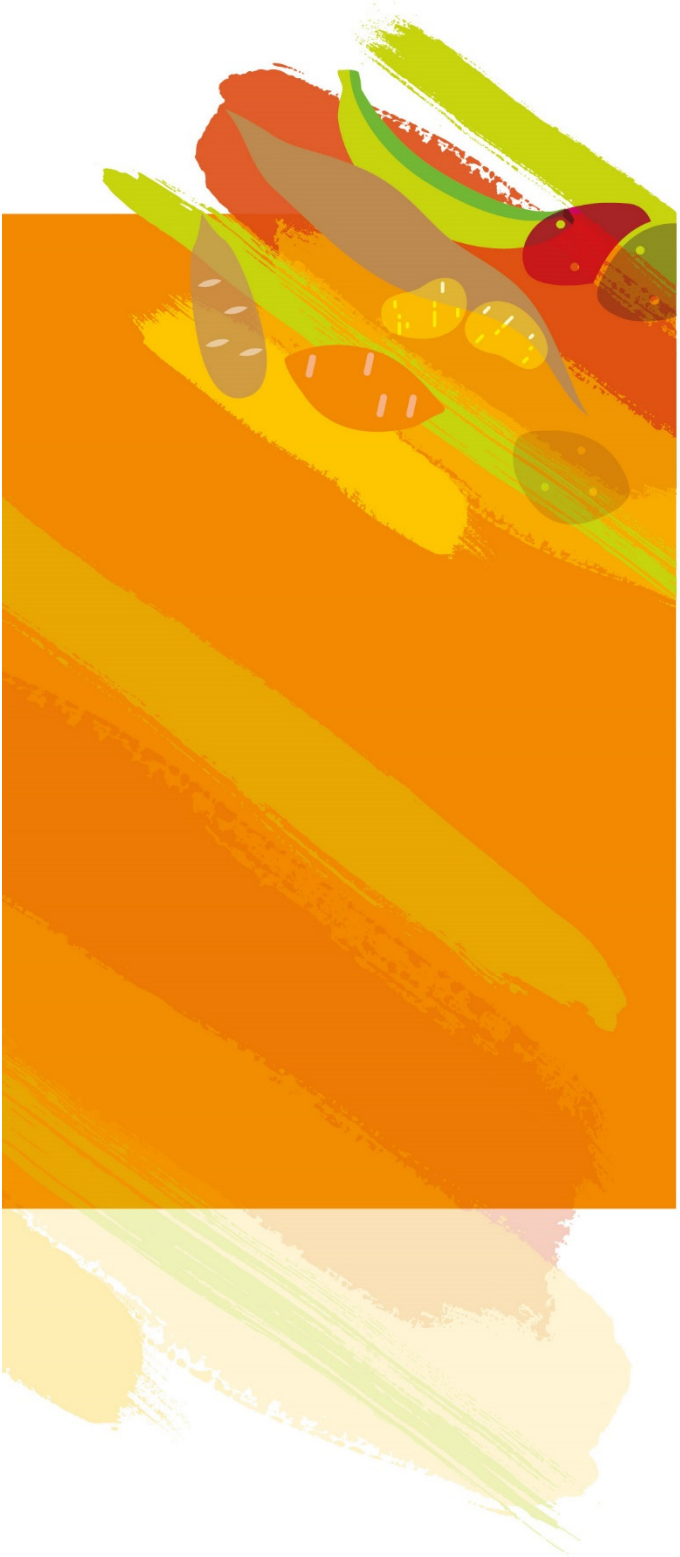

RTB Workshop Report

RTB Breeding Community of Practice and NextGen Breeding Clusters: Foundation and Planning Workshop

Merideth Bonierbale, Ismail Rabbi, Netsayi Mudege, Elizabeth Arnaud, Michael Friedmann, and Clair Hershey

J U N E 2 0 1 7

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

LED BY CIP INTERNATIONAL POTATO CENTER A CGIAR RESEARCH CENTER · Bioversity International · CIAT International Center for Tropical Agriculture Since 1967 Science to cultivate change · cirad AGRICULTURAL RESEARCH FOR DEVELOPMENT · IITA Transforming African Agriculture

RTB Workshop Report

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Contact:

RTB Program Management Unit
International Potato Center (CIP)
Apartado 1558, Lima 12, Peru
rtb@cgiar.org
www.rtb.cgiar.org

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The Organizing Committee gives a special thanks for support from RTB Program Management Officers Corine Loiseau (Bioversity) and Bettina Heider (CIP) for their dedication and participation in planning and support of this workshop.

RTB Breeding Community of Practice and NextGen Breeding Clusters: Founding and Planning Workshop

Venue: Hôtel Mercure Antigone, Montpellier, France

Date: 26-30 June 2017

Participants:

Scientists from the Breeding Community of Practice (DI1.1) and NextGen Breeding (DI 1.2) clusters
Representatives from other FP1 clusters and FP 2, 3, 4 and 5
Outside experts in breeding and breeding support
(See Annex B for full participant list)

Organizing Committee:

Merideth Bonierbale (CIP, Leader Cluster DI1.1), Ismail Rabbi (IITA, Leader Cluster DI1.2), Netsayi Mudege (CIP), Elizabeth Arnaud (Bioversity), Michael Friedmann (RTB PMU)

Process Group:

RTB Science Officer: Michael Friedmann
DI 1.1 and 1.2 Cluster Leaders: Merideth Bonierbale and Ismail Rabbi
Gender Leader: Netsayi Mudege
Center PMOs: Bettina Heider (CIP) and Corine Loiseau (Bioversity)
Meeting Facilitator: Clair Hershey (consultant)

Workshop Purpose:

1. Further develop and refine the vision, objectives and outputs of RTB Clusters DI 1.1 and DI 1.2
2. Advance on implementing selected deliverables of earmarked funding for DI1.1, DI1.2 and Gender.

Expected Workshop Outputs:

1. Effective linkages are established and active within DI1.1 and DI1.2 and with other clusters and platforms
2. Portfolio and selected deliverables of clusters DI1.1 and DI1.2 are agreed and built by cluster teams
3. Gender relevance of cluster products, deliverables and linkages are enhanced through gender integration and mainstreaming
4. Cluster management, governance and coordination are agreed and implemented
5. Common commitment and approach to fund-raising is built

(See Annex A for full workshop program.)

EXECUTIVE SUMMARY

Introduction

Some fifty scientists from three RTB clusters joined forces to refine Phase II structure and governance, and to review and launch work plans in a workshop in Montpellier, France from 26-30 June 2017:

- DI 1.1: RTB breeding community of practice (BCoP)
- DI 1.2: Discovery research for enhanced utilization of RTB genetic resources (NextGen Breeding)
- CC 5.3: Gender equitable development and youth employment

Each of the supporting earmarked projects for this workshop committed to specific deliverables related to improving impact of RTB breeding for targeted next- and end-users. The workshop purposes were to further develop and refine the vision, objectives and outputs of RTB Clusters DI 1.1 and DI 1.2, and advance on implementing selected deliverables of earmarked funding for DI 1.1, DI 1.2 and Gender.

Linkages and Communication

The workshop itself provided an effective forum for interchange among RTB scientists, but more importantly laid the foundation for the future. Participants advanced on developing an effective communications tool for better linkages among breeding-related clusters, through the launch and refinement of the RTB Breeding Portal. The Portal is being designed interactively by members to function as a key means for communicating, planning and knowledge sharing among RTB scientists and partners.

Refined Cluster Portfolios

Although the RTB Phase II proposal is comprehensive, and was well received by the Consortium Office, there remain many implementation details to be worked out. The workshop allowed both the BCoP and NextGen breeding clusters to involve a broader range of scientist input than was previously possible, to refine and fine-tune the cluster portfolios, especially at the Output level. At the same time, scientists' responsibilities and commitments, and Cluster governance were clarified.

Trait Prioritization

Breeding for the RTB crops relies fundamentally on having a common understanding of priority traits, realistic targets for their improvement, and standardized means to measure and describe trait expression. Participants discussed the importance and the steps to update the crop ontologies and trait dictionaries. Having a good understanding of next- and end-user priority traits requires an ongoing, interdisciplinary effort, and is at the core of future breeding success. Participants focused on principles and methodologies, and the plan to systematically and fully define and describe priority traits. Special attention was given to consumer-preference traits and the needs and strategy for better understanding and application in breeding.

System-wide Platforms

Platforms of key relevance to RTB breeding were described and a roadmap to optimized interactions discussed. Most of these platforms are still in an organizational phase. This makes it somewhat difficult to know the details of future interaction or support, but at the same time is an opportunity to influence

innovation and development that support RTB goals. The platforms discussed were Genebanks, Excellence in Breeding (including high-throughput genotyping), and Big Data. Participants discussed the applicability of the Breeding Assessment Tool for RTB (developed by FAO, Cornell University, and most recently by the University of Queensland, and promoted by B&MGF).

Gender Mainstreaming

Advances in understanding gender integration and mainstreaming in RTB breeding program design were presented and discussed. While gender remains at the core of social scientist input, there is also a broadening to include other social dimensions and clients, such as youth and urban/rural factors. There is a major RTB-led system-wide initiative underway to look in depth at gender responsive breeding (http://www.rtb.cgiar.org/gender-breeding-initiative/?lang=en). This should provide the foundation for moving toward better and more specific breeding strategies with social relevance.

Fundraising

The BCoP will provide a forum for developing common commitments and approaches to fund-raising. The purpose of the fund-raising session was to build awareness and seek guidelines for this function of the BCoP. The session provided opportunities to present ideas for discussion and development among interested scientists. Fundraising by RTB scientists has not been well-coordinated in the past, but will become increasingly important for supporting the ambitious research agenda needed to reach Phase II goals.

Summary

The RTB Breeding Community of Practice is recognized by the System Management Office as an innovative mechanism to enhance communication, coordinate planning, streamline collaboration and overall, support accelerated breeding gains. This workshop supported the launch and the refinement of some of the BCoP's planned activities, and especially with regard to interaction with NextGen Breeding and gender mainstreaming. The BCoP, with support from its members, will enable results and impact that are greater than the sum of its individual components.

SUMMARY OF ACTION POINTS

The following table summarizes follow-up action points brought out either in working group or plenary discussions.

Action	Timeline	Responsible
For Output 1: Effective linkages are established and active within DI 1.1 and DI 1.2 and with other clusters and platforms		
BCoP members register and upload portraits on the following link for the RTB breeding portal: https://cgiar.sharepoint.com/sites/IITA/Projects/rtb/Portraits/	As soon as possible and ongoing for new members	BCoP members
Complete the *Contacts* form in: https://cgiar.sharepoint.com/sites/IITA/Projects/rtb/SitePages/Contact%20Profiles.aspx	As soon as possible and ongoing for new members	BCoP members
Develop more informative and intuitive home page	Sept. 2017	M. Ferguson, G. Mwanthi
Name champions for each page and advocate across BCoP for active use	Sept. 2017	M. Ferguson, E. Carey
Create a *follow* function for discussion pages, so that one can be alerted via e-mail or text message about new posts	Sept. 2017	M. Ferguson, G. Mwanthi
For Output 2: Portfolio and selected deliverables of clusters DI 1.1 and DI 1.2 are agreed and built by cluster teams		
Ensure that each center has a team for each crop, that is committed to updating ontology traits	Sept. 2017	Cluster leaders
Plan the extension of trait dictionaries and ensure that they remain functional. There needs to be one person per crop who can help with curation and set up a training with NextGen Database and Crop ontology staff to coordinate actions.	Sept. 2017	E. Arnaud
Develop a draft framework for trait prioritization for review and further development under the coordination of the BCoP.	Aug. 2017	Leader BCoP and C. Hershey

Map people and skills in statistics and bioinformatics, who may be accessible to RTB scientists.	Nov. 2017	M. Rouard

For Output 3: Gender relevance of cluster products, deliverables and linkages are enhanced through gender integration and mainstreaming		
CIP to share their PVS data dictionary	Oct. 2017	E. Salas
Biomart to connect the germplasm catalogues with ontologies	Mar. 2018	E. Salas
CIP to share the sweetpotato dictionary to validate and update in the ontology	Sept. 2017	D. Geminet
For Output 4: Cluster management, governance and coordination are agreed and implemented		
Develop a succession plan for BCoP leadership as the founding cluster leader will retire from CIP in August 2017	Aug. 2017 (underway)	PMU
Cluster leaders review workshop recommendations with the full cluster team. In the case of the BCoP, it will be especially important to include the breeders who were not in the workshop, as well as reach out to other cluster leaders who have a major stake in the development or use of new RTB varieties	Sept. 2017	Custer leaders and FP1& FP2 leaders
Cluster leaders work with Product and Output leaders to resolve the relationship between persons currently named as 'responsible for reporting' on the MEL platform, and the leaders suggested in the Montpellier workshop (last two columns of Table 7)	Aug. 2017	Cluster leaders and FP1 & 2 leaders
Cluster leaders communicate with the MEL platform coordinator to establish protocols and lines of authority for specific scientists to add and to edit content on the platform	Oct. 2017	Cluster leaders
For Output 5: Common commitment and approach to fundraising is built		
CIP to initiate developing a concept note along with CIAT for a major project on exploiting heterosis in clonal crops	Nov. 2017	W. Gruneberg, H. Ceballos
Final submission of the RTBFoods to the Gates Foundation	July 2017 (done)	D. Dufour

INTRODUCTION

Researchers from three RTB clusters joined forces to refine Phase II structure and governance and to launch work plans in a workshop in Montpellier, France from 26-30 June 2017. Funding and guidance for the development of the workshop came primarily from three "W1/2 Earmarked Funding" allocations to the following cluster teams:

- DI 1.2: Discovery research for enhanced utilization of RTB genetic resources
- DI 1.1: RTB breeding community of practice
- CC 5.3: Gender equitable development and youth employment

Each of the supporting earmarked projects for this workshop committed to specific deliverables, some of which were to come from this workshop, and some from follow-up or other activities (Annex C). These deliverables were the fundamental rationale for the topics of the workshop sessions, and feed into the overall purpose and outputs of the meeting. Although cluster development received extensive input and discussion prior to and since submission of the Phase II proposal, defining the full portfolio of Products, Outputs and Deliverables will be an ongoing process for RTB. During the first year of Phase II (2017) it is essential to have full participation and buy-in of cluster leadership and scientists for long-term success of the RTB research agenda, a process strongly supported by this workshop.

The workshop **purpose** was stated in two parts:

1. Further develop and refine the vision, objectives and outputs of RTB Clusters DI 1.1 and DI 1.2
2. Advance on implementing selected deliverables of earmarked funding for DI 1.1, DI 1.2 and Gender

Expected outputs of the workshop were derived mainly from the deliverables listed in Annex C:

1. Effective linkages are established and active within DI 1.1 and DI 1.2 and with other clusters and platforms
2. Portfolio and selected deliverables of clusters DI 1.1 and DI 1.2 are agreed and built by cluster teams
3. Gender relevance of cluster products, deliverables and linkages are enhanced through gender integration and mainstreaming
4. Cluster management, governance and coordination are agreed and implemented
5. Common commitment and approach to fundraising is built

The program was organized in seven sessions, which cumulatively addressed the expected outputs. The workshop was designed to be highly participatory and interactive. Each session began with a few brief background presentations in plenary, followed by small group discussions, and finally return to plenary for sharing of findings and planning the way forward (for plenary presentations see http://hdl.handle.net/10568/89161.

One important presentation was added to the original program. On Day 2 (27 June) Philippe Ellul offered to come from the System Office to give current perspectives on the *Results Based Management Framework for CGIAR Research*, available for viewing in the link above. A key message

of that presentation was that the CGIAR Agri-food System Programs (AFSPs) should expect to adhere to strict guidelines from the System Office on formats for all levels of planning, execution and reporting of research for development. Concern was expressed by members of these relatively upstream clusters that the overwhelming emphasis of the CG System's monitoring and evaluation scheme on development impacts is somewhat risky because of the long-time frame required and the difficulty of directly linking investment to impact.

The planned agenda was quite ambitious and most working groups felt challenged with the time allocated for completing each discussion topic. Nevertheless, with an overall good sense of purpose, commitment and discipline, the expected outputs of the meeting were largely met (see Annex F, Workshop Evaluation).

To complement the planning activities of the workshop, the organizers requested visits to two state-of-the-art facilities relevant to cluster objectives: the PhenoArch platform of INRA (https://www6.montpellier.inra.fr/lepse_eng/M3P/PHENOARCH-platform) and the CIRAD Laboratories for an Integrated Approach to Food Quality (https://umr-qualisud.cirad.fr/en/research-teams), both in Agropolis Park. About half the participants took part in these visits which were kindly hosted by Drs. Claude Welker (PhenoArch) and Dominique Dufour (CIRAD) on the afternoon of Friday 30 June. Both visits were highly relevant to RTB breeding and value chain research, and much appreciated by participants.

This report summarizes the discussions, conclusions reached, and next steps to be taken, organized according to the five broad expected outputs of the workshop.

KEY CONCLUSIONS AND NEXT STEPS, BY EXPECTED OUTPUT

Next steps, with key responsible people and dates, are listed at the end of each Output section and consolidated across Outputs at the beginning of this document. General recommendations are summarized in the section of this report named *General Recommendations from Workshop*.

OUTPUT 1: EFFECTIVE LINKAGES ARE ESTABLISHED AND ACTIVE WITHIN THE RTB BREEDING COMMUNITY OF PRACTICE (DI1.1) AND NEXTGEN BREEDING (DI1.2), AND WITH OTHER CLUSTERS AND PLATFORMS (FROM ALL SESSIONS)

Phase I of RTB motivated and supported a wide range of new linkages and collaboration among RTB scientists who previously had little contact or knowledge of each other's work. Some of this interaction was facilitated by meetings and communications across RTB, and some by *complementary funded* research projects designed to exploit synergies across crops and centers. The Breeding Community of Practice (BCoP) takes communication and collaboration to the next level by involving a broader spectrum of the RTB breeding community and by creating new channels and new common goals for communication and collaboration. The launching of the BCoP was supported by Type 1 Earmarked Funds and focused on five deliverables identified for 2017 (Annex C).

Output 1 of the meeting relates to the following deliverables from the earmarked funding:

DI 1.1.1.2 (BCoP - deliverable #5803): Knowledge sharing portal established (IITA)

DI 1.1.1.2 (Gender - deliverable #8678): A webpage incorporated on gender perspectives into breeding in the BCoP portal: protocols, tools and training materials (CIP/IITA)

The overview presentation of the BCoP made clear that this cluster, while located in Flagship 1, is cross-cutting among all the RTB flagships, and especially among those clusters directly related to any part of the breeding pipeline. Participants raised the question of why the BCoP is not situated in FP2 along with the breeding clusters. Its home in FP 1 is somewhat arbitrary (each cluster needs to have a home within a single flagship), and in part is an attempt to give better balance across flagships. This placement does not indicate a greater participation of FP 1 clusters than those of FP 2 in the BCoP, but rather emphasizes the cross-flagship nature of the cluster which focuses initially in linking NextGen with the breeding and seed clusters of FP 2. Hosting the BCoP in FP1 may also help encourage needed interactions with and between FPs 2. 3. 4 and 5.

Participants discussed in some detail the role of partnerships in the BCoP. There was unanimity in the recognition that RTB breeders accomplish their objectives with and through partners. There was, however, a diversity of opinion on the process to bring partners into the planning and implementation of the various structural and operational components of the community. Workshop organizers were already somewhat constrained in bringing partners to the planning workshop due to the modest budget allocated. The highest priority was assigned to bringing together as many RTB scientists as possible from the supported clusters. Getting the house in order internally was considered to be a key first step before more intense involvement of partners. This approach was generally supported by the group, but with some reservations. The *RTB-first* approach was largely justified by a two-part rationale. First, since every RTB scientist already has extensive collaboration with partners, and worked with partners in development of the Phase II proposal, partners' perspectives were brought to the table in

all the discussions. Secondly, organizers considered the risk of bringing partners into internal RTB discussions which were in essence laying the groundwork for the next step of broad partner engagement. This debate was especially notable in the case of the BCoP portal: partners need to be provided access and encouraged to participate very quickly in the portal during its development phase in order to make it fully functional and meet its larger objectives.

The BCoP has multiple mechanisms to support linkages among the breeding-related clusters. These mechanisms span nearly all the cluster outputs, but are especially relevant to Product 1.1.1: Capacity building and knowledge sharing portal on clonal crop breeding. This workshop focused on setting up and launching the **RTB Breeding Portal.**

The Portal will be at the core of the communication and capacity building strategy for the BCoP. Better communication has been continually highlighted as a need by scientists within and among clusters and flagships. The portal full title (Output DI 1.1.2) is: *Web-based portal for repository of contacts, protocols, tools and training materials for clonal crop breeding*. It is described as follows in the MEL platform: *A web-based portal will be designed and structured to house or link to information on methods, tools, events, people, drivers and dialogue pertaining to challenging aspects and new developments in RTB Breeding. In addition to RTB BCoP members, the target audience of the portal includes researchers contributing to each RTB Flagship who inform breeding objectives and incorporate its products along their respective impact pathways.*

Some of the likely elements defined for the Portal were:

- Discussion forum
- Proposal development - versioning
- Document management
- Announcements
- Post recordings of presentations/ seminars / training programs / visits
- Task lists
- Search function
- Calendar

Participants also noted and discussed some of the challenges defined for the Portal, and proposed solutions accordingly (Table 1).

Table 1. Challenges and proposed solutions for development of the knowledge portal for the RTB Breeding Community of Practice.

Challenges for the Portal	**Proposed Solutions**
Requires committed leadership and administrative input to assure continual smooth functioning of the portal	The portal will be designed to be largely user-managed to minimize administrative inputs. Nonetheless, it is well recognized that without any oversight or administrative input, the site will not function well.
Since the Portal is currently based on SharePoint, it is accessible only by persons with CGIAR accounts	Portal manager (Geoffrey Mwanthi) is investigating the possibility for access to partners outside CGIAR
The language (i.e. the abbreviations, acronyms and jargon) of CGIAR, including of RTB, can be difficult to comprehend by partners	If the Portal is to become a tool of broad use by both RTB and partners, a glossary will be most useful, and users will need to exercise great care in communication
The Portal should not duplicate what other websites are doing, for example the Sweetpotato Community of Practice	Some duplication is inevitable, but the portal will concentrate narrowly on being the communication tool of the RTB Breeding Community of Practice and not a broader tool for RTB crop research for development in general.
Key portal potential users from RTB were not in the workshop, especially banana breeders	This report and the portal information will be distributed widely among all potential RTB uses for information and additional feedback and input.
The access and use of the Portal by partners was not fully elaborated	The BCoP proposes to develop the Portal first as primarily an internal tool, and then expand to partners after it becomes fully functional in an internal mode. It was confirmed that partners will be able to access the portal with credentials provided by the administrator on request of RTB BCoP members.

On the final day of the workshop, Morag Ferguson and Geoffrey Mwanthi led a launch of the Portal. The exercise included having participants register and upload their personal information. There was considerable discussion around the overall organization of the portal and the content of the drop-down menus. The group concluded that the portal should begin with a simple, basic structure and build on that based on actual needs going forward, as scientists begin to use the portal. While it is

hoped that the portal can be nearly self-sustaining by everyday users, it was recognized that sustainability will also require some leadership. Morag agreed to be the focal point for the portal to get it up and going, and leadership needs into the future can be discussed as those needs change. The BCoP should closely monitor and evaluate the use and effectiveness of the portal, and be prepared to adjust, adapt and refine it. This will require *light* but committed Portal stewardship as well as broad commitment among scientists especially of FP 1 and FP 2.

While the Portal will be at the center of communications to foster the linkages among breeding-related clusters, the workshop recognized an array of interactions that will be necessary for a fully functioning BCoP. Joint projects, inter-center meetings and regular communication among scientists via other means (e-mail, phone calls, etc.) will supplement and complement what the Portal is able to accomplish. The gender team proposes to have a page on the portal specifically to address gender issues.

Participants were also informed about latest developments in the system-wide platforms on Excellence in Breeding, including the genotyping and phenotyping components; on Genebanks; and on Big Data. However, as these platforms are just getting underway in most cases, there was limited information to be shared at this point in time, on the specific opportunities for RTB.

Next Steps

Action	Timeline	Responsible
BCoP members register and upload portraits on the following link for the RTB breeding portal: https://cgiar.sharepoint.com/sites/IITA/Projects/rtb/Portraits/	As soon as possible and ongoing for new members	BCoP members
Complete the *Contacts* form in: https://cgiar.sharepoint.com/sites/IITA/Projects/rtb/SitePages/Contact%20Profiles.aspx	As soon as possible and ongoing for new members	BCoP members
Develop more informative and intuitive home page	Sept. 2017	M. Ferguson, G. Mwanthi
Name champions for each page and advocate across BCoP for active use	Sept. 2017	M. Ferguson, M. Bonierbale
Create a *follow* function for discussion pages, so that one can be alerted via e-mail or text message about new posts	Sept. 2017	M. Ferguson, G. Mwanthi

OUTPUT 2: PORTFOLIO AND SELECTED DELIVERABLES OF CLUSTERS DI1.1 AND DI1.2 ARE AGREED AND BUILT BY CLUSTER TEAMS (SESSION 1 AND 6)

Output 2 of the workshop addresses the following deliverables of the earmarked funding:

DI 1.1.1.1: Cluster team formed; portfolio revised and MEL updated for BCoP

DI 1.2.0.1 (1) (new): Strategy document outlining the vision of the DI1.2 cluster, defining priorities and establishing mechanisms to achieve the overall objectives of the cluster. Joint concept notes for cross-cutting research relevant to DI1.2

DI 1.1.2.1: Framework for defining and describing breeding targets in terms of traits and trait levels against which genetic gains can be measured

DI 1.1.3.5: Standard Variables of the Global Agronomy Management Ontology validated for RTB crops

DI 1.1.3.7: BrAPI compliant data sources for breeding data

DI 1.1 AND DI1.2 TEAM DEVELOPMENT AND PORTFOLIO REVISION/UPDATING

Developing the research portfolio for all the RTB clusters was largely completed in the Phase II proposal, but is an ongoing process. An initial question from the workshop was about the degree of flexibility for clusters to modify this portfolio from time to time, relative to what was presented and approved in the Phase II proposal. Participants close to the process of proposal development agreed that reasonable changes could be presented to Flagship Leaders and PMU for approval and would need to be updated in the MEL platform. It is noted that the Clusters need specific guidance from PMU on the approval process to make changes to the portfolio. These changes should be made with great care and wide discussion among the cluster team in order to sustain a coherent, relevant and forward-looking research portfolio that adapts readily to a changing R&D environment. Participants suggested that the scientific agenda needs to guide the structure and function of the clusters and not be limited by a specific platform for MEL. Specific changes proposed and endorsed in the workshop are shown in Table 2.

Table 2. Cluster organization (Products and Outputs) and leadership identified for cluster teams.[1]

Cluster/Product/Output			Responsible for reporting (from current MEL platform)	Leaders indicated from workshop
Breeding Community of Practice				
1.1.1	**~~Capacity building~~ Partnership strategies and knowledge sharing portal on clonal crop breeding**			**M. Ferguson**
	1.1.1.1	Cross-crop and crop-specific CoP organized ... to be formulated	D. De Koeyer	A. Amele or Ch.Egesi
	1.1.1.2	Web-based portal for repository of contacts, protocols, tools and training materials for clonal crop breeding	M. Ferguson	M. Ferguson
	1.1.1.3	Workshops on methods and tools for RTB breeding	W. Gruneberg	T. Shah
	~~1.1.1.4~~	~~Guidelines for design and assessment of RTB breeding programs~~	~~P. Kulakow~~	
1.1.2	**Metrics and monitoring tools for RTB breeding**		**E. Carey**	**E. Carey**
	1.1.2.1	Objective traits, levels and combinations set for each RTB breeding program by region agroecology (spans FPs 1, 2, 3, 4 and 5)	M. Bonierbale	M. Bonierbale
	1.1.2.2	Metrics established to help monitor benefit and uptake of new tools proposed to accelerate RTB Breeding outputs (spanning FPs 1 and 2)	E. Mihovilovich	E. Salas
	1.1.2.3 (moved)	Guidelines for design and assessment of RTB breeding programs	P. Kulakow	T. Mendes
1.1.3	**RTB Breeding database support tools**			**E. Arnaud**
	1.1.3.1 (console-dated)	Ontologies to support RTB breeding		E. Arnaud

[1] Changes in the Cluster/Product/Output are indicated by: deletions: cross-through; additions: highlighted in yellow.

	~~1.1.3.1~~	~~Protocols and trait dictionaries for agronomy variables for the RTB crops documented, aligned, formatted and available in Crop Ontology platform for RTB trial management systems~~	~~E. Arnaud~~	~~E. Arnaud~~
	~~1.1.3.2~~	~~Protocol and trait dictionary of Participatory variety selection (PVS) for RTB crops documented, aligned and available in the Crop-Ontology platform for RTB trial management systems~~	~~E. Arnaud~~	~~Afolabi Agboana~~
	~~1.1.3.3~~	~~Protocol and trait dictionary of Quality and Chemical evaluations for RTB crops documented, aligned and available in the Crop-Ontology platform for the RTB trial management systems~~	~~E. Arnaud~~	~~E. Arnaud~~
	1.1.3.~~4~~2	Data collection methods such as time series, subsamples and repeated measures designed and represented field books and ontologies	E. Arnaud	Elisa Salas
	~~1.1.3.5~~	~~Standard Variables of the Global Agronomy Management Ontology validated for RTB crops~~	~~E. Arnaud~~	
	1.1.3.~~6~~3	Clearing house for information management tools to support breeding processes.	E. Salas	E. Salas
	1.1.3.~~7~~4	Application programming interface (API) for breeding RTB community	R. Simon	M. Rouard
1.1.4	**Cross-learning and scalable methods for clonal crop breeding and variety selection**			**H. Ceballos**
	1.1.4.1	~~Guidelines~~Parameters for resource allocation in early and later stages of RTB crop breeding program	W. Gruneberg	H. Ceballos
	1.1.4.2	Guidelines for heterosis increment estimations in RTB crops	W. Gruneberg	H. Ceballos
(New)	1.1.4.3	Experimental methods and models		T. Mendes
1.1.5	**Scaling ~~strategy~~ for more effective use of populations and elite breeding lines**			**S. de Haan**
	1.1.5.1	Attractive descriptions of breeding products and corresponding stocks promoted and available to next users	E. Carey	S. de Haan
	1.1.5.2	Decision support tools for performance prediction and recommendation domains	E. Salas	T. Mendes

	1.1.5.3	Case studies and policy approaches to reduce time frame for release of candidate varieties	S. de Haan	S. de Haan
NextGen Breeding				
1.2.1	**Omics Tools for Trait Definition and Selection**			**H. Lindqvist-Kreuze & M. Ferguson**
	1.2.1.1	Knowledge about the Biochemical, physiological and physical components of 1-3 key target traits per crop to facilitate increased precision and gain in selection	H. Lindqvist-Kreuze	
	1.2.1.2	Trait-linked molecular markers identified through: transcriptomics, metabolomics, genetic mapping (QTL and GWAS)	H. Lindqvist-Kreuze	
	1.2.1.3	Proof of Concept (POC) and validation of marker-assisted and genomic selection tools	H. Lindqvist-Kreuze	
	1.2.1.4	Knowledge of association between physical-chemical traits and consumer preferences for 2-4 traits for each RTB crop	H. Lindqvist-Kreuze	
1.2.2	**Genetic Stocks and Populations for Discovery Research**			**A. D'hont**
	1.2.2.1	Inbred lines, ploidy variants and genetic stocks to develop and strengthen product development pipelines	A. D'hont	
	1.2.2.2	Training populations established for genomic selection in RTB crops	A. D'hont	
	1.2.2.3	Bi-parental and association mapping populations developed for RTB crops	A. D'hont	
1.2.3	**Genotype Profiling and Diversity Analysis**			**L. A. Becerra**
	1.2.3.1	Dense genetic linkage maps and reference genome developed	L. A. Becerra	
	1.2.3.2	Breeding populations and Germplasm collections genotyped using high-density methods (GBS, DARTseq and RAD)	L. A. Becerra	
	1.2.3.3	Transcriptomic, ~~and~~ metabolomic and proteomic profiling key breeding-goal traits for RTB crops	L. A. Becerra	

1.2.4	**High-Throughput Phenotyping Tools and Technologies Implemented For RTBs**			**I. Rabbi & S. Carpentier**
	1.2.4.1	2-4 precision and high throughput imaging and sensor tools for macro level diagnostics and selection (e.g. foliage and roots) for all RTB crops	I. Rabbi	
	1.2.4.2	2-4 tools and methods for high throughput evaluation of physiological and developmental traits for yield and resilience for all RTB crops	I. Rabbi	
	1.2.4.3	Tools and methods for high throughput evaluation of 2-4 key processor and consumer preference traits for all RTB crops	I. Rabbi	
1.2.5	**Data and Knowledge Management**			**M. Rouard & L. Mueller**
	1.2.5.1	Integrated bioinformatics platform for allele and candidate gene discovery	M. Rouard	
	1.2.5.2	Open access databases for management of phenotypic and genotypic information with integrated analysis and decision support tools	M. Rouard	

OBJECTIVE TRAITS, LEVELS AND COMBINATIONS: A FRAMEWORK FOR SMART BREEDING OBJECTIVES FOR RTB GENETIC IMPROVEMENT

This output is considered of fundamental and over-arching importance to RTB breeding and related disciplines and activities. The discussion on breeding objectives is a follow-up to a table (Table FP1 4.1) presented in the RTB Phase II proposal, which summarizes key target traits for each of the RTB crops, by region. The table gives a preliminary estimate of expected genetic gains for each trait, through the period to end of Phase II in 2022. It also attempts to show traits which should be priority targets of tools and information developed with the NextGen Cluster and those that can best be targeted for improvement through genetic engineering or gene editing with the Game-changing Solutions cluster.

Defining target traits and target trait levels is fundamental to the workshop purpose and the expected outputs. Having a clear vision of traits and their level of expression desired by next-users and end-users along the value chains drives nearly all of Flagship 1 and 2, as well as significant components of Flagships 3, 4 and 5. Table 3 shows some examples of how Clusters from different RTB Flagships feed into the definition of target traits and/or depend on having a well-defined set of target traits in order to develop their Products, Outputs and Deliverables. Nearly every Cluster of every RTB Flagship takes into account the traits that breeders work with to satisfy next-user and end-user needs for new varieties.

Several steps are needed to advance the information in this table toward capacities for monitoring and evaluation. A first step should be to consolidate interdisciplinary *crop improvement teams* including those who worked together in the workshop to improve the crop x target region sections of the table. For each crop improvement team, steps should include validation of target agro-ecologies/ geography descriptions; prioritization of traits for genetic improvement; trait dictionaries (ontologies) with definition of parameters for describing trait status (e.g., presence-absence; frequency; level), objective trait level for each target region, baseline trait status of current predominant varieties, and expected genetic gains. Agro-ecological information may be enriched by social targeting information where relevant, and trait definitions should consult crop, management, end-use or other disciplines' ontologies (e.g., pathology, agronomy).

Table 3. Examples of how the appropriate definition of target traits in RTB breeding impacts or relates to all of the RTB Flagships.

Cluster Abbreviated Description	Contributions to and/or dependence on a well-defined set of target traits for new RTB varieties
FP 1: Discovery research for enhanced utilization of RTB genetic resources	
DI1.1: BCoP	Leads overall exercise
DI1.2: NextGen Breeding	Molecular geneticists/breeders provide tools and techniques to accelerate the process toward reaching trait targets
DI1.3: Game-changing Traits	Identify and incorporate genes for target traits for which insufficient diversity exists in current gene pool, or where gene combination/ pyramiding is complicated in RTB.
DI1.4: Genetic Diversity	Support identification of new diversity for target traits in genebank collections
FP 2: Adapted productive varieties and quality seed of RTB crops	
CC2.1: Access to quality seed/ varieties	The ultimate measure of genetic gain is in farmers' fields and access to breeding products by way of quality seed is essential for this outcome. Efficient delivery systems and appropriate capacities for timely availability of quality seed of new varieties are an essential part of the breeding pipeline. Furthermore, seed quality is likely to become more relevant as climate change affects crop development (e.g., partitioning) and seed storage conditions, and characteristics needed as a response.
BA2.2: User- preferred banana cultivars/hybrids	Understanding user-preferred traits is at the heart of developing user-preferred cultivars/hybrids
CA2.3: Added- value cassava varieties	Includes the full complement of traits important in the value chain
PO2.5: Agile potato for Asia	
SW2.6: User- preferred sweetpotato varieties	
PO2.4: Seed Potato for Africa	Includes the full complement of traits important in the value chain. Genetically controlled varietal traits are a key component of quality seed. Seed quality may become more relevant as climate change affects RTB development and seed storage characteristics.
YA 2.7: Quality seed yam	
FP 3: Resilient RTB crops	
CC3.1: Pest/disease management	Resistance to key pests and diseases is relevant for all the RTB crops. Management practices are designed to complement and optimize varietal attributes and performance. Knowledge of host-pathogen interaction, disease pressure, dynamics and management options are essential inputs for setting priorities and target trait levels in RTB breeding programs.
BA3.3: Banana fungal & bacterial wilt (Foc/BXW)	
BA3.4: Banana viral diseases (BBTD)	

CA3.5: Cassava biological constraints, Asia/Americas	
CA3.6: Cassava biological threats, Africa	
CC3.2: Crop production systems	Trait expression interacts strongly with crop management, and therefore breeders and agronomists collaborate on defining key traits for optimum response in improved production systems.
FP 4: Nutritious RTB Foods and Value Added Through Post-harvest Innovation	
CC4.1: Post-harvest innovation	The post-harvest support clusters provide feedback on processor and consumer preferences, and the traits breeders need to keep in mind for adaptation to new innovations in post-harvest management and utilization
CA4.2: Cassava processing	
CA4.3: Biofortified cassava	Nutrition traits, especially micronutrient density, are primarily managed through breeding. Target traits and trait levels are set according to target populations' nutritional status and dietary intake.
SW4.4: Nutritious sweetpotato	
FP 5: Improved Livelihoods at Scale	
CC5.1: Foresight and impact assessment	Awareness of technology opportunities along the value chain, resource costs (labor, energy, water, fertilizer), market demand and climate change-related pressure on the horizon of ~10- 20+ years is needed for setting breeding objectives, target traits and trait levels in RTB breeding programs, and for positioning new varieties in value chains.
CC5.2: Sustainable intensification/ diversification	Resilience and phenological traits are key to the sustainable intensification and diversification of farming systems with RTB. Systems considerations play an important role in setting target traits and trait levels, such as crop duration, plant architecture, level of pest resistance, etc.
CC5.3: Gender and youth	The Gender and Youth team helps define and refine target traits such that breeders can develop varieties that support equitable development among beneficiary groups.
CC5.4: Scaling RTB agri-food system innovations	Scaling tools and methodologies should include continuing feedback between technology developers and technology users to assure end-user relevance and completeness of the trait portfolio offered, in the case that new varieties are part of the technology package being scaled up or scaled out.

The workshop participants made key progress in recommendations for a refined framework for RTB target traits and trait levels, but suggested that a more comprehensive revised framework needs to be developed beyond this workshop. The following are some of the key discussion points about the traits framework.

Target traits need to be explicitly packaged within RTB next-user and end-user products. Workshop participants reiterated that breeding goals should be SMART, as follows:

- **S**pecific: The goal should target a specific area of improvement or answer a specific need.
- **M**easurable: The goal must be quantifiable, or at least allow for measurement of progress.
- **A**ttainable: The goal should be realistic, based on available resources and existing constraints.
- **R**elevant: The goal should align with other business objectives to be considered worthwhile.
- **T**ime-bound: The goal must have a deadline or defined end.

In order to define target traits and their target levels of expression more rationally, the beginning point should be to understand the array of crop-specific trait combinations required for agro-ecosystem x end-user needs. Each of the RTB objectives has its breeding goals defined in part by a combination of market uses and agro-ecologies. In turn, combinations of these target traits and trait levels comprise the respective product profiles under development by RTB (cross-flagship) crop improvement teams. Specific sections of the workshop were dedicated to collaboration on tools and methods needed to describe traits and measure trait levels in a consistent manner.

TRAIT DICTIONARIES AND ONTOLOGIES

A session was held to update and refine RTB trait dictionaries and ontologies, the development process and use, and plan next steps for further improvement, buy-in by breeders, and general adoption in breeding programs.

All the RTB crop ontologies are curated at www.cropontology.org. The ontology team of RTB led by Elizabeth Arnaud proposes a bottom-up approach to engage the RTB BCoP. Although standardized ontologies have been under development for several years, there is still considerable diversity among breeders in how they describe the same traits. Further, new traits continue to enter the picture, especially with regard to consumer preference traits and their wide variation with products and with regions. Development of trait dictionaries requires someone who understands the crop and its genetic improvement, i.e. the breeders need to interact closely with trait specialists, end users and the ontology team. There is flexibility in the database to create additional ontologies, but this needs to be curated to ensure we monitor what has been selected.

Potato offered an example of a more advanced protocol for ontologies. At CIP, breeders are aligned with descriptors used by the genebank, which could be a starting point for other crops and for adding the quantitative measurement methods and variables.

The NextGen breeding database and fieldbook use for cassava has been successful. A collaboration exists with the ontology team to harmonize the traits in the database with those of the Breeding Management System. There is a programmer at BTI who edits the ontology and inserts it into the

database, and at IITA there is a person in charge of maintaining the ontology. Duplicated traits are relabeled and new traits added.

Scales. The utility of interval scales to improve on standardized methods for assessing susceptibility to diseases was presented as an example of describing trait levels in a robust manner as sought in the RTB trait improvement metrics framework. The late blight susceptibility scale of Yuen and Forbes (2009)[2] enables inference to resistance levels with a reduced coefficient of variation among trials as compared to other semi-quantitative metrics like AUDPC or rAUDPC. The scale uses reference cultivars in regression analysis and will help breeders to measure and describe resistance of genotypes with reduced effect of the environment or inoculum level, which can vary from site to site and year to year. This approach gives breeders a simple numerical metric for quantitative traits that is useful across years and locations and in mathematical and statistical operations like the setting of baselines and calculation of genetic gain.

The complexity of breeding for target traits for RTB crops. Breeders focus on relatively few traits in order to add value for users, relative to varieties that are already available. However, the users will also have a list of traits that they expect to see maintained at the same or nearly the same level or type of expression. One discussion group referred to ***improvement traits*** and to ***maintenance traits*** – traits that are not targets for improvement, but which need to be maintained at current levels (relative to expression in varieties in current use). *Maintenance traits* typically receive little attention in the discussion of genetic gains, but are a key part of the discussion for crop breeding. To make matters more complex, breeders also need to go an additional step to define ***preemptive traits***. These are traits that next or end-users may not have in mind when communicating their needs and interests to plant breeders, but which will be necessary because of future changes. The lead time in breeding is quite long, and breeders need to anticipate traits that may not be appreciated now but may impact livelihoods or be needed in 20 years. Examples are traits that make mechanization more suitable, that can increase nutrient intake, or that respond to future threats from pests and diseases. Because all RTB crops are highly heterozygous, many traits segregate widely after making a cross, including those traits that the breeder wants to improve, as well as non-target traits. This wide segregation is simultaneously one of the greatest opportunities and one of the greatest challenges for RTB breeders. Even in local varieties or currently available best hybrids that only need to be improved in one or a few traits, nearly every other trait of importance to users of the variety will segregate after any cross between two heterozygous parents. If one considers that each of these traits may segregate in any given cross, the challenge to the breeder becomes evident. If, for example the breeder's main goal is to increase resistance to a particular disease, he/she is not selecting only for resistance, but must also consider perhaps 15-20 other traits to be sure the new selections continue to meet users' acceptance criteria. These maintenance traits are often poorly understood, and sometimes only become evident when new varieties fail to meet user expectations.

[2] Yuen, J. and Forbes, G. (2009) Estimating the level of susceptibility to *Phytophthora infestans* in potato genotypes. The American Phytopathological Society, Phytopathology 99(6), 2.

BRAPI COMPLIANT DATA SOURCES FOR BREEDING DATA

The needs for communication and coordination for database development and management suggested that there should be some strong roles for the BCoP. It is a very large topic and this workshop only allowed time for some rather general insights and suggestions on how to move forward. Discussions perhaps generated more questions than answers; nonetheless there were some key areas noted for next steps and future development.

The idea of massive centralized databases has faded in recent years and attention has turned to interoperability among an array of databases so that all can communicate with each other and provide systematic archiving and access of breeding data. A key part of this is the development of common application program interface (API) standards between information systems, e.g. the Breeding API (BrAPI), which support compliance of data exchange within RTB. The Breeding API specifies a standard interface for plant phenotype/genotype databases to provide access to their data for crop breeding applications. It is a shared, open API, to be used by all data providers and data consumers who wish to participate (https://brapi.org). BrAPI is based on existing validated standards like Multicrop Passport Data, Ontology, and Minimum Information About a Plant Phenotyping Experiment (MIAPPE). The BrAPI website currently focuses on genotype visualization, field data collection, R module, data transfer, geographic visualization and search.

This output develops and adapts software systems to support and document breeding processes and products including crossing, trait assessment and exchange of breeding materials linked to RTB breeding data bases. The BCoP will not in itself develop information systems or databases, but will develop and share breeding information management tools and provide a forum for interaction of crop improvement teams to develop and use information management tools to support breeding processes.

Biometrics was identified as a weakness among all the centers. How can the BCoP act to support bioinformatics and biometrics across crops and across centers? It is a clear area where combining of resources might benefit the community. For example, Bioversity has a bioinformatics facility and can provide a good learning environment for the BCoP. There is already a good connection between CIAT and CIRAD on bioinformatics, which might be extended across other centers.

The RTBbases are a useful model for all the crops. Cassavabase now has five years of experience and a lot of data. All due care is given to data security and to date there is no evidence of data leaks. But some data remain sensitive. For instance, where there is partner collaboration or information on farmers such as in PVS, data may need additional layers of access permission and be made anonymous when shared externally. The BCoP should encourage all parties to contribute data in a timely way and to find creative ways around sensitivities about data *ownership*. For the most part, institutions rather than individual scientists dictate how data is shared in open access systems, or not shared.

Next Steps

Action	Timeline	Responsible
Ensure that each center has a team for each crop, that is committed to updating ontology traits.	Sept. 2017	Cluster leaders
Plan the extension of trait dictionaries and ensure that they remain functional. There is need to have one person per crop who can help with curation and set up a training with Nextgen Database and Crop ontology staff to coordinate actions.	Sept. 2017	E. Arnaud
Develop a draft framework for trait prioritization for review and further development under the coordination of the BCoP.	Aug. 2017	Leader BCoP and C. Hershey
Map people and skills in statistics and bioinformatics, who may be accessible to RTB scientists.	Nov. 2017	M. Rouard

OUTPUT 3: GENDER RELEVANCE OF CLUSTER PRODUCTS, DELIVERABLES AND LINKAGES ARE ENHANCED THROUGH GENDER INTEGRATION AND MAINSTREAMING (ALL SESSIONS, AND ESPECIALLY SESSION 7)

Output 3 responded to the following deliverables for the Gender earmarked funding:

DI 1.1.1.3: A workshop report defining gender mainstreamed protocols for PVS to record data for trait preferences and ontology dictionaries to support the deliverables of output DI1.1.3.2

DI 1.1.3.2: Prototype for collecting and reporting gender preferences for traits in PVS reviewed with gender specialists.

On the whole, workshop organizers planned sessions and discussion groups to facilitate integration of gender and social sciences into the broad topics of the workshop rather than stand-alone gender discussions. Nonetheless, there were also opportunities for the social scientists, along with bio-physical scientists, to focus on specific gender issues. The gender earmarked funds specifically indicated input into the Ontologies discussions and on Participatory Varietal Selection (PVS) methodologies, including consumer preferences.

To scale up the incorporation of farmers' preferences for integration into a breeding program, breeding teams need to access a large amount of data. The experimental design and the protocol used must be stored in a database along with bio-physical data. Capture and standardization of preference

traits and scales are required for PVS and for surveys in order to compare and combine data sets. Socio-economic baseline studies may be necessary before conducting PVS. Some good resources noted by the group are the Rural Household Multi-Indicator Survey (RHoMIS) for rapid characterization of households to inform climate smart agriculture interventions (http://rhomis.net/blog/), and a methodology produced by PIMS (http://pim.cgiar.org/2014/07/31/standards-for-collecting-sex-disaggregated-data-for-gender-analysis/)

Meanwhile, the Gender in Breeding Initiative of the CGIAR (http://www.rtb.cgiar.org/gender-breeding-initiative/) brings together plant and animal breeders and social scientists to develop a strategy for gender-responsive breeding with supporting methods, tools and practices. This Initiative is commissioning a paper on socio-economic targeting, to be available by the end of 2017

Do the different RTB centers have gender responsive breeding objectives?

All centers had socio-economic objectives integrated into breeding programs, but not all of them integrated gender. CIP presented an update on the methods and supporting data collection tools it is using for PVS. Most effort is placed on working with farmers and a range of other stakeholders in the final stages of selecting among elite clones and varieties, but it is also applied in pre-breeding to capture preferences and expose end users to available diversity in early stages of breeding. The PVS method and data templates collect sex disaggregated data. The main purpose is to empower women by having them involved in breeding decisions or at least in the selection of varieties that will be released. CIP has developed a gender mainstreamed PVS manual to guide the data collection step by step. Using the guidelines, field data are sex disaggregated and both quantitative and qualitative data are collected. Observations are made for the most important traits at various crop stages, including organoleptic qualities, dormancy and storage conditions. Statistical analytics can be performed to compare the mother and baby trials.

The BTI/IITA Nextgen project on cassava uses the trials of NextGen in East Africa to collect qualitative data. A household survey gathers both biological and socio-economic variables such as number of people in the household, children under 5, who owns the land, who controls the money, who decides on varieties, who is in charge of activities, management practices, variety names, and how the varieties have been used. Although these qualitative data are collected, there is still further need for analytical methods that can merge the quantitative and qualitative information.

At Bioversity *Seeds4needs* is a pre-breeding project taking germplasm from genebanks (hybrids and landraces) for assessment by farmers under their own conditions. Seeds of the most preferred varieties are conserved in community seedbanks. Projects exist in Latin America, Africa and Asia with different crops, including Bananas in East Africa. The methodology includes both a crowd sourcing method for large numbers of farmers to provide their preferred traits. Mother and baby trials go deeper into the evaluation. Study design includes both women and men. The project started with agronomic traits to validate the methodology and will evolve to include post-harvest traits. Bioversity is developing a platform called CLIMOB for collecting all Seeds4Needs crowd-sourced information. Training of enumerators is organized for using the forms on tablets. Bioversity can share the methodologies for field apps using the Open Data Kit as is done with the banana programme -- an electronic fieldbook form for banana farmers' preferences.

Often, gender input is sought as a post-breeding assessment when PVS trials are performed after a clone is ready to be submitted for the farmers' assessment. Alternatively, gender specialists can provide input at pre-breeding stages to support the definition of product profiles. Surveys can be performed on preferred agronomic and post-harvest traits, through consumer surveys and crowd sourcing before committing to a full-scale breeding program.

There remains the need to integrate components of successful methodologies for testing clones for different crops and in different regions. CIP has some training material that can be shared (how to integrate gender into PVS) and FAQ on PVS. Formal methods for sensory analysis have been well established, such as in the CIRAD food laboratories visited by workshop participants. RTB can learn from experiences in other crops, such as in maize, e.g. BELLON AND REEVES, Quantitative Analysis of Data from Participatory Methods in Plant Breeding http://libcatalog.cimmyt.org/download/cim/448231.pdf

While gender teams have continued to stress the importance and develop the methodology for PVS, breeders, with some exceptions, have generally not mainstreamed the process. The disconnect is not a matter of lack of sensitivity or interest by breeders, but a matter of practical response to the way that multiple breeding objectives are incorporated into a breeding pipeline. The typical means by which breeders apply selection criteria in their breeding trials is to become intimately familiar with the traits that customers (farmers, processors, consumers) need. There are multiple ways they can obtain this information, e.g. user interviews, variety field days and direct participation of next and end-users in selection in breeders' nurseries. Much of the PVS methodology has focused on the latter, and in fact much has been learned from hundreds of such examples across crops and continents.

This workshop addressed the next steps for assuring that RTB breeding is gender-relevant and at the same time adapts to the demands for accelerated genetic gains through higher throughput and higher precision methods. As breeders ramp up their throughput with genomics and high throughput phenotyping, PVS needs to assess and exploit the opportunities for engaging in the process in creative new ways. PVS in its traditional mode of farmers working alongside breeders in selection trials will need to adapt and contribute to the needs and capacities of breeders for ever-higher throughput for the evaluation of breeding materials.

What are the key approaches to ensure the interests of men and women farmers and consumers are taken into account when setting breeding objectives?

Generally, the trait preferences differ across value chains and the use to which the product is directed. As a result, there is a need to distinguish/clarify who the consumers and other value chain actors of interest are.

In banana, the starting point is profiling all the products made from banana which helps to characterize the various actors in the value chain and their needs. Each product usually has its own value chain and in obtaining the scope of the value chain, the gender aspects usually come through. Each segment of the value chain is probed for social-economic issues.

In sweetpotato, commercial products drive what the industry wants e.g. for sweetpotato produced for puree for bread, the traits desired may be different from those desired for consumption at the local level.

The level of complexity depends on the location and desired need, e.g. cassava starch processors will only look for high starch production potential. Farmers may still maintain certain traits depending on their food security and culinary needs. Market segment analysis hence is very important in understanding users' preferences for traits which would then feed into the breeding programs. Typically, a combination of income, nutrition and food security drive trait demands, and a good understanding of this is very important for the breeders. Hence the selection of the stakeholders should be representative of the entire value chain after which their needs would be ascertained

How can we design our program in such a way that the selection of traits for genomic selection breeding and use of economic-weighted selection indices ensure that new varieties have wide and gender-equitable impact (Are there any methods developed or that can be adapted)?

Breeders may sometimes find it difficult to standardize and measure farmer preferred traits. Thus there must be continual back and forth linkages/communication between the social scientists and breeders. Breeders need to work with social scientists to answer a number of questions: What are the pathways for better linking breeders to social scientists for PVS trial design? What institutional or projects setups are hampering an integration of breeders and social scientists for PVS design? How to improve this? What key steps are needed to foster the incorporation of PVS data into breeding strategy design, in breeding product definition and in technology deployment strategy?

What are the pathways for better linking breeders to social scientists for PVS trial design?

Expectations of social scientists and breeders can and do need to be synchronized. The social sciences data need to be comparable and interoperable – which is where ontology comes in. This shows that there is need to work in truly interdisciplinary and multidisciplinary teams. Some national institutions hamper variety release procedures which makes such collaboration difficult. There is need for a cultural shift. For example, where possible, men and women farmers can be brought to the station for variety evaluation. This would disregard the farmer conditions but can help speed up information acquisition.

What are the feed-back loops to ensure that data is fed back into the breeding process?

- Need for back and forth linkages/communication between the social scientists and breeders
- Breeding teams should include social scientists
- Incorporating people with a background in both disciplines to improve communication and understanding of issues in both domains
- Work with farmers who are engaged in both breeding and processing trials
- Need good facilitators and partners on the ground to help setting up and evaluation of trials

Suggestions for developing a gender integrated crop ontology:

- Need to have a gender objective in the breeding strategy
- Collect socio-economic information from farmers and households hosting trials (in addition to age, gender, ethnicity, information collected could include how households are organized, who is in charge of activities, number of people, number of children under 5, who owns the land, who controls the money, who decides on varieties)
    - Age, gender, ethnicity

- When conducting household surveys on trait preferences there is need to have enough men and women in the sample to be able to do sex disaggregated analysis (aim for at least 70%/ 30%)
- There is need to conduct a baseline study on preferences before doing PVS activities
- There are possibilities of using interactive software such as participatory GIS to collect data.
- While crowdsourcing is interesting to explore, men and women should be engaged not only to get general trends but also to understand the gender dimensions of trends and preferences.
- Develop standardized field books for collecting gender integrated PVS data (CIP has templates in its PVS manual, Bioversity also had templates and field books that can be standardized and gender mainstreamed).

What key actions are needed to foster the role of gender mainstreamed PVS data into breeding strategy design, in the breeding product definition and in a technology deployment strategy?

- Forming multi-disciplinary teams as a pre-requisite to setting up the PVS system: this is quite costly and would require a large resource outlay
- There is need for an evidence base of case studies to work in favor of setting up this system as it definitely provides value when compared to releasing a variety that will not be adopted. A baseline study of previous varieties released, how they were adopted by men and women could help. E.g. breeding for *big bunches* – how big should the bunch be for a woman to be able to carry it?
- We could think of trials that link farmer preferences with specific regions of the crop genome, to which breeder's traits may also be mapped. We could also use the Likert scale for scoring (e.g. https://www.socialresearchmethods.net/kb/scallik.php). This would then need to be put in an ontology format. Hence some methods exist and some may need to be developed but need to be reformulated in an ontology format. A baseline study of previous varieties released, how they were adopted by men and women could help.
- Under the "resource mobilization" Session the participants contributed to the formulation of a new proposal *RTBFoods* which has since been submitted to BMGF and would support the dissection of both complex traits and farmers' preferences for their eventual association and more precise management in breeding programs.
- Need to evaluate crop ontology data bases to see if the data is sufficiently sex disaggregated and update the data base
- Since different centers have been using different data bases, the protocol used to collect data need to be stored in the data base so that data users can make informed choices about comparability of data.
- Develop a consistent methodology for testing the clones (for different crops and different countries)
- Develop similar gender integration standards for PVS in RTB
    - Format for consumer evaluation: Could use the one developed by CIRAD but can be upgraded to include gender issues (There is need to follow up with Dominique regarding this).
    - CIP has some training material that can be shared (how to integrate gender into PVS)
- Learn from other CRPs like maize who are pioneers in PVS.

Next Steps

Action	Timeline	Responsible
CIP to share their PVS data dictionary	Oct. 2017	E. Salas
Biomart to connect the germplasm catalogues with ontologies	Mar. 2018	E. Salas
CIP to share the sweetpotato dictionary to validate and update in the ontology	Sept. 2017	D. Geminet

OUTPUT 4: CLUSTER MANAGEMENT, GOVERNANCE AND COORDINATION ARE AGREED AND IMPLEMENTED (SESSION 1)

Discussions on cluster management and governance responded to two Deliverables identified in the earmarked funding.

DI 1.1.1.1: Cluster team formed; portfolio revised and MEL updated for BCoP

DI 1.2.0.1 (1) (new): Strategy document outlining the vision of the DI1.2 cluster, defining priorities and establishing mechanisms to achieve the overall objectives of the cluster. Joint concept notes for cross-cutting research relevant to DI1.2

Flagship leaders and cluster leaders are both provided terms of reference but other levels of management and coordination, e.g. at Product and Output levels, are rather flexible. Governance is to be agreed among flagship and cluster leaders with the cluster teams. This workshop allowed a first-time face-to-face meeting among many of the scientists in DI1.1 and DI1.2 to work out the details of cluster management. Currently, there is no arrangement for compensation of leaders at these levels below cluster level, although everyone recognizes the significant time input and responsibilities incumbent with taking on Product or Output leadership.

At a minimum, RTB requires each cluster to indicate person responsible for reporting at the Output level, and these persons are already provisionally named in the MEL platform of RTB (Table 2). Prior to this workshop, the breeding CoP had designated Output leaders, and used the opportunity of the workshop to reaffirm these positions and discuss the need to assign other responsibilities in cluster management. In the case of the NextGen cluster, sub-cluster leadership responsibilities had not yet been formalized.

Table 2 summarizes suggestions from the working groups with regard to cluster management, including Product and Output leaders (the latter for DI 1.1 only), as well as changes in the portfolio already discussed under Output 2.

In addition to Product and Output leaders both Clusters 1.1 and 1.2 named center focal points for the cluster (Table 4). The center focal points will maintain lines of communication between the center and the cluster leader and help assure the quality and timeliness of reporting from that center.

Table 4. Center focal points identified for BCoP and NextGen Clusters

Center	Focal Point for BCoP (DI 1.1)	Focal Point for Next Gen (DI 1.2)
Bioversity		Mathieu Rouard, Sebastien Carpentier
CIAT	Stef de Haan	Luis Augusto Becerra
CIP	Edward Carey	Hannele Lindqvist-Kreuze
CIRAD	Hana Chair	Angelique D'hont
IITA	Trushar Shah	Ismail Rabbi

DI 1.1 and 1.2 developed a management/governance system that relies on three interacting leadership roles. A small difference in governance between the two clusters is that the BCoP named different scientists to be Product and Output leaders, while in the case of NextGen, Product leaders will also provide overall leadership for the Outputs. In both Clusters, governance will be reviewed at end of the year to assess whether any future changes are needed.

1. Cluster DI 1.2 Leader(s) provides overall technical guidance and coordination among product leaders and among all scientists of the cluster
2. Product Leaders: primarily responsible for coordinating reporting with Delivery scientists
3. Center Focal Points/Coordinators for the Cluster: coordinate outputs and deliverables of that center together with cluster leader
4. Flagship 1 Leader, in consultation with Cluster teams and PMU, sets overall scientific agenda and assures quality of science
5.

DI 1.1 will communicate via Skype, the RTB Breeding Portal, One Note, Slack, GoToMeeting, and email. It was noted however that email is not ideal because of the volume that most scientists manage. In connection with regular virtual meetings of FP 1, the cluster leader commits to not less than quarterly virtual communication with the cluster team. At the beginning and end of the year there will be a general meeting for each center to give ideas that can be communicated to PMU.

Reporting on the MEL platform is a key responsibility of Output leaders. Scientists responsible for Deliverables can report directly to the platform but only the Output leaders can further edit this input.

The Cluster leader can authorize the platform manager to add names so that more people can edit the contribution to outputs.

Funding for the time scientists give to Cluster governance and coordination will sometimes be an issue. There are collaborators, e.g. from NRI, willing to participate but they will need financial contribution because they do not have internal funding. As an example, Aurelie Bechoff and colleagues from University of Greenwich are willing to be co-leaders of 1.2.1.4 and 1.2.4.3 related to end-user preferences, but a funding mechanism needs to be found. If a unique skill were to be available from a partner institution the role could be built into earmarked funding or restricted donor funded proposals.

Next Steps

Action	Timeline	Responsible
Develop a succession plan for BCoP leadership as the founding cluster leader will retire from CIP in August 2017	Aug. 2017	M. Bonierbale, M. Friedmann, PMU (under way)
Cluster leaders review workshop recommendations with the full cluster team. In the case of the BCoP, it will be especially important to include the breeders who were not in the workshop, as well as reach out to other cluster leaders who have a major stake in the development or use of new RTB varieties	Sept. 2017	Cluster leaders
Cluster leaders work with Product and Output leaders to resolve the relationship between persons currently named as 'responsible for reporting' on the MEL platform, and the leaders suggested in the Montpellier workshop (last two columns of Table 7)	Aug. 2017	Cluster leaders
Cluster leaders communicate with the MEL platform coordinator to establish protocols and lines of authority for specific scientists to add and to edit content on the platform	Oct. 2017	Cluster leaders

OUTPUT 5: COMMON COMMITMENT AND APPROACH TO FUND-RAISING IS BUILT (SESSION 5)

In a period of tightening W1/W2 budgets for CGIAR, the urgency for fundraising devolves further down the organizational hierarchy. Most scientists are involved in project development. At the same time, ever-increasing teamwork and collaboration in project development and in fundraising is essential for defining and elaborating the most compelling project areas. The RTB Breeding CoP did not include coordination of fundraising in its portfolio, but the earmarked funding proposal that supported this workshop recognized the need and the opportunity to engage the members of the BCoP in discussion about common commitments and approaches.

The BCoP can provide a forum for discussion and coordination of project ideas, proposal development and fundraising among RTB breeders and related fields. Such activities do not fit logically under any of the current Products, and will not have necessary prominence unless explicitly articulated at a higher level within the BCoP (as opposed to being assumed or just an option for open discussion through the Portal, for example).

In a plenary exercise prior to the Session 5 on fundraising, the workshop facilitator asked the group to respond to the following scenario:

If your supervisor told you that an anonymous donor has committed $25 million for a 5-year project, with no strings attached, what would be your highest priority investment?

Participants responded individually and independently by writing a suggestion on a card and posting it on the wall. Detailed results are noted and discussed in Annex E. Most of the cards identified as cross-cutting (n=14) versus the six who specified a particular crop. By itself, this strong predominance of cross-cutting project ideas reflects the advance in thinking about synergies and collaboration that RTB has fostered. It is difficult to imagine that just six years ago, as the CRP system was just getting started, that more than a few scientists would have been thinking about cross-crop projects in this hypothetical scenario. It is truly a credit to the RTB and system management that this collaborative thinking has evolved so well.

The session on fundraising strategy was introduced with an invitation for participants to make a case to the group for a specific project in an *elevator talk*. People interested in learning more or contributing ideas to such a proposal would join in a small group discussion. The session developed into three small groups.

Group 1, led by Wolfgang Gruneberg, discussed the elements of a cross-crop proposal to study the exploitation of heterosis in RTB crops. This discussion revolved mostly around cassava and sweet potato, which have already advanced considerably in thinking about the technical steps to be taken.

Group 2, led by Dominique Dufour, worked on refining a well-advanced, and provisionally approved by Gates Foundation, project focusing on consumer preference research in RTB crops.

Group 3, led by David de Koeyer, took a more strategic look at resource mobilization in general for RTB breeding.

The discussions on fundraising received the lowest marks from participants with regard to achieving expected workshop outputs. This is not surprising, in the sense that fundraising has not been previously formally included in the output/deliverable portfolio of BCoP. Additional preparation time for the participants, with clear guidelines for the expected outputs, would probably have yielded some additional project ideas. Nonetheless, the process stimulated good thought about the role of BCoP in project development.

Next Steps

Action	Timeline	Responsible
CIP to initiate developing a concept note along with CIAT for a major project on exploiting heterosis in clonal crops	Nov. 2017	W. Gruneberg, H. Ceballos
Final submission of the RTBFoods to the Gates Foundation	July 2017 (done)	D. Dufour

GENERAL RECOMMENDATIONS FROM WORKSHOP

Action	Timeline	Responsible
For Output 1: Effective linkages are established and active within DI 1.1 and DI1.2 and with other clusters and platforms		
For the Portal		
Update user profile and ensure it reflects all about you and your line of work.	As soon as possible and ongoing for new members	BCoP members
Users should immediately begin to use the current functions of the portal and provide feedback to Morag and Geoffrey on suggested improvements	As soon as possible and ongoing for new members	BCoP members
Portal manager/focal point should frequently monitor portal use and receive suggestions for improvement, especially in early months after launch	Monthly review	M. Ferguson, G. Mwanthi

Hold periodic virtual meetings of page champions to discuss ongoing Portal development and use	Quarterly throughout the year	M. Ferguson, BCoP leader
Other Means to Foster Linkages and Capacity Building for the BCoP		
BCoP should be proactive in guiding development of the system-wide platforms related to plant breeding, especially where these platforms can provide specific tools or services to address issues of particular relevance to clonal crops.	Ongoing	Output leaders
BCoP members should be familiar with and consider using the Breeding Program Assessment Tool (BPAT) from the University of Queensland, Australia for a comprehensive breeding program assessment aimed at maximizing genetic gain (www.plantbreedingassessment.org).	Ongoing	BCoP members
BCoP members should be aware of and communicate to each other about meetings and workshops of mutual interest, and where further interaction among RTB clusters can enhance overall effectiveness of RTB breeding	Ongoing	BCoP members
For Output 2: Portfolio and selected deliverables of clusters DI 1.1 and DI 1.2 are agreed and built by cluster teams		
Develop an automatic system whereby the curator for each crop can curate what has been added	Dec. 2017	E. Arnaud
Based on this map, explore BCoP member interest to develop a network of statistics and bioinformatics to match needs and available skills and expertise.	Dec. 2017	M. Rouard
Explore ways to develop capacity and fill gaps, especially young staff mentorship	Ongoing	M. Rouard
Provide a forum for NARS to access training, achieve visibility and feedback on what they need and don't need.	Ongoing	M. Rouard
Asian Cassava Network training…could open it up/ combine workshops (e.g. different crop teams could have a joint workshop). BCoP will need to take the pulse of the utility of this, e.g. whether trainees would be interested in each other's crops. Exchange of training agendas and materials via the Portal can be indicative of the value of this proposition	Ongoing as opportunities develop	Leader BCoP
Develop a system to receive user input on breeder needs for support and tools	Dec. 2017	S. de Haan

Portal can act as a clearing house to list and describe available databases and tools	Dec. 2017 and ongoing	M. Rouard
The Portal should provide a platform for sharing of CIPcross (potato/sweetpotato), which has generated broad interest from other crops	Dec. 2017 and ongoing	E. Salas
Support training around database uses.	Mar. 2018 and ongoing	M. Rouard
Excellence in Breeding to provide visibility for new tools, facilitate communication and collaboration among centers, and assure certain standards such as BraPI compliance	Ongoing	E. Carey
For Output 3: Gender relevance of cluster products, deliverables and linkages are enhanced through gender integration and mainstreaming		
RTB breeders and gender specialists should engage with the System-wide project on gender and breeding, currently underway	Sept. 2017 and ongoing	Breeders and gender specialists
Crop Ontology should include the PVS quantitative and qualitative scoring methods for all crops	June 2018	E. Arnaud
For Output 4: Cluster management, governance and coordination are agreed and implemented		
Cluster leaders utilize the Portal as a means of communications for their teams	Sept. 2017	Cluster leaders

FACILITATOR REFLECTIONS

New crop varieties remain one of the main technologies for farmers to improve their livelihoods, and for urban consumers to access affordable and nutritious food. RTB, and specifically the participants in this workshop, are trying to make sure that this process happens at the highest level of effectiveness and efficiency for the RTB crops. Optimizing the multiple ways that breeders and crop improvement teams work together across crops and institutions is a key part of the strategy.

The idea of the BCoP is to make the whole better than the sum of the parts for breeding-related research. Working together accomplishes much more than working in parallel.

In the first phase of RTB, there was already the beginning of much more collaboration among crops and centers, but this was largely done around specific projects. Now RTB wants to increase that synergy with broader collaboration among all scientists who are working in breeding-related fields.

While there are clearly easy informal working relationships among many scientists, frameworks and mechanisms to promote even higher levels of interaction and collaboration are needed. But this takes work and leadership. The point of the CoP is to enhance the effectiveness of research, but there are different ways to look at this concept. Breeders may want to achieve the same level of results, with fewer human and financial resources. In that model, you are not putting too much effort into the running of the BCoP. I would suggest that you are looking for a model where you want to put in a modest level of additional work to achieve far better results. This is kind of like the plant breeder aiming for input use efficiency. You can work very hard to breed for productivity under zero inputs, and perhaps make some progress. But if you move to the next level of breeding for high response to low or moderate inputs, you can probably move much faster toward higher yields.

It is clear that scientists need to make commitments for this to work. Good will in a meeting where you're forced to sit together and eat together for five days isn't the same as longer term commitments. The more formalized structure of the BCoP and your commitment to your role in that structure, is a key to the sustainability of the community. At the same time, if management becomes unwieldy, the community will fall apart because people simply don't have time. This group has proposed a quite reasonable compromise in terms of developing a structure that is not too heavy but can be effective.

Money is often an issue. We've seen some potential for the BCoP to bring people together who should have a better chance of funding because of being part of this community. This workshop again demonstrated clearly the high value of face-to-face meetings among the scientists involved in all aspects of RTB breeding. At the same time, it is understood that the costs of those meetings tend to be high and should be balanced against other needs for investment of scarce resources.

Breeders can take many alternative pathways to achieve specific targets. There are many possibilities for going in the wrong direction, but only a few possibilities for going in the right direction – to succeed in getting just that right combination of traits, expressed at the right levels. This is a really important exercise for the BCoP. These traits can't be defined just by the breeders or the social scientists or the molecular breeders. This discussion was one of the most animated ones, and brought forward some great ideas on how to move forward with developing a framework for breeders to define their trait portfolio for different products that fit different ecologies and markets. The refined, updated portfolio

of traits and strategies to achieve target levels of expression will take your continued commitment to follow-up discussion and debate.

The breeders and gender team need to work together to identify and focus on key issues and traits where large impact can be achieved. Most of the social sciences discussion continues around the assumption that all breeding programs in all locations need to be looking at gender differentiated traits. At the same time, the methodologies are so costly and time-consuming that they have only been applied on a pilot study type of scale, and often parallel to, rather than integrated into, breeding programs.

Finally, as we well know, the only constant in our world is that there will be constant change. You shouldn't be building inflexible structures to which you commit yourself over long periods of time. This isn't easy within the CGIAR structure, but you have to be agile and flexible and be prepared to change as circumstances change.

ANNEXES

ANNEX A. PROGRAM

Monday 26 June			
Time	**Topic**	**Responsible**	**Expected Outputs**
7:30 – 8:00	Registration		
8:00 – 8:15	Introduction to workshop	M. Friedmann	
8:15 – 8:30	Workshop process and outputs	C. Hershey	
SESSION 1 (S1) - Cluster form and function in RTB			
8:30 – 8:45	Overview of Breeding Community of Practice Cluster (DI 1.1)	M. Bonierbale	
8:45 – 9:00	Overview of NextGen Cluster (DI 1.2)	I. Rabbi	
9:00 – 9:15	Overview of Gender-responsive breeding	B. Teeken	
9:15 – 10:30	Parallel working groups (and possible subgroups): Clusters DI 1.1 (**S1 WG 1**) and DI1.2 (**S1 WG 2**)— Assess products, outputs, and deliverables for logic and consistency in agreement with purpose of the cluster	Cluster leaders with support of Product leaders	All participants understand current cluster portfolios and roles of participating scientists. Suggestions captured for improvements to achieve optimum cluster performance
10:30 – 10:50	Coffee		
10:50 – 12:30	Report back to plenary, and discussion	WG Rapporteurs	As above with notes and implications for next steps
12:30 – 14:00	**Lunch**		
14:00 – 15:20	Parallel working groups:	Introduction on some	Cluster governance is outlined for finalization by Centers and RTB; How to

	Clusters DI 1.1 (**S1 WG 3**) and DI1.2 (**S1 WG 4**); Define cluster governance and internal lines of communication, scientist roles and responsibilities and reporting.	principles by M. Friedmann	maintain visibility of cluster and products. Linkages with the gender team.
15:20 – 15:40	Coffee		
15:40 – 16:45	**S1 WG 1-4**: Report back to plenary, and discussion		As above with notes and implications for next steps

Tuesday 27 June			
Time	**Topic**	**Responsible**	**Expected Outputs**
SESSION 2 (S2) - Communication and Capacity Development: BCoP Knowledge-sharing Portal Structure and Function			
8:45 – 9:15	Perspectives on RBM framework	P. Ellul, Sr. Officer, Consortium Office	Understanding of a new RBM framework being proposed, and especially its relevance to RTB breeding
9:15 – 10:00	Portal presentation, with discussion	M. Ferguson & G. Mwanthi	
10:00 – 10:15	Sweet potato CoP and lessons for the breeding CoP	C. Bukania	
10:15 – 10:30	coffee break		
10:30 – 11:30	**S2 WG 1-3** (NextGen, Breeding, Gender, Capacity Development) Parallel working groups: Portal functionality and content		Participants from complementary backgrounds understand and are enabled to access and contribute content and improve the structure and functioning of the

			knowledge-sharing portal
11:30 – 12:30	**S2 WG 1-3:** Report to plenary	WG Rapporteurs	As above with notes and implications for next steps
12:30 – 14:00	**Lunch**		
SESSION 3 (S3)- Conceptual and operational framework for RTB breeding pipeline management			
14:00 – 14:10	1. Genebank Platform	N. Roux	Participants understand purpose and structure, and identify possible entry points for collaboration
14:10 – 14:25	2. Excellence in breeding Platform	E. Carey & M. Friedmann	
14:25 – 14:35	3. Big data Platform	E. Arnaud	
14:35 – 14:50	4. Overview and experiences with Breeding Program Assessment Tool (with emphasis on Breeding Pipelines)	P. Kulakow	
14:50 – 15:30	5. Perspectives on breeding product development/deployment, flow and pipeline management	B.M. Prasanna	
15:30 – 15:50	Coffee		
15:50 – 17:00	**S3 WG 1-4**: Breeding product development and deployment; pipeline design for RTB		Framework for managing, monitoring and evaluating RTB breeding pipelines (umbrella under which the different crops manage their pipelines) is conceived by RTB for development in Phase 2

17:00 – 18:00	**S3 WG 1-4:** Report back to plenary	WB rapporteurs	As above with notes and implications for next steps

Wednesday 28 June			
Time	**Topic**	**Responsible**	**Expected Outputs**
SESSION 4 (S4) - Databases, Information Management and Breeding Tools			
8:30 – 8:40	Session introduction: DI1.2	I. Rabbi	
8:40 – 9:10	The Breeder toolbox: Overview of RTB databases (cassava-, yam- musa-, sweetpotato-base)	G. Bauchet	Access and functionality of RTB databases shared and understood
09:10 – 09:30	RTB breeding information management support tools: achievements and exchange in RTB	E. Salas, S. de Haan & L. A. Becerra	Examples of breeding information management support tools are shared and made available by the portal, stimulating exchange among Centers
9:30 – 9:45	Update and priorities on ontology development and use in NextGen, databases and phenotyping	E. Arnaud & M. A. Laporte	A roadmap and interest group formed
9:45 – 10:15	System-wide High Throughput Genotyping Platform and what it can offer to the RTB community in terms of genotyping services	Enghwa NG	Road-map for operationalizing forward breeding. Different targets for different crops. Why markers are not being used in breeding pipeline. Which traits, what are our expectations to meet the targets on the roadmap.
10:15 – 10:35	Coffee		

10:35 – 12:30	(Working group specific topics to be elaborated based on cluster products**: Progress to date; gaps; linkages within and between clusters/flagships; What are the 2-4 outputs for your product?** For example: **S4 WG 1:** Omics tools; genotype profiling and diversity **S4 WG 2**: Genetic stocks and populations **S4 WG 3**: Ontologies **S4 WG 4**: Phenotyping **S4 WG 5**: Data and knowledge management	(Based on Monday working group outputs and interests for further discussion)	Teams are formed to assure uptake the tools coming from DI1.2
12:30 – 14:00	**Lunch**		
14:00 – 15:00	**S4 WG 1- ?:** discussion in plenary	WG rapporteurs	
SESSION 5 (S5) - Resource Mobilization Strategy and Initiatives for Clusters			
15:00 – 15:30	Resource mobilization: "Elevator" talks by proposal leaders: What? For whom? Why? Inputs needed?		
15:30 – 17:00	**S5 WG 1- ?:** Working groups on concept notes for projects and fund-raising (coffee in the middle)	Project proposal/ concept note champions	
17:30 – 18:00	WG Discussion in Plenary		

Thursday 29 June			
Time	**Topic**	**Responsible**	**Expected Outputs**
SESSION 6 (S6) - Setting SMART Breeding Objectives			
8:30 – 9:00	Roadmap for setting crop-specific breeding objectives: review and improve Table 1.4 from RTB II proposal	L. A. Becerra & H. Lindqvist-Kreuze	
9:00 – 11:15	**S6 WG 1-5**: Working groups by crop: developing SMART breeding objectives (with integrated coffee): banana, cassava, potato, sweetpotato, yam	Working group sessions (by crops) facilitated by designated crop leaders	Improved table of breeding objectives and framework for dynamic development of SMART breeding objectives in crop improvement teams
11:15 – 12:30	**S6 WG 1-5:** Report back to plenary, and discussion		As above with notes and implications for next steps
12:30 – 14:00	**Lunch**		
SESSION 7 (S7)- Participatory Variety Selection and Gender Mainstreaming			
14:30 – 15:00	Participatory variety selection achievements and gender mainstreaming	B. Teeken	
15:00 – 16:00	**S7 WG 1-3**: Gender/user focus for ontologies; participatory variety selection and gender mainstreaming.		Protocols and tools are shared and recommendations captured for developing best practices for collecting, storing and analyzing PVS data with gender differentiation, with integration of PVS traits into ontologies

16:00 – 16:20	coffee break		
16:20 – 17:30	**S7 WG 1-3:** Report to plenary and discussion	WG rapporteurs	As above with notes and implications for next steps
20:00	Workshop dinner (to be confirmed)		

Friday 30 June			
Time	**Topic**	**Responsible**	**Expected Outputs**
Arising Topics and Portal Launch			
8:30 – 10:30	Open for arising topics during workshop or small group follow-up discussion		
10:30 – 10:50	coffee break		
10:50 – 11:20	Launching of portal	M. Ferguson	
Wrap-up and Conclusions			
11:20 – 12:30	General discussion and wrap up: meeting evaluation and feedback	M. Bonierbale, I. Rabbi & C. Hershey	
12:30 – 14:00	**Lunch**		
Field Trip			
14:00 – 17:00	Field trip to CIRAD Food laboratory and PhenoArch platform, Agropolis		

ANNEX B: PARTICIPANTS.

	Last Name	First Name	Institution	Expertise	Base	Contact
1	Arnaud	Elizabeth	Bioversity	breeding information management	France	e.arnaud@cgiar.org
2	Bauchet	Guillaume	BTI	bioinformatics, databases	USA	gjb99@cornell.edu
3	Becerra Lopez-Lavalle	Luis Augusto	CIAT	FP1 Leader, cassava molecular br	Colombia	L.A.Becerra@cgiar.org
4	Bechoff	Aurélie	NRI, Chatham	post-harvest quality	UK	A.Bechoff@greenwich.ac.uk
5	Bhattacharjee	Ranjana	IITA	yam molecular genetics	Nigeria	r.bhattacharjee@cgiar.org
6	Bonierbale	Merideth	CIP	DI 1.1 leader, potato breeding until 16 August 2017	Peru	mwbonierbale@gmail.com
7	Bukania	Christine	CIP	communication specialist	Kenya	C.Bukania@cgiar.org
8	Bullock	Renee	IITA	gender	DRC	R.Bullock@cgiar.org
9	Carey	Edward	CIP	sweetpotato breeding/ EIB DI 1.1 leader, potato breeding as of16 August 2017	Ghana	E.Carey@cgiar.org
10	Carpentier	Sebastien	KUV Leuven	phenotyping	Belgium	sebastien.carpentier@kuleuven.be
11	Ceballos	Hernan	CIAT	cassava breeding	Colombia	h.ceballos@cgiar.org
12	Chair	Hana	CIRAD	yam genetic diversity	France	hana.chair@cirad.fr
13	Crichton	Rhiannon	Bioversity	banana germplasm eval.	France	r.crichton@cgiar.org
14	D'hont	Angélique	CIRAD	banana genomics	France	angelique.d'hont@cirad.fr
15	De Haan	Stefan	CIAT	cassava breeding	Vietnam	s.dehaan@cgiar.org
16	De Koeyer	David	IITA	yam breeding	Nigeria	d.dekoeyer@cgiar.org
17	Dufour	Dominique	CIRAD	post-harvest, RTB Focal point	France	dominique.dufour@cirad.fr
18	Ferguson	Morag	IITA	cassava molecular br	Kenya	m.ferguson@cgiar.org
19	Friedmann	Michael	RTB	science officer	Peru	M.Friedmann@cgiar.org

20	Gemenet	Dorcus	CIP	sweetpotato molecular br	Peru	d.gemenet@cgiar.org
21	Gruneberg	Wolfgang	CIP	sweetpotato breeding	Peru	w.gruneberg@cgiar.org
22	Heider	Bettina	RTB/CIP	PMO, sweetpotato evaluation and pre-breeding	Peru	b.heider@cgiar.org
23	Hershey	Clair		Facilitator	USA	clair.hershey@gmail.com
24	Kulakow	Peter	IITA	cassava breeding	Nigeria	P.Kulakow@ciar.org
25	Laporte	Marie Angélique	Bioversity	breeding info management	France	m.a.laporte@cgiar.org
26	Lindquist-Kreuze	Hannele	CIP	potato molecular br	Peru	h.lindqvist-kreuze@cgiar.org
27	Mayanja	Sarah	CIP	gender	Uganda	s.mayanja@cgiar.org
28	Mendes	Thiago	CIP	potato breeding	Kenya	T.Mendes@cgiar.org
29	Muranaka	Satoru	CIRAD/JIRCAS		France	s.muranaka@cgiar.org
30	Mwanthi	Geoffrey	IITA	IT, portal design	Kenya	g.mwanthi@cgiar.org
31	Ofei	Richard	IITA	RTB - PMO	Nigeria	R.Ofei@cgiar.org
32	Rabbi	Ismael	IITA	DI1.2 leader, cassava molecular br	Nigeria	I.Rabbi@cgiar.org
33	Rouard	Mathieu	Bioversity	bioinformatics	France	m.rouard@cgiar.org
34	Roux	Nicolas	Bioversity	genetic resources	France	n.roux@cgiar.org
35	Salas	Elisa	CIP	breeding information management	Peru	e.salas@cgiar.org
36	Sardos	Julie	Bioversity	banana mol. genetics	France	j.sardos@cgiar.org
37	Teeken	Bela	IITA	gender	Nigeria	b.teeken@cgiar.org

ANNEX C. SUMMARY OF OUTPUTS AND DELIVERABLES FROM EARMARKED FUNDING PROJECTS SUPPORTING THE MONTPELLIER WORKSHOP

Output code	Deliverable	Type	Description	Reporting scientist
From Breeding Community of Practice Earmarked Funding Proposal (Type 1)				
DI 1.1.1.1	Cluster team formed; portfolio revised and MEL updated for BCoP	Workshop	The vision of the cluster will be shaped in light of RTB breeding needs outputs and expected outcomes in communication and knowledge sharing across all flagships, including knowledge and data management and capacity building.	M. Bonierbale (CIP)
DI 1.1.1.2	Knowledge sharing portal established	Web-site	A portal for exchange of contacts, protocols, breeding support tools and other information will be designed and established	M. Ferguson (IITA)
DI 1.1.2.1	Framework for defining and describing breeding targets in terms of traits and trait levels against which genetic gains can be measured	Working paper	Trait and trait level table from RTB Phase 2 proposal has to be revised and improved to consider indicators and metrics. Approaches to this task will be reviewed from a multi-disciplinary perspective and a framework drafted for breeding objectives	M. Bonierbale (CIP)
DI 1.1.3.5	Standard Variables of the Global Agronomy Management Ontology validated for RTB crops	knowledge	Variables and Ontology validated to support robust documentation of crop management data contributing to experimental designs for RTB breeding and variety assessment. Available through the Knowledge Portal.	E. Arnaud (Bioversity)
DI 1.1.3.7	BrAPI compliant data sources for breeding data	Software	BrAPI calls implemented on main breeding databases (Cassavabase, BMS, BioMart)	T. Shah (IITA)

			Note: Will all of this be done for 2017 or need to limit to the Bases??	
From Gender earmarked funding proposal (Type 3)				
DI 1.1.1.2	A webpage incorporation on gender perspectives in to breeding in the BCoP portal: protocols, tools and training materials (CIP/IITA)	Webportal	The gender subpage will encourage a gender community of practice on breeding for team members to share and collaborate on gender and PVS and gender mainstreaming protocols and other gender and breeding guidelines will be shared. (This is linked to the portal under development under DI1.1 type 1 funds)	N. Mudege
DI 1.1.1.3	A workshop report defining gender mainstreamed protocols for PVS to record data for trait preferences and ontology dictionaries to support the deliverables of output DI1.1.3.2	Workshop report	This workshop will be linked other workshops in the breeding community of practice particularly to DI1.1.1.1 (in type 1) to reduce associated costs of travel	N. Mudege (CIP) & E. Arnaud (Bioversity)
DI 1.1.3.2	Prototype for collecting and reporting gender preferences for traits in PVS review with gender specialist.	Tool	Ensuring that collected trait data takes into account any gender differentiation and that trait preferences from both men and women are standardized and are SMART	E. Salas (CIP)
From NextGen Breeding Earmarked Funding Proposal (Type 1)				
DI 1.2.0.1 (1) (new)	Strategy document outlining the vision of the DI1.2 cluster, defining priorities and establishing mechanisms to achieve the overall objectives of the cluster. Joint concept notes for cross-cutting research relevant to DI1.2	Strategy document and concept notes	A meeting will be organized in the second quarter of 2017 to bring the team together and develop clear targets, a coherent portfolio and develop a resource mobilization plan. The roles and responsibilities of each participating center (including output leaders), monitoring and joint learning and communication strategies will be established	I. Rabbi (IITA) & L. A. Becerra (CIAT)

ANNEX D. WORKING GROUP DISCUSSION SUMMARIES FOR PRODUCT AND OUTPUT PORTFOLIOS: DI 1.1 AND DI1.2.

Table Annex D1. Tentative changes proposed for Product and Output portfolio of DI1.1.

Capacity building is crosscutting (not only in product 1.1.1.): e.g., om PVS, next gen **Change name of Product 1** to Partnership strategies (instead of capacity building).
Communication and knowledge sharing (web-portal is very important)
It is a challenge to increase interaction among different crops and breeders **(make a deliverable for outreach plan and an indicator for partnerships and partners)**
Product 1.1.1 Partnership strategies and knowledge sharing portal on clonal crop breeding
1.1.1.2 Change PORTAL to PLATFORM (knowledge, partners). Not accepted, platform is a bit more general
Gender integration and participatory approaches may be lacking as a specific output. Maybe cross-cutting? Maybe, a document on strategies / best practices for mainstreaming gender into RTB breeding. New output but must be linked with Geber in Breeding Initiative to avoid redundancy and build on existing efforts One can find out more about this work on our website: http://www.rtb.cgiar.org/gender-breeding-initiative/?lang=en
Product 1.1.2 Metrics and monitoring tools for RTB breeding
Excellence in breeding module 1 (link to). Stage gate
Optimized System for M&E of RTB breeding (excellence in breeding platform). New output. Developing the breeding methods assessment tools (process, tool, system).
Metrics for the adoption of tools (product 1.1.3 related)
Product 1.1.3 RTB Breeding database support tools
1.1.3.1., 1.1.3.2., 1.1.3.3 and 1.1.3.5 can be collapsed in a single. Now: “Ontologies to support RTB breeding”
1.1.3.6 sharing of tools and prototypes. Philosophy is not to reinvent the wheel. Share the best tools among the communities. Technology, user wise, etc. it has it be adapted. Adapt the name of 1.1.3.6 “Clearing house ……”
Product 1.1.4 Cross-learning and scalable methods for clonal breeding
We had a detailed explanation for the 2 outputs from the product leader.

Multistage selection procedures. Important to divide in early and later breeding stages. Common rules of how resources should be allocated in terms of, for example, number of genotypes, plots or locations used in different stages of the selection process.
1.1.4.1. Maybe should say PARAMETERS instead of GUIDELINES. One manuscript for sweetpotato that can be used for other RTBs.
1.1.4.3 A new two-part outputs: Experimental methods and models, (i.e. Accelerated breeding / how do you integrate rapid multiplication into the breeding)
Product 1.1.5. Scaling strategy for more effective use of populations and elite breeding lines. Just take out strategy.

Table Annex D2. Tentative changes proposed for Product and Output Portfolio of DI1.2.

The main objective of the cluster was clarified as aimed to accelerate breeding process by developing tools and markers, basically; 1. Trait definitions/dissection 2. Assembling relevant populations 3. Phenotyping 4. Genotyping 5. POC on application 6. Roll out to breeders for application
Question: who are the critical partners regarding trait definition/dissection Agreed that this depends on the crop and traits but partners like CIRAD, NRI and JHI were noted as possible partners among others
Question: Who defines the traits? Agreed, in collaboration with the BCoP and with the Breeding flagship FP2, or FP4 for end-user traits It was also suggested to include cross prediction POC in this cluster to assist in population development and heterosis exploitation.
1.2.1: leave as is
1.2.2: Genetic stocks and population for discovery research

The main concern was where to map pre-breeding and breeding products regarding population development

Agreed: Tool development would be in DI1.2 while application of the tools would map to the breeding flagship FP2.

In this case, population necessary for genetic dissection of traits would remain in DI1.2.

One output had no deliverables i.e. Genomic selection populations (1.2.2.2): It was noted that such activities may be ongoing but mapped to breeding cluster. Various teams working on GS POC encouraged to link to this cluster

1.2.3: Genotyping profiling and diversity analysis

Concern: How to link with diversity cluster which has the mandate of germplasm conservation

Was agreed that DI1.2 can genotype and phenotype genetic stocks that fit their objectives but that the output can remain with the diversity cluster for conservation purposes

DI1.2 will use germplasm for trait dissection and there will need to be a good leverage of resources between DI1.2 and the diversity cluster.

Agreed to work together and agree on use of raw data sets.

I.2.3.3 Add Proteome profiling to the list which already includes transcriptomic and metabolomics profiling

1.2.4: High throughput phenotyping tools for RTBs

Objective is to develop HTP tools and see if they work in actual breeding set-ups

Several examples raise e.g. the ground penetrating radar (GPR) being developed by CIAT to phenotype roots and tubers non-destructively. Almost ready for testing and CIP will be involved in the initial trials

PhenoAPPS being developed by Kansa State University were also listed as activities that map here.

It was also noted that HTP had to be decided depending on the crop for example canopy phenotyping does not work for Cassava because diseases lead to increased canopy at the expense of roots

There was also a concern on where 1.2.4.3 fits whether here or in FP4.

Agreed to work together with FP4

The issue of how traits are defined also arose here and it was again reiterated that this could be done in collaboration with other clusters.

Conclusion:

Mainstreaming HTP tools for use in breeding will be an accomplishment for this activity.

1.2.5: Data and Knowledge management

The open access 'Bases' are incorporated here and it was agreed that it was ok to have crop specific data management in these 'Bases'.

However, there is need to define what challenges are being addressed by these

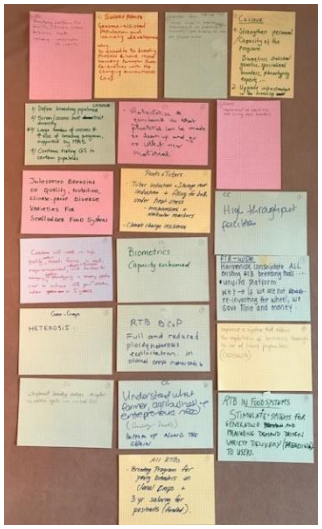
How to link with Cluster DI1.3 for game changing solutions was also a concern raised.

Another concern was if any of these 'Bases' provide an interface for breeders to access marker information developed from this cluster in a way that it can be readily applied in breeding

In conclusion, the working group generally agreed with the current formulation of the cluster. Several strengths, opportunities, concerns were recorded on the cards and will be synthesized.

ANNEX E: RESOURCE-ALLOCATION EXERCISE

A short exercise was implemented during a midweek Plenary Session. Participants were given approximately 15 minutes to write their answer to the question, "If your supervisor told you that an anonymous donor has committed $25 million for a 5-year project, with no strings attached, what would be your highest priority investment?" on a 15x21 cm card. Each was also asked to indicate whether the project was cross-cutting or crop specific (and if so, what crop). Note that there was no time to drill down on the answers. Twenty individuals wrote down their best use of $25 million. Pictured below are the cards written by participants. This type of exercise is a "top of the mind" focusing and extracting activity. It is useful to help identify major currents in the group's thinking, surface ideas, and assist the individual in clarifying their own vision for resource allocation.



Most of the cards identified as cross-cutting (n=14) versus the six who specified crops. Seventy percent thought that across crops for resource allocation was priority. By itself, this strong predominance of cross-cutting project ideas reflects the advance in thinking about synergies collaboration that RTB has fostered. It is difficult to imagine that just six years ago, as the CRP system was just getting started, that even more than a few scientists would have been thinking about cross-crop projects in this hypothetical scenario. It is truly a credit to the RTB and system management that this collaborative thinking has evolved so well.

The answers are up to many interpretations and categorizations. For summarization, this Annex groups them into:

1. People-focused
2. Infrastructure-related
3. Breeding Advancement, Efficiency, and Integration
4. Heterosis

Some comments could go in multiple categories, e.g., "In yams, a phenotyping platform for quality/disease/stress tolerance traits including infrastructure and HR capacity." In these cases, the answers were dissected and each component listed in appropriate category. The four categories are detailed following a short summary.

Summary

The distillation of the people-related ideas is to fund projects that increase the understanding of the end user's needs, increase staff, build a community of practice, and nurture the next generation of breeders. Infrastructure comments were to improve and expand facilities. A specific suggestion for Cassava included, "Invest in high quality modern research farms in each mega-environment in Nigeria and Tanzania with facilities for managing, genotyping, phenotyping a breeding pipeline sized to achieve 15% gain in selection index in 5 years."

Breeding Advancement, Efficiency, and Integration is the largest and most difficult grouping to distill. Climate changes surfaces multiple times as a primary driver of needs. Resilience is a theme. Other ideas relate to improving the gene bank and using Molecular Assisted Selection along with a Genome Wide Association Study to accelerate the selection/breeding process. A specific suggestion for yams is a phenotyping platform for quality/disease/stress tolerance traits including infrastructure and HR capacity. Another also mentioned a platform, in the context of sharing tools across RTB, with an implication that otherwise we are "reinventing the wheel." The next section covers the specific ideas of how to best spend the $25 million:

People-focused projects:

- Understand what farmer, agribusiness and entrepreneurs need (quality traits) bottom up along the value chain.
- Breeding program for young breeders in clonal crops and 3-year salaries for positions.
- Invest in improved understanding of user preferences/quality traits.
- Hire more potato breeders.
- In Cassava, strengthen personnel/capacity of the program: biometrics, statistical genetics, specialized breeders, phenotyping experts, etc.
- Stimulate systems for generating and measuring demand-driven variety delivery (breeding) to users.
- RTB BCoP (Root, Tuber, and Banana Breeding Community of Practice).

Infrastructure-related:

- High throughput facilities.
- Invest in accelerated/speed breeding for preferred user varieties.
- Improvement of facilities for potatoes.
- For Cassava, invest in high quality modern research farms in each mega-environment in Nigeria and Tanzania with facilities for managing, genotyping, phenotyping a breeding pipeline sized to achieve 15% gain in selection index in 5 years.

Breeding Advancement, Efficiency, and Integration

- Tuber induction and storage root induction and filling for both under heat stress: mechanisms and molecular markers. Climate change resilience.
- Characterize the genebank so that priorities can be made to team up and go to scale with new materials.

- Integrated breeding of quality, nutritious, climate-proof diverse varieties for smallholder food systems.
- Implement breeding strategies to exploit non-additive gene effects – include GWAS (Genome Wide Association Study)
- In yams, a phenotyping platform for quality/disease/stress tolerance traits including infrastructure and HR capacity.
- Genome-assisted population and variety development (especially sweet potato). This will expedite the breeding process and have rapid variety turnover that coevolves with the changing environment.
- Biometrics capacity enhanced

Heterosis

- For Cassava, define breeding pipelines. Screen/access best trait diversity. Large number of crosses. Increase size of breeding program supported by MAS (Molecular Assisted Selection). Continue testing genomic selection in certain pipelines.

- Exploitation of Heterosis based on full- and reduced-ploidy in clonal crops.

ANNEX F: WORKSHOP EVALUATION

A ten-question survey was used to gauge meeting outcome and lessons learned. Queries were made on both meeting content and logistics with each question having space for additional comments. Out of the 36 attendees, 26 filled out an evaluation (72% response rate). Paper evaluations were available during the meeting and a digital version was made available later. Twenty-four were on paper and 2 from online.

The first five questions were on outputs leading off of a general question, "How well were the expected meeting outputs achieved?" Participants were asked to choose one answer from three options: "Mostly achieved," "Partially achieved," or "Not achieved."

Responses were overwhelmingly positive about the outcomes, facilitation, and meeting accommodations -- especially the food. Multiple comments echoed the need for follow up and further engagement. Several pointed out that there are many to dos unfinished. But as one noted, "For a start-up meeting it was excellent." Results indicate discussions were good and engaging, though some may have been unable to contribute as this comment hints, ""We had good discussions in which most of us were able to understand and contribute to reviewing the deliverables."

Five outputs were surveyed and are covered in detail in following sections. Of note is the Gender-relevant output (advancing consideration of gender differences in development of linkages and products) and the comments that surfaced. A distillation of the gender-related comments indicates that there was a gender view at the workshop but this was lost in the small group work. "Inspirational" female leadership in the organizing team was specifically commented upon. One comment summarized the difficulty and complexity of the issue, "Not always clear where gender can really be implemented."

Funding remains an ongoing effort. Future modes and deliverables were mentioned. Also noted was the need for resources to build community. The facilities were complimented repeatedly in the comments with several indications that a return to the location would be welcomed. Worth highlighting is a comment on the need for a longer planning horizon so participation could increase.

RESPONSE SPECIFICS

Responses for each question are summarized in this section[3]. The next graphic is for the inquiry related to Output 1 on establishing effective linkages within the community of practice to outside clusters and platforms.

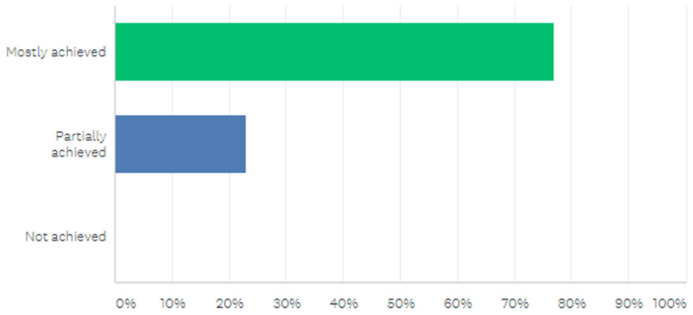
Output 1: Linkages

Of the 26 responses to the statement, "How well were the expected meeting outputs achieved?" twenty agreed (77%) that Output 1 (see below) was "mostly achieved." The other 23% thought the output was "Partially achieved."

[3] Please pardon the graphics; only a basic version of Survey Monkey was available.

Output 1: Effective linkages are established and active within the Breeding Community of Practice (DI1.1) and NextGen Breeding (DI 1.2), and with other clusters and platforms

Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES	
Mostly achieved	76.92%	20
Partially achieved	23.08%	6
Not achieved	0.00%	0
Total		26

Comments (6)

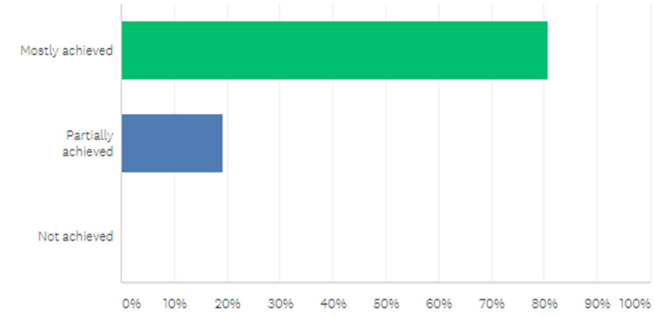
Comments were complimentary of the organizers (Meredith was mentioned specifically as "inspirational"). One meeting attendee commented that "having a meeting bringing together the various RTB crops, disciplines, and Centers was a good idea." Another pointed out that "breeders from all crops were not present." Two others commented on the need for follow up. One thoughtful response was, "Specific cases and lines of collaboration remain to be established between Flagships. The workshop showed how this will in principal be important but still with many assumptions."

Output 2: Deliverables

The next graphic is for Output 2 on portfolio building and cluster deliverables.

Output 2: Portfolio and selected deliverables of clusters DI 1.1 and DI 1.2 are agreed and built by cluster teams

Answered: 26 Skipped: 0



ANSWER CHOICES	RESPONSES	
Mostly achieved	80.77%	21
Partially achieved	19.23%	5
Not achieved	0.00%	0
Total		26

Comments (3)

Even more positive responses to this outcome. Eighty-one percent agreed that the output had been mostly achieved. One comment specified, "members of the Clusters left with good understanding of the Cluster objectives." Another acknowledged "the discussion was good" and that "most were able to understand and contribute to reviewing deliverables." And the third comment stated, "still some to do's."

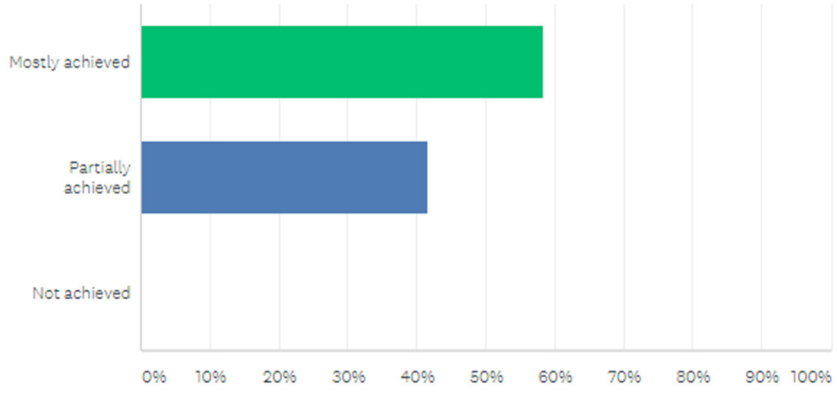
Output 3: Gender Relevance

Output three is gender-relevance impact on cluster products and linkages. The next graphic summarizes the responses. Twenty-four in total responded to the question with answers limited to "mostly achieved" (n=14) and "partially achieved" (n=10). The comments provided further insight on the participants thoughts. In the interest of completeness, all six comments are included:

1. Not as engaged as expected.
2. As for question 1, case-specific collaboration and exchange is needed to realize the assumptions and principles deliberated in the workshop.
3. By breaking up into groups, and having gender as a separate group, in some cases, missed the integration.
4. Need follow up discussions.
5. Not always clear where gender can really be implemented.
6. Full participation and contribution from the gender colleagues.

Output 3: Gender relevance of cluster products, deliverables and linkages are enhanced through gender integration and mainstreaming

Answered: 24 Skipped: 2



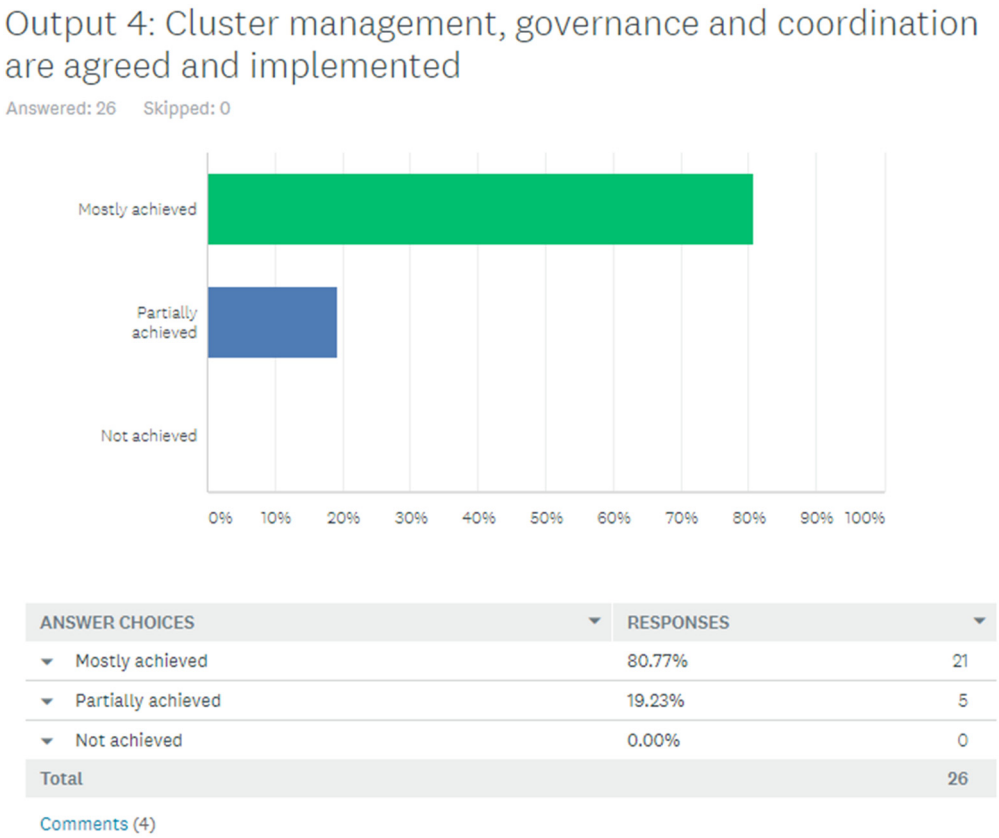
ANSWER CHOICES	RESPONSES	
Mostly achieved	58.33%	14
Partially achieved	41.67%	10
Not achieved	0.00%	0
Total		24

Comments (6)

Output 4: Admin and Coordination

Output 4 relates to cluster management, governance and coordination. The following graphic shows again highly positive responses on achievements. The four comments included this thoughtful response, "A round of communication at the Center level is needed, as governance of clusters is part of cross-Center agreements and interactions. Probably the Center Focal Points in RTB should be asked to turn the workshop report section into an agreement with any changes to areas not fully addressed by the workshop participants. "

Another noted that "we did not indicate what are the next actions for revising our work plan and making decision active and articulated." And a third observed that "I don't think there was much efforts in this direction but I don't think that we needed more in this area."



ANSWER CHOICES	RESPONSES	
Mostly achieved	80.77%	21
Partially achieved	19.23%	5
Not achieved	0.00%	0
Total		26

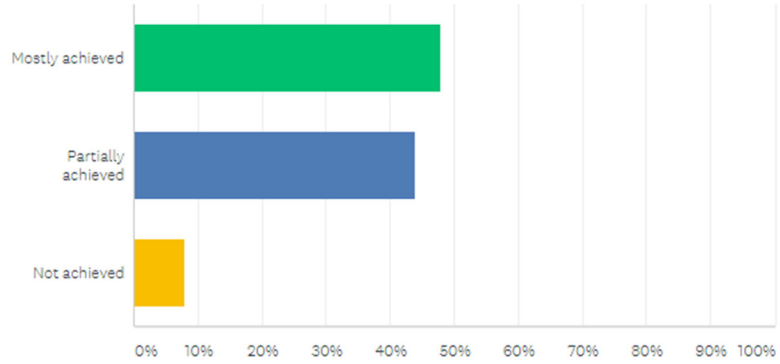
Comments (4)

Output 5: Commitment and Fund Raising

Output 5 referred to the common commitment and approach to fund-raising, see next graphic. This is the least positive set of responses. Two responded that this was "not achieved." Comments highlighted that "next steps regarding CN drafting will be critical." One lamented that "more new ideas could have been brought up and discussed." One participant took time to write that "the session was interesting and hoped that the concept notes would be shared."

Output 5: Common commitment and approach to fund-raising are built

Answered: 25 Skipped: 1



ANSWER CHOICES	RESPONSES	
Mostly achieved	48.00%	12
Partially achieved	44.00%	11
Not achieved	8.00%	2
Total		25

Comments (5)

MEETING SPECIFICS

The next questions relate to the meeting organization and venue. Overall the participants were unanimous that the organization and facilitation were good (see next graphic). All four comments were positive including “Great facilitator!” and “better than good.”

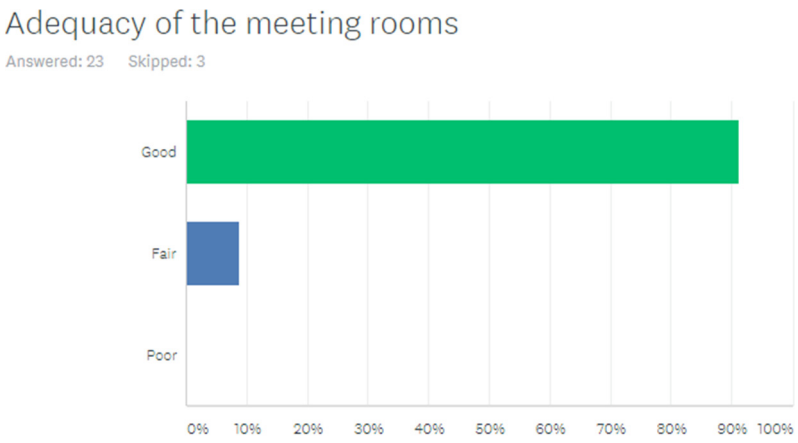
Overall meeting organization and facilitation

ANSWER CHOICES	RESPONSES	
Good	100.00%	23
Fair	0.00%	0
Poor	0.00%	0
Total		23

Comments (4)

Meeting Rooms

The meeting rooms were good with one of the three comments noting a heat problem.



ANSWER CHOICES	RESPONSES	
Good	91.30%	21
Fair	8.70%	2
Poor	0.00%	0
Total		23

Comments (3)

Everyone who responded agreed that the hotel and surrounding area was a good choice. Both comments were complimentary with one being "Excellent – should use it more."

Venue: Hotel and surrounding area

ANSWER CHOICES	RESPONSES	
Good	100.00%	23
Fair	0.00%	0
Poor	0.00%	0
Total		23

Comments (2)

Everyone responding agreed the meals and coffee breaks were good. All four comments were to note how good the food was – especially the fruit.

Meals and coffee breaks

ANSWER CHOICES	RESPONSES	
Good	100.00%	23
Fair	0.00%	0
Poor	0.00%	0
Total		23

Comments (4)

GENERAL COMMENTS

The final question asked respondents to "Please provide any comments on the value of the meeting to furthering the RTB agenda or gaps that need to be addressed in future."

These comments are as follows:

1. Very well-organized meeting. Need to continue communication within Flagship 1 and also with Flagship 2 colleagues who might not have been attending the Montpellier meeting.
2. Was a pleasure to participate. Look forward to further strengthening and linkages/synergies.
3. Finalize dates earlier to ensure everyone can attend
4. I gained many useful insights that I could also take back to my crop specific COPs. Thank you!
5. Survey digital
6. Superb organization. Very productive meeting. Good crosscutting interaction
7. Mode of funding of BGP in future. Funding for deliverables, but also need for operation of community
8. The meeting purpose was complex and good planning contributed to achievement level of the objectives. However, planning should be done at least 2 months in advance to assure full participation. For a start-up meeting it was excellent, then for future meetings focus groups could meet ahead of time (face-to-face or virtually) to bring some specific inputs to the sessions.

RESEARCH PROGRAM ON Roots, Tubers and Bananas

CGIAR

The CGIAR Research Program on Roots, Tubers and Bananas (RTB) is an alliance led by the International Potato Center implemented jointly with Bioversity International, the International Center for Tropical Agriculture (CIAT), the International Institute of Tropical Agriculture (IITA), and the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), that includes a growing number of research and development partners. RTB brings together research on its mandate crops: bananas and plantains, cassava, potato, sweetpotato, yams, and minor roots and tubers, to improve nutrition and food security and foster greater gender equity especially among some of the world's poorest and most vulnerable populations. www.rtb.cgiar.org

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