CGIAR | INITIATIVE ON Accelerated Breeding

Accelerated Breeding Initiative

Update Session

Michael Quinn, Clare Mukankusi & team

December 8, 2022

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Accelerated Breeding

Update Session #1

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December 8, 2022

Source EiB

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Agenda:

- Welcome. Warm-up poll
- Remarks from: *John Derera*
- ABI overview: *Michael, Clare*
- Work Package highlights: *WP Leads*
- Questions & feedback

Source IITA

First, a few words from:

John Derera

Senior Director,
Breeding & Pre-Breeding

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What is Accelerated Breeding?

Aim:

Programs deliver higher rates of **genetic gain** providing farmer-preferred candidate varieties with a step change in performance

Modernized CGIAR and NARES breeding programs

Leads:

- **Michael Quinn**, EiB / CIMMYT
- **Clare Mukankusi**, Alliance of Bioversity & CIAT

Work packages

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WP1

ReFOCUS

Meet farmers' needs, based on Market Intelligence insights

Peter Coaldrake

WP2

ReORGANIZE

Organize breeding activities and teams to best drive breeding outcomes

Sarah Hearne

WP3

TRANSFORM

Build inclusive, impactful **CGIAR-NARES-SME breeding networks**

Bish Das

WP4

DISCOVER

Drive & improve **trait discovery & deployment**

Sarah Hearne

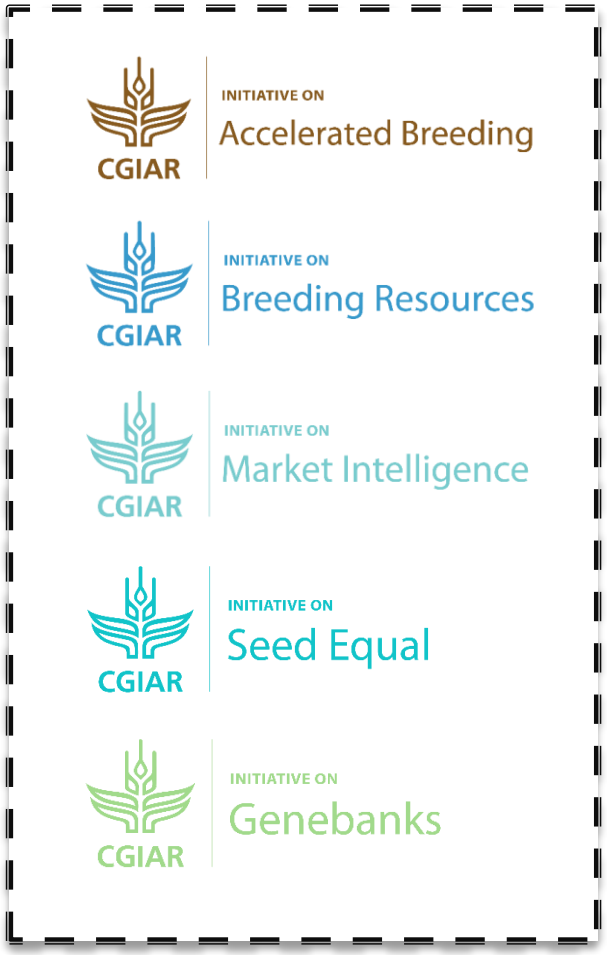
WP5

ACCELERATE

Optimizing breeding pipelines to accelerate rate of genetic gain

Dorcus Gemenet and Bhoja Raj Basnet

Collaboration across Genetic Innovation Initiatives



- Genetic Innovation Initiatives are interrelated.
- Accelerated Breeding pursues effective interactions with the other initiatives.

Key Collaborations:

- **ReFOCUS:** Market Intelligence
- **REORGANIZE:** Breeding Resources
- **TRANSFORM:** Market Intelligence, Breeding Resources, Seed Equal, CtEH
- **DISCOVER:** Breeding Resources, Genebanks
- **ACCELERATE:** Breeding Resources, CtEH, Seed Equal

Work packages

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WP1 Re-FOCUS: Progress

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Re-structuring breeding pipelines *in alignment with market segments*

For the first time in CGIAR history, we have taken stock of CGIAR breeding efforts:

- 21 Crops and Forages
- 7 Centers, serving CGIAR regions through 35 networks with NARES and SME partners
- 340 Target product profiles (TPPs)
- 119 Breeding pipelines aligned to 271 of 428 sub-regional market segments

Ongoing:

- Reviewing pipeline structures and links to market segments and TPPs by crop
- Linking pipelines to breeding schemes
- Updating information on pipeline investment levels
- Capturing feedback from staff and partners for increased accuracy
- Consistent understanding of terms and concepts

Market Intelligence:

- Improve our understanding of market segments: Insights from farmers and markets
- Make TPP design a cross-institutional cross-disciplinary effort
- Projection of benefits

WP2 ReORGANIZE: Progress

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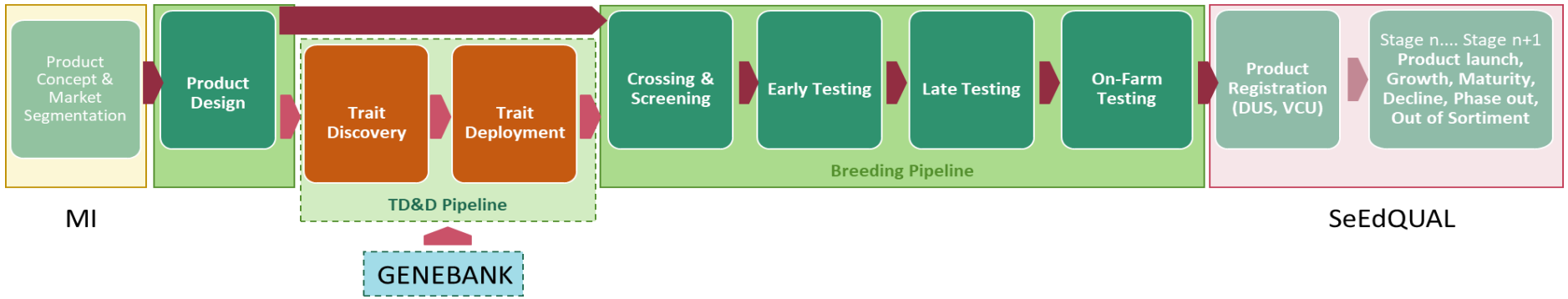
*Improving **organizational effectiveness** by organizing pipelines into effective teams*

- Developed a coherent and consistent **breeding stage plan, adopting common terminology and stage definition**
- Endorsed by breeding program leads and GI senior directors to be used by centers and crops



ReORGANIZE working groups, representing multiple commodities, geographies and centers:

- Document **breeding stage plan** detailing inputs and outputs of each stage including mapping of human resources
- Define common **Stage Gate** with consistent targets, inputs and hand over criteria or stop/go points
- Define **individual and team RACI** and **decision-making processes** to empower and democratize work across disciplines and teams
- Define **KPIs** for breeding performance assessment

Establish current use of stage gates, RACI and KPIs at centers (baseline)

WP4 DISCOVER: Progress

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Drive, right-size & synergize trait discovery and deployment

Surveyed all **ongoing Trait Discovery and Deployment (TD&D) activities** in crops and forages in the CGIAR detailing trait focus, purpose, market/geography targeted, resourcing envelope and timeframe

Large number of TD&D activities, as evidenced by 111 publications in 2022 alone

- 65% discovery, 24% screening approaches, 11% validation and deployment
- 44% biotic stresses; 23% abiotic stresses, 19% end-use; 14% yield & agronomic traits

Work in progress:

ROI/opportunity cost assessment for TD&D work has begun to:

- Establish process to quantify value of traits, together with MI and ReFOCUS
- Align TD&D projects with existing TPPs
- Execute initial expert estimation of trait value: contribution to yield stability or yield potential
- Standardize and improve costing of TD&D activities, together with BRI

Established cross commodity DISCOVER **working groups:**

- Trait valuation
- TD&D cost assessments
- Best practices and feasibility
- DISCOVER specific KPIs
- Sub-Stage gates.

WP3 TRANSFORM: Progress

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*CGIAR, NARES and SMEs as a **single, effective breeding network**.*

- For the first time, **partner (public, private, NGO) participation** in crop breeding networks documented across CGIAR.
  - ~1,200 partner organizations from 135 countries
  - All low and lower-middle income countries, where CGIAR crops are relevant, are represented
  - Almost a quarter of partners are private sector, 15% are universities
- **Crop and region based working group** established and meeting regularly to implement TRANSFORM workplan – close to 30 staff from all CG breeding programs
- **Nairobi June 2022**: Agreed with NARES and SROs in Africa on equitable partnership principles for evolving NARES-CGIAR partnerships: strategy alignment, fair attribution and clear roles and responsibilities
- **Taking stock of NARES** priorities and strength in SSA
  - Analyzing national and subregional strategy documents
  - GI level baseline survey of current NARES breeding activity and capacity
- Developing more effective **germplasm development collaboration models**
  - Stock taking of current CGIAR collaboration approaches
  - “Licensing-for-impact” workgroup: Seed Equal – ABI – Genebanks
  - Approaches for joint priority setting and inclusive decision-making being pursued in several networks

WP5 ACCELERATE: Progress

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Optimize breeding pipelines *for population improvement & variety identification*

Work taking place in 60+ breeding programs and 119 breeding pipelines – current insights

1. **Development of highly elite candidate varieties**

2. **Genomics-supported rapid cycle recurrent selection schemes**
   - **Progress:** Use of genomic selection rapidly increasing, now >30% of all breeding pipelines
   - **Progress:** Several crops report high predictions between measured and predicted values
   - **Need:** Mainstream best practices among many lessons learnt, across crops

3. **Optimized breeding pipelines**
   - **Progress:** Crop-specific quantitative genetic studies to optimize pipeline simulations
   - **Need:** Alignment of breeding schemes with TPP traits (in Breeding Pipeline Manager)

4. **Optimized pipeline structure and germplasm sharing**
   - **Progress:** Crop-specific diversity studies that help in revising breeding pipeline structure
   - **Need:** fully rationalize pipeline structures and germplasm sharing across centers, programs and with NARES

5. **Farmer-and market-relevant variety identification schemes**
   - **Progress:** Majority of crops assessed progress and/or genotype-by-environment interactions viz-a-viz distinct farmer- or market relevant traits.
   - **Progress:** >12 crops experiment with improved on-farm trialing approaches, such as TRICOT for on-farm testing
   - **Need:** Alignment with TPPs, larger-scale lower-cost testing approaches, capturing gender-specific differences.

WP5 ACCELERATE: Progress

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Optimize breeding pipelines *for population improvement & variety identification*

Work taking place in 60+ breeding programs and 119 breeding pipelines – current insights

6. Systematized genetic gain assessment and prediction across crops

- **Progress:** The majority of CGIAR crops assessed genetic gains in one or several pipelines.
- **Insight:** Realized genetic gain was statistically significant and positive in 74 out of 134 studies.
- **Need:** Monitor increases as breeding approaches are changing and calculate predicted genetic gain

ACCELERATE team

- **Workplan developed and discussed:** cadence of regular engagement with crop and center level, both 1:1 and as a group
- **Crop-specific deep dive discussions:**
  - Done: Banana & Plantain, Potato, Sweetpotato, Cassava (IITA), Maize
  - More upcoming
- **Standardizing tools, methods and approaches:** e.g. genetic gain calculated using standardized methods for all pipelines
- **Baseline survey:** progress on work plans, challenges, priorities, and support
  - 43 Responses from 19 Crops so far
  - Top three priorities identified by the breeding programs
- **Breeding optimization support -** working with the QG (EiB M2) team continues - Latest examples: application of F1 hybrid prediction model in Yam; use of Desired Gain Index (DGI); estimate realized genetic gains; training breeders on the application of quantitative in breeding programs

Contact & info flow

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WPs

Each crop has ABI contacts: For each WP & the crop lead.

Communication and planning through these contacts

Crop Teams

Urged to:

Reach out to Center contact points or WP leads for guidance

Use best practices for sharing info across teams, including the Project Management Center (PMC) from Scriptoria

ABI comms

CG working on expanded website

For now, EiB site & social media has events, news, tools etc.

Client survey coming, together with BRI, to follow up on EiB 2021 survey

Crop leads

ABI chairs regular Crop Leads meetings to discuss progress.

John and Michael are main contacts

Thank You! Questions?

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www.cgiar.org/initiative/01-accelerated-breeding