Desired Score of all the Essential Improve Traits should be achievable in a candidate variety within a clearly defined timeframe.

- Essential Improve Traits pursue 1-2 (max 3) value propositions
- Other value propositions can exist as Essential Maintain Traits because they already exist in the germplasm, based on past breeding efforts.

Impactful: Pursued value propositions should provide greatest benefit to farmers and consumers to create impact

In-demand: The targeted change in Essential Traits, as compared to check varieties, should be recognizable to farmers and they, (and seed companies) ***will want to replace*** their current variety.

Product Design – How to choose Essential Improve Traits given the need to focus on a few

Essential improve trait = **The reason why farmers/the market will want to replace their current variety**

What trait(s) need to be better?

- Market perspective and priorities –They are the decision makers
- The **improvement** needs to be large enough that farmers/the market recognizes the change and its value
- Identified and prioritized together with stakeholders (informants) e.g. through Product Design Team meetings.
    - Also draw on market surveys, and insights from gender research.

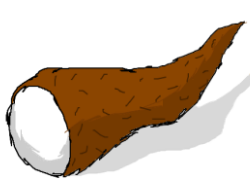
Essential Improve traits: Consequences of too many?

- **Reduced selection intensity:** If you select the top 10% for one trait, you're applying strong pressure. But if you also need the top 10% for five traits, very few individuals will qualify.
  - Exponentially larger population sizes required
- **Genetic trade-offs:** Negative trait correlations might inadvertently reduce performance in one trait while improving the other
  - Affects both Essential Improve and Essential Threshold
- **Longer cycle lengths:** Some traits can be challenging to measure at Early Testing if pursuing too many traits
- **Increased costs and complexity:** Measuring many traits is expensive and logistically complicated

Lead to **limited to no progress:** The population improves slowly or not at all because the top candidates for one trait are rejected due to poor performance in others

What is a value proposition

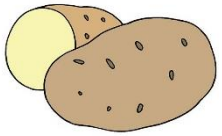
- Is both a strategic and a marketing concept
- Identifies the benefits that products will deliver to users
- In the case of B4T, value propositions cluster Target Product Profile Traits with similar potential benefits
  - E.g. root size, root number and yield are all related to higher productivity as a value proposition
  - Simplifies and conceptualizes benefit projections
- Facilitates discussions of relative priorities of TPPs with users and stakeholders, and feasibility assessments of TPPs
  - E.g. is it more important to improve climate resilience vs biotic stress resistance vs end-user characteristics vs productivity?









Why do we use value propositions?

- Cluster traits
- Discuss different objectives with non-breeders and rank them
- Used by Market Intelligence to make benefit projections
- Crude first pass to assess feasibility of TPPs

❖ In the Breeding Portal, the affiliation between a Target Product Profile Trait and the Value Proposition is made in the **Trait Catalogue**

The value propositions

Value Proposition	Value to Beneficiary
01 Farmer - Higher Productivity	More production; more yield in representative target environment
02 Farmer - Higher fodder yield or value	More or higher quality fodder
03 Farmer - Less Loss & Risk - CC relevant stress	More production where and when a climate change-relevant stress occurs such as drought, excess water, heat, salinity.
04 Farmer - Less Loss & Risk - Biotic stress	More production where and when this pest or disease occurs.
05 Farmer - Less Loss @ Location	More production by farmers that have location-specific conditions, such as cold, acidity, alkalinity, shade.
06 Farmer - Less Loss - Other	Less loss in the field due to shattering or lodging.
07 Farmer - Greater fertilizer use efficiency	Less need for fertilizer, more production at low levels of fertilizer.
08 Farmer - Less labor	Ability to mechanize. Less work and drudgery for weeding, harvesting and on-farm sorting.
09 Farmer - Appropriate maturity	Better fit in cropping system.
10 Farmer - Longer storage	Longer storage with fewer losses.
11 User - Less labor	Less labor for home processing = higher demand to farmer.
12 User - Meeting end-user requirements	Higher value product for user = higher demand to farmer.
13 User - Better nutrition and/or health	More nutritional and/or healthier product, when combined with awareness raising = higher demand.
14 Multiplier - Easier to multiply	Lower costs to multiplier; greater seed availability to farmers.
15 Other	Undefined value to farmer, end user, or multiplier

Target product profiles: Initial feasibility check

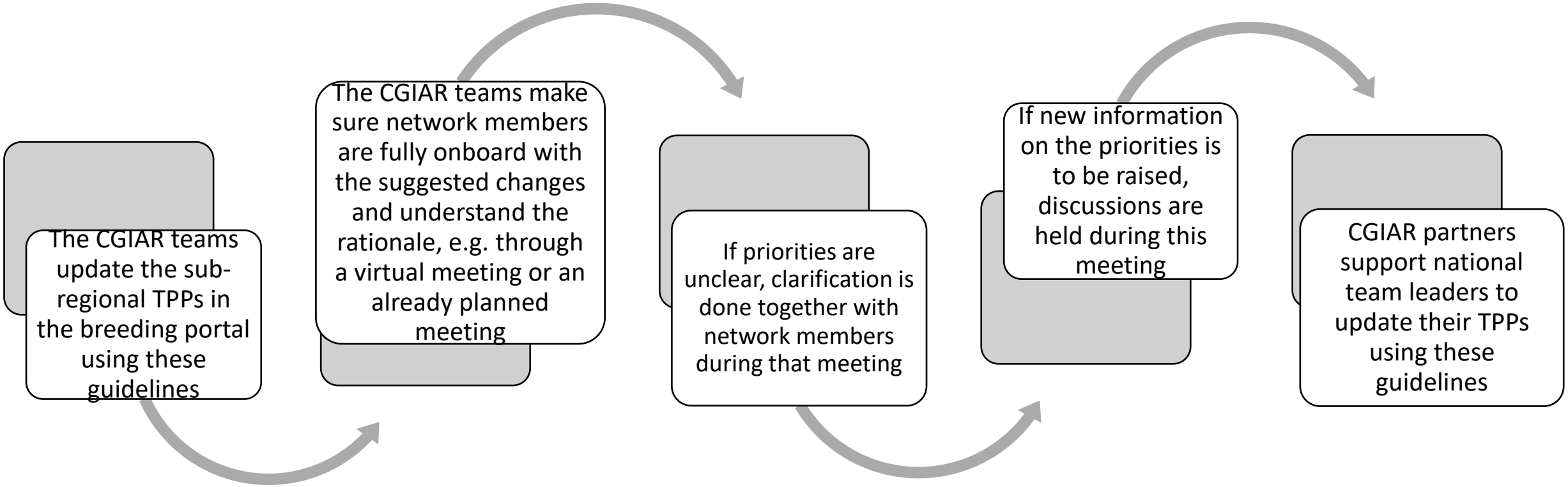
While we have many good quality TPPs (~65%), some TPPs try to improve too many essential traits which leads to negligible breeding progress

a. TPPs must target only 1-2 (max 3) value propositions for improvement
    - Less important essential improve traits should be changed to “Essential Maintain” or “Nice-to-have”
b. Evaluate for potential trait correlations within value propositions
    - E.g. resistance to different diseases, starch and beta-carotene
c. Decide together with network members - What value proposition(s) and traits will result in farmers/markets wanting to replace their current variety

Review of existing TPPs: Criteria

1. 1-2 (3 max) value propositions with an essential-improve trait(s)
   - Too many, especially lowly correlated or negatively correlated traits = No progress
2. Within all value propositions, no more than 3 genetically uncorrelated or lowly correlated essential improve traits
   - Consider trait architecture – simple vs polygenic traits
3. Downgrade the least important essential improve traits together with network members
4. The breeding population needs to have the essential maintain traits already at high frequency
   - Should result in culling no more than 50% of the population
   - Otherwise deploy essential maintain traits or change the germplasm base
5. Focus on important TPPs that target at least 250,000 ha or at least 250,000 ha value adjusted area

Update of existing TPPs: Process



Important: Use the updated TPPs when making selection and advancement decisions

Breeding Strategy: Next steps

- Priority setting
- Alignment to and evaluation of the feasibility of breeding pipelines
- Breeding scheme design and optimization

FAQ: Is CG only focusing on breakthrough products? How to incorporate into existing TPPs?

The Gates Foundation introduced the term "Breakthrough Product"

- To target ambitious improvements (25%) over existing benchmark varieties
- To focus on traits that are game changers, or one-time step-changes such as Hybrids over OPVs
- To focus on specific and important pipelines only
- The Gates Foundation criticizes that we scatter our efforts by working on too many traits, pipelines, and poorly focused TPPs and therefore make limited progress.

Whether we use the term "Breakthrough Product" or not, Accelerated Breeding / B4T agrees that CGIAR should

- Target products (varieties) that exhibits significant and novel improvements over existing products.
- Set ambitious and aggressive targets so to offer substantial gains in performance.
- Focus on critical challenges in agriculture
- Systematically use advanced breeding techniques / best breeding approaches

The implications: **FOCUS** on well prioritized, clearly defined TPPs that have the potential of being game changers … even in regions that are non-targets for the Gates Foundation.

Thank You!

Questions and Discussion

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