Change in Action

Questions on this session: [link]
Session 1 objectives

• Understanding the change needed in CGIAR breeding
  – Active management engagement
  – Role specialization in a cross-functional team
  – Revisiting breeding as a multi-stage process
  – Data-driven assessment (continuous improvement)
  – EiB support for change

• Example of creating change: Product advancement meeting
Breeding as a product development process

- All product development processes have clearly defined components
- Each requires specific skills
- Management oversight is necessary
- EiB supports all stages
CGIAR breeding: The status quo

- Lack of boundaries for responsibilities managing the breeding process
- Specialized staff are working in silos
CGIAR breeding: The ideal state

Center leadership ultimately responsible for decisions

Market knowledge

Role specialization across the breeding team

Technical knowledge

- More accountable, more defined CGIAR-NARS collaboration
- More likely to deliver on goals
- Breeding staff focus on areas of expertise, but working in collaboration with others
- Lower risk process with shared responsibilities
Using RACI to assign roles & responsibilities

• Every task has a person defined as
  Responsible
  Accountable
  Consulted
  Informed

• Leadership comes from the top – accountability and active involvement

• Belief in change comes from the bottom – when staff clearly understand their roles and how they fit in the big picture
Using metrics to implement change

• Specific KPIs ensure specialization and collaboration across the breeding process

• Breeding program performance metrics create transparency within programs and in cross-institution collaboration

• Breeding goals are adjusted based on performance
How do we do this....
Advancement meeting at the heart of the breeding flow

Breeding is a process of continuous improvement, driven by targets and managed by an advancement meeting.

- **Targeting**
- **Product delivery**
- **Population improvement**

**Product types**
- Traits / donors
- Varieties

CGIAR Excellence in Breeding Platform
What is a advancement meeting?

• The most important meeting of the year

• An annual meeting to assess breeding program performance and output

• All specializations and stakeholders in the breeding process are represented

• KPIs and performance metrics are assessed
Goals of the advancement meeting

• Population improvement and variety development decisions are made based on the data

• Cross-functional input is ensured, from market-facing metrics and technical breeding metrics

• Assess current breeding program performance and define goals for the next year

• Identify products to be released and delivery/marketing strategy
Who needs to be present from NARS & CGIAR?

- Center leadership (DDGRs)
- Breeding program leadership
- Market expert (i.e. product manager)
  - Socioeconomics
  - Gender
  - Seed systems
  - End user representatives
- Technical expert from each breeding specialization
How is it set up?

• By invitation of DDGRs/leadership
• Set in between harvesting and planting (when performance data is available)
• Attendees identified and informed long in advance
• Clear expectations, roles and responsibilities
• Required metrics communicated
• Advancement meetings linked to Breeding Lead objectives
Goals of creating a project advancement meeting

**Purpose:** Introduce standard product management to increase genetic gain and product replacement in CGIAR NARS within 1 year

**Objective:** Leaders co-develop a viable process

**Output:** Meeting format and roadmap for implementation

**Outcome:** Process implemented in 12 months, follow-up meetings with leaders to gather learning/feedback
Creating the conditions of change...
Deep dive 1

Targeting: Good design and management looks like..
Success Needs Preparation and Prioritization

• Market Segment/TPE Prioritization
• Targeted Product Profiles
  – Demand Driven
  – Design comes from product managers representing the cross-function design team
• Role Specialization in Product Design
• A stage and gate system, based on metrics, manages product progress
Clear Targeting drives an engineer and manufacturing pipeline

Target Environments

Market segments

Product profiles

PP1 Product profile 1
PP6 Product profile 6
Market Segment

- Market Segment - a sub-group of clients based on some type of shared characteristics.

- Market Segment Survey
  - 7 of 8 centers participated
  - 167 targeted market segments
  - 686 (crop x country) combinations are primary breeding targets

- High performer’s focus
Targeted product profile: The way we deliver

• Written planning documents that define the market-driven products to be developed throughout the breeding pipeline in five year periods

• A new way of setting breeding targets: from economic assessment of traits in breeding area, to cross-functional design teams targeting varieties on the market, today and in the future

• Owned by the product manager

• Used as a benchmark to measure progress in continuous improvement
Targeted Product Profiles are a blueprint for engineer

- Population construction
- Product Replacement Strategy
- Benchmark for the product advancement process
- Guides Trait Discovery and Deployment
  - Donor Line
Role Specialization In Design Team

Product Targets (TPPs) are passed from the design team to the breeding team.
Advancement meeting uses stage & gates process link TPPs to Outcomes

**Market Facing Breeding**
1. Trait discovery
2. Trait deployment
3. GERMPLASM PIPELINE
4. TRAIT PIPELINE
5. PRODUCT PIPELINE
6. TECHNICAL OPERATIONS
Product Management Process

- Formalized, transparent and managed focused on increasing the rate of variety turnover
- Guided by a validated product design
- Govern by pre-determined advancement metrics
- Measure breeding team effectiveness in implementing the breeding strategies developed by technical expertise
- Complements the assessment of the breeding program
Final Thoughts

- Modern plant breeding has evolved into a team effort
- Modern plant breeding is not a spectator sport. The process needs to be managed
Deep dive 2

How to engineer a good breeding scheme to deliver the design
A competitive breeding program has role specializations when it comes to engineering the process.

Center leadership ultimately responsible for decisions.

Role specialization across the breeding team.

- Market knowledge
- Product manager
- Breeder
- QG
- Technical knowledge
1) A good engineering process requires back and forth discussion between design and engineering.

Customer need → Design team

Design team → Manufacturing team
- Civil Engineer

Design team → Engineering team
- Mechanical Engineer

Manufacturing team → Engineering team
- Breeder + QG

Customer need
2) Clear targets are required before we engineer a manufacturing pipeline

**Target Environments**

- Dry Lowland
- Dry Mid-altitude
- Highland
- Wet Lower Mid-altitude
- Wet Lowland
- Wet Upper Mid-altitude

**Product profiles**

- PP1 Product profile 1
- PP2
- PP3
- PP4
- PP5
- PP6
- PP7
- PP8 Product profile 8

**Market segments**

- Fresh-consumption
- Processing

**Breeding pipelines**

- 1 Fresh-consumption wet lowland
- 2 Fresh-consumption dry lowland
- 3 Processing dry lowland
3) A blueprint stating clearly the values of or desired product has to be used to design specifications

### Kumquat Targeted Product Profile (Market Trait Inventory)

<table>
<thead>
<tr>
<th>PP1</th>
<th>Plant Type</th>
<th>Height</th>
<th>Stability</th>
<th>Heading Date</th>
<th>Foliar Diseases</th>
<th>Tillering Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP2</td>
<td>Plant Type</td>
<td>Height</td>
<td>Stability</td>
<td>Heading Date</td>
<td>Foliar Diseases</td>
<td>Tillering Capacity</td>
</tr>
</tbody>
</table>

#### Kumquat Targeted Product Profile (Replacement Strategy)

<table>
<thead>
<tr>
<th>Market Leading Variety #1: DG 503</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet peel/Internal tart flavor contrast</td>
</tr>
<tr>
<td>Biotic Resistance (Fungal): Scab Resistance</td>
</tr>
<tr>
<td>Maturity</td>
</tr>
<tr>
<td>Stress Tolerance</td>
</tr>
</tbody>
</table>

This market segment is defined by subsistence farmers with an annual income of less than 2000 USD. The majority of on-farm activities (sowing, weeding, harvesting and processing) are performed by women, who are usually in charge of the marketing of the product. Farm labor availability is a rising issue, with availability declining by 5% each year, so earlier maturing with the ability to mechanical harvest is valued. Orchards are normally rotated every two years with stagnant variety turnover. An estimated 60 percent of farmers grow just one variety - DG 503 - largely because of consumer-preferred traits (taste). The breeding strategy to replace DG 503 is to retain the taste but to reduce the maturity by 10 days to avoid potential water stress, increase stress tolerance for the ability to set under high night temperatures (> 32 C) and to increase scab resistance due to a loss of chemical control. A suggested gender responsive trait that would be valuable would be a tree to scrub conversion.

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Value-added traits, which represent improvements on the product to replace or within the market segment that can be sourced from material available to the breeding program, and delivered commercially on a 5-year time frame. **Game Changing** traits are significant step-change tools that cause a radical shift in the market. These traits are not found within the elite breeding material.
4) The engineering team should use methodologies and tools that allows them to minimize possibilities of failure.
5) A good engineering process has clear metrics to assess performance.
What EiB has done and has to offer for engineering good breeding schemes?

• Targets
  – Product profile tool

• Mapping pipeline
  – Flowchart tools to map breeding process
  – Breeding pipeline mapping tool

• Optimization tools
  – BMGF grant for across-CG simulation platform
  – Breeding optimization methodology (February training)
Deep dive 3

Execution: A good manufacturing operation looks like..
“Quality is the result of a process… A bad process won’t result in the best possible quality.”
Going from a well engineered Breeding Scheme to Execution

**Technical: Best Practices**

*Define How to Execute*

**Standard Operating Procedures**

**Management**

**Operational Excellence Techniques**

*Ensure Effective Execution*

**Execution**
Benefits of Well Defined SOPs

• Clear and common understanding of breeding processes
  – Consistency – reduction in errors
  – Continuity - training/onboarding

• Enables effective support for the process
  – Biometrics, breeding IT, genotyping, phenotyping, mechanization, …

• Ability to track metrics and identify issues/bottle necks
  – Targeted interventions
  – Ability to provide a clear rationale for investment
Genotyping as part of the manufacturing process

- QC genotyping (F1 & Parents)
- Forward Breeding (MAS)
- Genomic selection (GEBV)
- QC genotyping (GOT)

Breeding Nursery

Product Testing (MLT)

- RGA
- SSD
- 3 - 4 years cycle
- Elite x Elite
- Recycling of materials from MLT
- Centralization
- Data driven

National Releases (Seed System)
Developing and Documenting SOPs

• Process Mapping – Visual representations of processes

• Effective approach to defining and documenting SOPs at different levels of detail
  – Captures the critical details
  – Enables easy communication of SOPs
Stage Gates

Phase 1
- Activity 1
  - SOPs
- Activity 2
- Activity ...

Stage Gate 1

Phase 2
- Activities
  - SOPs

Stage Gate 2

Phase 3
- Activities
  - SOPs

Stage Gate 3
Stage Gates are “SOPs” for critical decisions

Defines:
- The process for making decisions
- The criteria for making the decisions
- The roles, responsibilities, and expertise of those making the decisions
Stage Gates

Stage Gate 1
- Activity 1
  - SOPs
- Activity 2
- Activity …

Stage Gate 2
- Activities
  - SOPs

Stage Gate 3
- Activities
  - SOPs

Stage Gates must be carefully designed to ensure successful delivery
Advancement Meeting

• Ensures the effective Execution of the Stage Gates (Management - Operational Excellence)

• To enable a successful advancement meeting you must first:
  – Define the process and roles – who does what?
  – Define the criteria for advancement – what information is needed and how should it be used?
    (The process, roles and criteria will be unique to each Stage Gate)

• This requires extensive planning and preparation
  – All activities conducted throughout the year feed into the advancement meeting
Variety Selection (Advancement)

According to acceptance criteria decide if the advancement decision for a variety is a **Yes** (+ outcomes, advance to next stage); **No** (- outcomes, stop evaluating); **Maybe** (mixed +/- outcomes, retain as feasible)

1. Define advancement procedure:
   - Product profiles and advancement decision criteria (with EiB module 1)
   - Breeding schema and corresponding trial protocols (with EiB module 2)
   - The types of decisions to make and how to make them
   - Participants; Meeting procedure; Timing in breeding cycle; …

2. To Implement define:
   - Recommend analyses for advancement decisioning
   - Visualization frameworks for making variety advancement decision
   - Data arrays providing data to analyses and visualizations
   - Means for recording decisions

3. Enable by providing access to:
   - Analytics
   - BI tools or R modules implementing visualizations
   - Data management

4. Conduct advancement meeting

5. Practice for evaluating how well the process executed

6. Phased implementation: Step 1 -> Step 2 -> Step 3-> Steps 4, 5