ROOTS
TUBERS &
BANANAS

CGIAR

RESEARCH
PROGRAM ON
Roots, Tubers
and Bananas

RTB Extension Request

2015-2016

April 2014

TABLE OF CONTENTS

ABBREVIATIONS

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
BBTD / BBTV	Banana bunchy top disease / Banana bunchy top virus
Bioversity	Bioversity International
CBSD	Cassava brown streak disease
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CGIAR	Organization dedicated to international agricultural research
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
Cirad	Centre de coopération internationale en recherche agronomique pour le développement
CMD	Cassava mosaic disease
CRP	CGIAR Research Program
ECA	East and Central Asia
FOC Tr4	*Fusarium oxysproum f.sp. cubense* – Tropical Race 4 (a.k.a. Panama Disease)
GCP21	Global Cassava Partnership for the 21st Century
GIS	Geographic Information System
GLCI	Great Lakes Cassava Initiative
ha	hectare
HH	Household
Humidtropics	CGIAR Research Program on Integrated Systems for the Humid Tropics
IDO	Intermediate development outcome
IITA	International Institute of Tropical Agriculture
INRA	Institut National pour l'Etude et la Recherche Agronomiques
IRD	Institut de Recherche pour le Développement
IRR	Internal rate of return
ISTRC	International Society for Tropical Root Crops
KM	Knowledge management
LAC	Latin America and the Caribbean
LB	Late blight
M&E	Monitoring and evaluation
NARS	National Agricultural Research System
NPV	Net present value
OFSP	Orange-fleshed sweetpotato
PAC	Program Advisory Committee

PIM	CGIAR Research Program on Policies, Institutions and Markets
R&D	Research and development
R4D	Research for development
RBM	Results Based Management
RTB	CGIAR Research Program on Roots, Tubers and Bananas for Food Security and Income
SLO	System-level outcome
SSA	Sub-Saharan Africa
t	ton
ToC	Theory of Change
VAD	Vitamin A Deficiency

0. SYNTHESIS

This document explains the rationale for an extension of RTB. The objectives are to:

- Transition from output-based to results-based management (RBM).
- Increase integration of gender and implement strategic gender research to enhance gender equity.
- Expand linkages with regional and subregional organizations.
- Build broader alliances of partnerships.
- Maintain longer term pipeline of discovery research.
- Improve the RTB business case to achieve a tangible set of outcomes more cost effectively.

RTB brings together four CGIAR Centers (Bioversity, CIAT, CIP, and IITA) and Cirad (representing the French organizations IRD, INRA, and Vitropic) with many research and development partners. Research covers six crops: bananas (and plantains), cassava, potato, sweetpotato, yams, and other roots and tubers, organized around seven disciplinary Themes (http://bit.ly/1hzeWAN).[1]

In 2013 RTB began to reorganize its program structure in order to increase impact (http://bit.ly/1gXGOJL). The disciplinary Themes offer a strong framework for planning and monitoring of research products, but not a coherent basis for tracking outcomes. Achieving outcomes requires Themes to come together, drawing on the entire stock of available technology. RTB scientists developed a framework for RBM (http://bit.ly/1kBI62P) based on a set of discovery, delivery, and learning & support flagships[2] (see Annex 2) that focused research on the highest priorities. For each delivery flagship, research products were identified, impact pathways tentatively mapped out, and indicators for intermediate development outcomes (IDOs) constructed to provide the basis for RBM.

An RBM pilot began in 2014 with four flagships. RBM will be implemented for four to six more flagships during the extension phase. For delivery flagships, stakeholders will be involved in validating flagship design, co-constructing impact pathways and agreeing shared accountabilities in selected focus countries. This will be accompanied by the development of user-friendly monitoring and evaluation (M&E) with a "dashboard" showing key outcome indicators. M&E will link with a learning agenda and action research to understand exactly how outputs translate into outcomes. Once this framework is in place, complementary investment can occur in critical capacity strengthening and other outcome support identified in impact pathways.

The RTB extension phase, 2015–2016, involves a phased transition from output-based planning and reporting (by Themes) to RBM (by flagships). The framework for the extension period is a hybrid, retaining the original seven Themes as basic building blocks (n-1 level). It adds an eighth as the space for setting up RBM, with pilots of selected flagships (n-2 level). This transition will allow RTB to (1) focus on research products that make the clearest contribution to outcomes, drawing on the RTB priority assessment (Annex 1); (2) secure extensive stakeholder involvement; and (3) create capacity for RBM at Center and partner level. During the extension phase, RTB flagships teams will prepare compelling business cases; full implementation of RBM with the flagships with the clearest value proposition will be part of the second phase from 2017.

[1] Theme 1: Unlocking the value and use potential of genetic resources; Theme 2: Accelerating the development and selection of cultivars with higher, more stable yield and added value; Theme 3: Managing priority pests and diseases; Theme 4: Making available low-cost, high-quality planting material for farmers; Theme 5: Developing tools for more productive, ecologically robust cropping systems; Theme 6: Promoting postharvest technologies, value chains, and market opportunities; and Theme 7: Enhancing impact through partnerships.

[2] Flagships in the RTB definition correspond to "Clusters of Activity" (n-2 level) in CGIAR definition.

1. INTERMEDIATE DEVELOPMENT OUTCOMES, THEORIES OF CHANGE, AND IMPACT PATHWAYS

The RTB vision rests on the four CGIAR system-level outcomes (SLOs: poverty reduction, food security, nutrition and health, natural resource management). The original RTB proposal (http://bit.ly/1lJYIHc) explained how RTB crops contribute to this vision by realizing:

> *The potential of RTB for improving nutrition, income generation, and food security — especially among some of the world's poorest and most vulnerable populations. The program is building on the expertise, complementarities, and comparative advantages of four CGIAR Centers — Bioversity International, CIAT, CIP, and IITA — along with their partners and stakeholders. It will build on the common characteristics of RTB and strong cross-center collaboration to increase efficiencies and capacity. The greater scale and synergies of this new partnership offer a unique opportunity to enhance scientific advancements, share knowledge, and spur uptake to increase RTB research for development impacts*.

At start-up RTB organized research around seven Themes. These Themes were used to build a product portfolio by crop, including a set of synergistic products (e.g., around commonalities in seed systems) that crosscut RTB crops. Theme leaders were assigned responsibility for cross-crop work. They guided the development of a set of crosscutting multi-year projects that created a stronger team structure amongst CGIAR partners and increasingly other R&D partners. Projects have been initiated for gender integration, targeted use of global genetic diversity, managing avoidance of seed degeneration, seed system development, small-scale cassava processing, banana bunchy top disease (BBTD), and pest risk assessment. Small grants to develop full proposals include gender capacity strengthening, yield gaps analysis, partnership/network analysis, banana/plantain improvement, in-situ conservation, bacterial diseases, and banana mixed cropping systems.

A generic theory of change (ToC), known as the impact pathway[3], shows how the Themes and associated research products are linked to seven RTB IDOs (Fig. 1).[4] The ToC shows probable causal linkages from research products to IDOs mediated by next users (including both research organizations and development partners) who interact with end users (farmers, processors, etc.). Outcome support increases the probability that development partners can translate research outcomes into development outcomes. Accountability in the current RTB structure, however, is limited to the generation of products (research outputs) and their yearly milestones but without clear accountability linked to outcomes.

To broaden the scope of accountability, in 2013 RTB initiated a shift from its output-focused research agenda, based on Themes, to RBM. The RBM framework, still under development, will improve program performance, enhance achievement of outcomes, and increase value for money through evidence-based impacts. The RBM cycle (Fig. 2) begins with setting a vision for RTB, then implementing regular M&E of progress toward the goals (strategic objectives) and using results from M&E to manage the program. RBM focuses on improved performance that can be described and measured while helping people to plan, manage, and learn more effectively.

[3] A full ToC would include the assumptions underpinning causal linkages and the actor network relationships required to achieve IDOs. These will be developed in country-specific impact pathways as part of RBM pilot.

[4] RTB IDOs are aligned with the concept and wording of the IDOs common to the CGIAR Research Programs (see IDO Design Group, 10 October 2013: Result of CRP Discussion of the Common IDOs. p.1f).

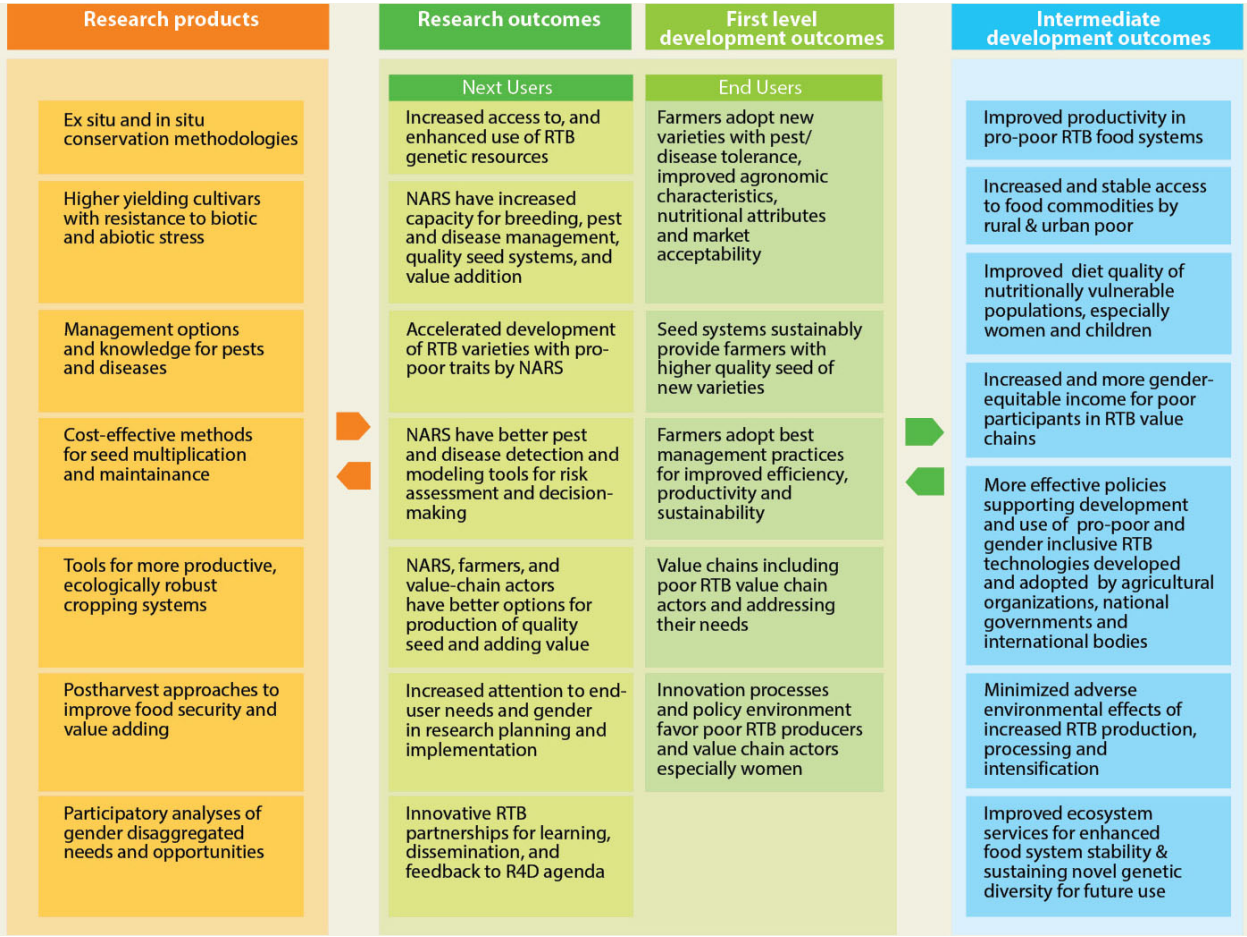

Figure 1. Impact pathway showing major research products by Theme leading to seven RTB IDOs.

Achieving outcomes is an inherently uncertain process: it requires changes in knowledge and practices by many players in an innovation system—hence the importance of joint learning for continuous improvement. Outcome support creates an enabling environment, which increases the likelihood that the desired changes will occur. Under the proposed RBM framework, RTB is accountable for outcome support to ensure that the right partners and stakeholders are engaged, capacities are developed, and a policy environment is conducive to adopting technologies and achieving outcomes. The RBM framework also requires that an array of stakeholders contribute to the participatory development of impact pathways and assume a shared responsibility.

This process of shifting to RBM is still underway. For 2014 RTB was selected by the CGIAR Consortium as one of five CGIAR Research Programs (CRPs) to pilot RBM with an additional budget. The framework and business case for RTB will be fully developed during 2015–2016 (see Section 2).

2. FLAGSHIP PROJECTS

RTB's RBM framework is flexible and iterative, incorporating experiential insights and lessons to improve its utility. RBM is guided by the achievement of quantified indicators of progress in research and of IDOs. The RBM framework links outcomes to a set of flagships that draws multidisciplinary expertise from the different RTB Themes. In this RTB understanding, a flagship corresponds to the CGIAR definition of a "Cluster of Activity" (n-2 level – see Annex 5). These flagships require functioning teams of RTB scientists and R&D partners. The 23 flagships currently proposed focus on the research products that have the greatest impact potential. They bring together several hundred outputs in the current product portfolio spread across several Themes to create the basis for RBM. RTB flagships will subsequently be aggregated at the n-1 level. The principles for aggregation are still under discussion and will be defined at the beginning of 2015 (see Section 6).

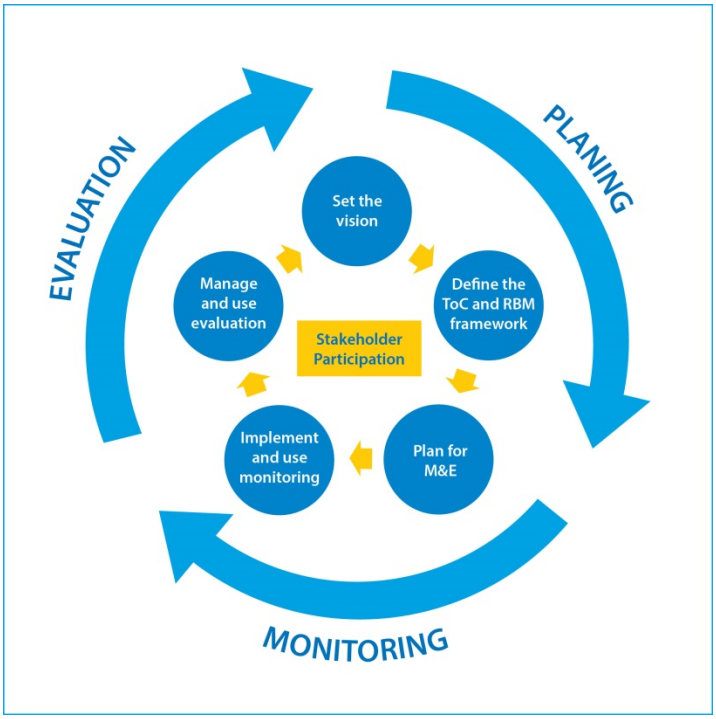

Figure 2. Based on "Results Based Management Cycle," United Nations Development Group, 2009.

The flagship product is the centerpiece of a work package that also consists of linked, or enabling, products and is associated with a ToC with quantified indicators. A flagship product as defined by RTB:

1. Is a significant measurable and time-bound deliverable, based on an **output of research** that results from a **research activity** or set of related activities attributable to RTB.
2. Is used by a well-defined group of **next users** who may be either researchers or development actors, with strong evidence of **demand pull** from these users.
3. Responds to a **clear need/demand of end users** to improve livelihoods.
4. Has potential for **large-scale impact** directly or indirectly.

The combination of flagship products, linked products, impact pathway, and strategic objectives is referred to for simplicity as a "flagship." It requires a work package comprising both the research needed to develop and improve the products and the outcome support, including capacity strengthening, that is also required to achieve the strategic objective. Gender aspects are taken into consideration in an integrative manner to improve user orientation and adoptability of technologies and to improve gender equity (see Annex 2).

As just one example, Figure 3 shows a flagship product (centerpiece), "Small- and medium-scale processing centers targeted preferentially toward rural women," with a set of linked products. This illustrates how a flagship links different RTB Themes: cassava processing centers, life-cycle analysis, and protocols for high product quality—Theme 6; varieties—Theme 2; seed systems—Theme 4; and training—Themes 3, 4, 5 & 6. The linked products are required for the flagship product (improved small-scale processing centers) to achieve significant outcomes.

RTB teams, including partners, are preparing a set of flagship business cases with ToC and quantified indicators (see drafts at http://bit.ly/1lMZcZx).

Three types of flagships have been developed:

- **Delivery flagships** emphasize outcome support to create the capacities, development partnerships, and innovation environment for product delivery to take outcomes to scale. These flagships require articulation with value chains and client-responsive seed systems to create demand pull. They include client-oriented research to continuously improve the flagship and linked products.
- **Discovery flagships** focus on well-targeted, high-potential upstream research that contributes to outcomes in the longer run. Some of the outputs of these flagships will generate products for delivery, once proof of concept is established.

Figure 3. Illustrative flagship: "Small- and medium-scale cassava processing centers targeted preferentially toward rural women."

- **Learning & support flagships** focus on developing methods and approaches that facilitate outreach from other RTB flagships and learn from them in a continuous feedback loop, leading to enhanced outcomes. Methods, and linked learning, could go beyond RTB and be applied, for example, with other crops.

Delivery flagships closely correspond to the concept of scalable technology and the linked inventory proposed by the U.S. Agency for International Development (http://bit.ly/1iAyC2Z). They require active outcome support with knowledge management (KM), capacity strengthening, and close attention to gender equity. They pass through three stages as the scale of RTB outcomes increases (Table 1). Stage 1 focuses on client-oriented participatory research and the assembly of the flagship and linked products for piloting. In stages 2 and 3, the emphasis shifts to outcome support and scale increases. Transitions will require a learning agenda to identify adoption levels and patterns; drivers of adoption and "dis-adoption," including both supply-side constraints and market opportunities; as well as the influence of norms and agency on gender equity in each context. The progressive scaling-up and shifting from one stage to the next will be based upon evidence of efficacy and efficiency for scaling - shown through triangulated methods for impact evaluation, including rigorous methods with counterfactual and quasi-experimental design and more qualitative approaches.

Table 1. Stages of delivery flagships

	Stage 1: Assembly and Pilot	Stage 2: Scaling-out	Stage 3: Scaling-up
Scale of impact	<10,000 farmers	<100,000 farmers	1–10 million farmers
RTB role	Lead	Coordinate	Support/backstop
Research emphasis	***	**	*
Outcome support emphasis	*	**	***

Note: * = significant, ** = important, *** = major emphasis

Generic impact pathways leading to IDOs have been developed for the delivery flagships and are included in the flagship business cases. Specific indicators for RTB IDOs have been estimated for delivery flagships (Table 2). Work is in progress to refine these indicators with stakeholders, including numbers of beneficiaries and scale of outcome at the country level.

Table 2. RTB IDOs (abbreviated), selected flagships, and draft indicators for 2023

IDO	Type	RTB Flagship	Indicator
Productivity	**Delivery**	Recovery, containment, and quarantine strategies for smallholder banana production in systems affected by BBTD	120,000 farm households (HH) produce 5 t/year from 0.5 ha in BBTD recovered production in East, Central, and West Africa
Food Security		Boosting cassava farmer yields through emergency and ongoing response to persistent biological threats in Africa	20M HH with increased dietary security through avoided or delayed spread of cassava brown streak disease (CBSD) in sub-Saharan Africa (SSA)
Nutrition		Candidate resilient, nutritious orange-fleshed sweetpotato (OFSP) varieties	15M resource-poor HH increase diet diversity score by 20%, and 50% under 5 years of age consume OFSP twice a week in SSA
Income		3Generation approach to accelerated potato seed multiplication and delivery	2,500 decentralized potato seed multipliers achieving a profit of US $1,500/ha/year in East and Central Africa (ECA)
Environment		Small- to medium-scale cassava processing centers targeted preferentially to rural women	20,000 small- and medium-scale cassava processing centers eliminate discharge of processing waste into surface water in SSA, Asia
Policies		Affordable and pest- and disease-free yam planting material	Improved yam varieties cover 50,000+ ha through the *Economic Community of West African States* variety release and certification schemes
Future Options	**Discovery**	Global network of RTB in-situ conservation monitoring sites	Total number of landrace cultivars preserved in situ and ex situ per hotspot in x hotspots in y regions
No corresponding IDO	**Learning & Support**	Framework for analyzing and intervening in RTB seed systems	Number of next users adopting framework

Note: The inclusion of certain flagship products here is illustrative. No priority for resource use or implementation is implied. This is work in progress, as teams refine information about number of beneficiaries.

The impact pathway in the orange-fleshed sweetpotato (OFSP) example (Fig. 4) shows how the flagship and linked products lead to research outcomes with next users, which in turn trigger development outcomes with end users or beneficiaries. These outcomes are all essential for the logic of the impact pathway to carry through. OFSP varieties have to be available as vines. Women, as primary caregivers, need improved knowledge of OFSP's contribution to reducing vitamin A deficiency (VAD) if OFSP is to be adopted significantly. In turn, greater adoption of OFSP would help to reduce occurrences of VAD among the critical under-three population and greater demand for OFSP from wider adoption would create more income opportunities for women.

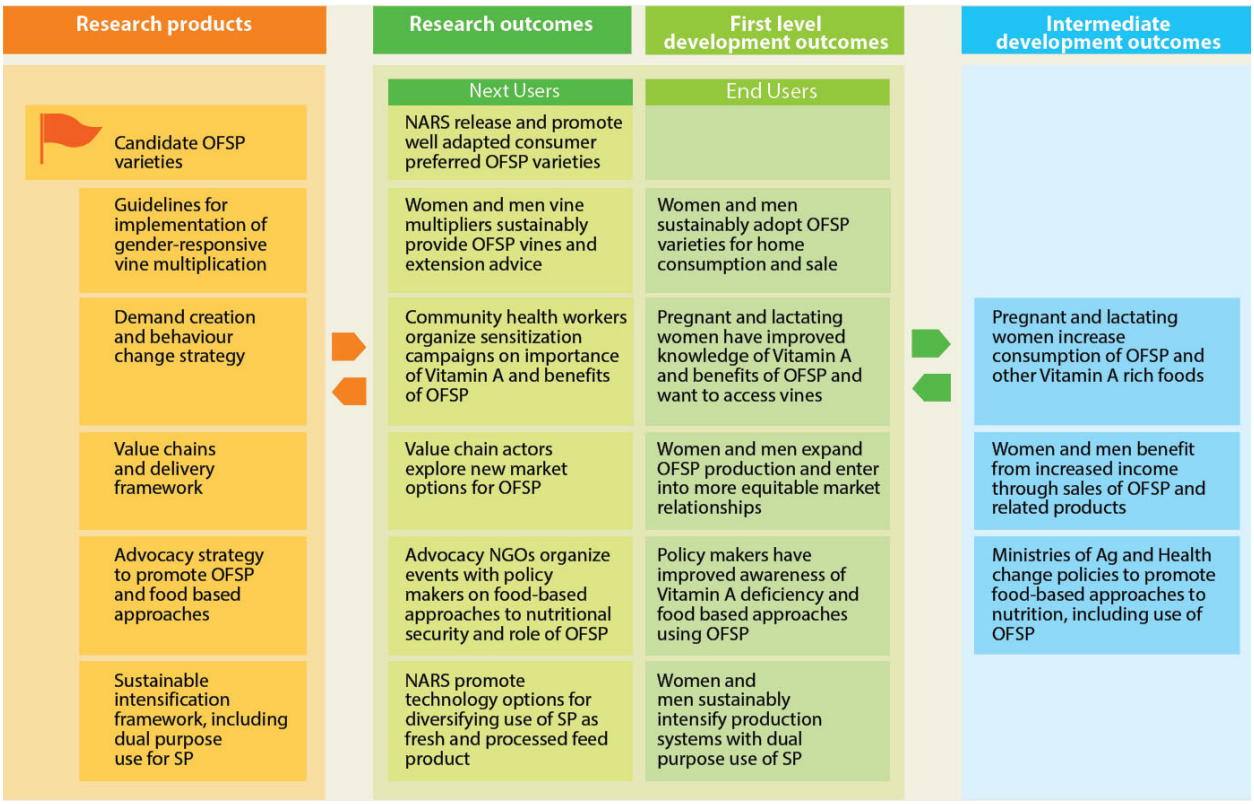

Figure 4. Prototype impact pathway for OFSP flagship.

For discovery and learning & support flagships, the ToC carries through via the delivery flagships and other initiatives. Hence, indicators of research progress and outcomes with next users provide the basis for RBM rather than IDOs. The basis for M&E with discovery flagships is illustrated in Table 3 for the next-generation breeding flagship, based on breeding targets for varietal improvement that include both yield and gains in quality and other traits. A related set of targets for trait improvement with genetic modification and gene editing form part of the game-changing traits flagship (see Annex 2, DI2).

Table 3. Examples of targets for genetic gain and preliminary indicators achievable by 2023[5]

	Target environment	Target trait	Current level of trait	Annual gain (%) or change by 2023
Banana & Plantain	East Africa	Yield (highland bananas) Earliness; drought tolerance and Fusarium resistance; Nematode and weevil resistance	7.6 t/ha 0% Multilocational testing	5% Under multilocational testing Resistant varieties released
	West and Central Africa	Yield (plantain) Earliness; tolerance to drought	6.1 t/ha Entire area affected	12% Varieties in trial
	Latin America	Yield (plantain & silk banana) Sigatoka and Fusarium resistance	9.8 t/ha Entire area affected	7% Resistant varieties released
	Asia	Yield (plantain) Sigatoka resistance	24.5 t/h Sigatoka ravaging crop	4% Resistant varieties released

[5] Indicators for traits are measured under optimum management given a representative level of limited resources available to a typical farmer.

	Target environment	Target trait	Current level of trait	Annual gain (%) or change by 2023
Cassava	SE Asia and China	Yield Dry matter	15-30 t/h 32-35%	2% 1%
	Latin America	Pro-vitamin A	< 10-µg B-carotene	3%
	West and Central Africa	Yield Dry matter (plus poundable, low CNP) CMD resistance Preemptive CBSD resistance High pro-vitamin A	15-30 t/ha < 30% (>15 ug/g	2% 2% Resistant varieties wide adoption High levels in candidate varieties 2%
	East Africa	Yield Dry Matter CMD & CBSD resistance Culinary attributes	12-25 t/ha < 30% High (CMD) to low (CBSD) Lower culinary acceptance than landraces	2% 2% 2% 2%
Potato	Tropical highlands and mid-elevation tropics	Late blight resistance Earliness Drought tolerance Fe concentration Zn concentration	Score =6 (mod. suscept.) ≥ 120 days g /L water To be defined 19 ppm 17 ppm	Score =2 (highly resistant) 90 days g /L water To be defined 9% (45 ppm) 8% (37 ppm)
	Subtropical lowlands	Earliness PVY extreme resistance Heat tolerance (mean tuber weight) Dry matter Drought tolerance Cold chipping (chip color)	120 days Not available 20g/tuber 18-20% g /L water To be defined 4 (4-5 on color scale))	70 days Resistance developed 60 g/tuber 1.5% g/L water To be defined 1 -2 on color scale
	Temperate and mid- altitude	Yield Earliness PVY extreme resistance Salinity tolerance	10t/ha >120 days Not available To be defined	2% ≤90 days All clones resistant To be defined
Sweetpotato	Humid tropics	Root yield & vine yield	10t/ha & 10t/ha	1.5-2.5% & 1-2%
		Pro-vitamin A and dry matter	50-100 ppm B-carotene and 26-28% drymatter	3%
		Earliness	120 days to harvest	-2%
		SPVD resistance	1 of 1000 clones resistant	All clones resistant
	Tropical savanna	Root yield & vine yield Pro-vitamin A and dry matter Non sweet	8-10t/ha & 10t/ha 50-100 ppm B-carotene and 25-27% dry matter 10% sucrose	1.5-2.5% & 1-2% 3% -4%
Yams	West Africa	High yield and dry matter Anthracnose resistance & nematode resistance Post-harvest losses	Below 10 t/ha Not available 30–40%	12%. Resistance to anthracnose & viruses -3%

During the extension phase (2015–2016), the seven Themes (with an eighth Theme for the RBM pilot, see below) will be the highest level of the RTB program structure (n-1). These provide a clear scope of work to underpin contracting, planning, and reporting, while laying the groundwork for a much more significant change around a new set of flagships that brings together products from different Themes (http://goo.gl/P2J7vQ). This can only be achieved by restructuring the way teams of scientists work together, building trust amongst them and establishing effective alliances with downstream partners to agree shared accountabilities. Research products will become more aggregated and focused as they are restructured and prioritized by flagship. M&E will be based on a combined system of research milestones, flagship research/development outcomes, and IDO indicators aligned with annual performance monitoring.

RTB will progressively roll out a framework for this change, beginning in 2014 with four flagships and continuing in 2015 and 2016 with additional flagships via the pilot for RBM**,** implemented under Theme 8 (http://bit.ly/1kBI62P).

The RBM pilot for 2014 involves three delivery flagships (potato seed bottleneck, banana bacterial wilt, cassava processing) and the discovery flagship "next-generation breeding" with metrics for tracking genetic gains as the basis for "results" in RBM (Table 4). Delivery flagships operate at the level of at least a subregion (e.g., East Africa, and sometimes across a broader geography). For the definition of the geographic region, the following distinction is made: (1) *Pilot area*: Area where the whole flagship will be implemented (all relevant countries included) and (2) *Focus country*: Country in which the RBM flagship pilot will be implemented and first stakeholder workshop held. A focus country should have:

- A significant area under the crop/opportunity/problem addressed in the flagship.
- Country-level commitment to work on this as a national priority.
- Significant amount of current project activity to map, track, and coordinate via RBM pilot.
- Strong presence of the CRP on Integrated Systems for the Humid Tropics (Humidtropics)/other CRPs for joint implementation and cross learning.

RTB will organize workshops with stakeholders, in some cases jointly with Humidtropics (see 4.1. and 4.3.) for the delivery flagships in the RBM pilot. The workshops will involve co-construction of impact pathways and definition of shared accountabilities with development partners for achieving outcomes. They will create the basis for a comprehensive M&E system to track change as part of RBM. The workshops will be fully supported by gender and KM specialists to ensure that gender relevance and KM are integrated with the impact pathway. Once this framework is in place, complementary investment will occur in critical capacity strengthening and outcome support identified in impact pathways.

3. GENDER

The full-time RTB gender research coordinator, based in the Program Management Unit, will guide the preparation of a "Gender Action Plan" to implement the "RTB Gender Strategy" approved in 2013 (http://bit.ly/1i54b7i). The action plan will stimulate increased political will in support of gender mainstreaming, promote a supportive and equitable organizational culture, encourage institutionalization of accountability measures, and continue capacity strengthening in gender. The action plan includes implementing the two-year capacity-building plan and promoting use of gender audits by Centers, a participatory process to assess organizational policies, current attitudes, beliefs, and technical capacity of staff.

RTB will systematically strengthen gender analysis throughout the research cycle in order to: (1) encourage regular and early communication and learning between gender and biophysical researchers and managers, (2) designate critical points in the cycle to identify relevant gender issues for particular projects building on the gender responsive RTB project proposal template, (3) develop gender-relevant problem statements to be addressed within and across flagships, (4) define specific objectives and methods for gender integration, including defining roles of various researchers (5) establish transparent gender budgets and clearly designate management roles for those budgets between gender and biophysical researchers, (6) support the preparation of a workplan led by development partners to implement positive, gender-equitable change, based on research findings, (7) make M&E for RBM gender-sensitive and so (8) contribute to improved gender equity at the household level.

RTB will institutionalize gender mainstreaming responsibilities for Theme leaders, center focal points and other research positions within RTB. These research managers will realign their terms of reference to work closely with gender researchers to define gender-equality targets for the various Themes and flagships. They will consider gender aspects in an integrative manner as flagships with their impact pathways are scoped out. This will continue with the stakeholder workshops planned for the RBM pilot, which will require participation of gender researchers.

The capacity-strengthening trajectory initiated in 2013 will continue with follow-up mentoring provided for those who already joined training events. A new coaching approach will be introduced through face-to-face and virtual interactions. Coaching will help value chain scientists to undertake equitable and efficient diagnosis of value chain bottlenecks and opportunities and to support women and men to engage in new market opportunities with RTB crops. This has begun already in Uganda with Agriprofocus (http://bit.ly/R60XqF). It will be expanded during the extension phase as part of cross-CRP collaboration (see Annex 3) with the CRP on Policies, Institutions and Markets (PIM), linked to the application of two value chain development approaches: Participatory Market Chain Analysis (PMCA) and 5Capitals.[6]

RTB has identified opportunities for collaboration and South-South learning opportunities for gender and value chains in SSA and Latin America and the Caribbean (LAC) with PIM. Regional collaboration will be strengthened with the CRP on Agriculture for Nutrition and Health (A4NH) in East and Southern Africa and Asia for gender research on agriculture and nutrition and with the CRP on Humidtropics in West, East, and Central Africa for gender research on cassava and banana.

Working together with the CGIAR Gender network, RTB will ensure that indicators for IDOs are sex disaggregated where appropriate and form part of a gender sensitive M&E system. By the end of the extension phase it is expected that all socio-economic baseline data collected and analyzed for Themes and pilot flagships will be sex disaggregated and 30% of them will have representative samples of men and women. Social science resources, as well as capacity development related to gender data collection and analysis, will be needed to accomplish this target.

As part of the cross-CRP study on “Innovation and Development through Transformation of Gender Norms in Agriculture and Natural Resource Management: A global comparative research initiative,” RTB expects to undertake strategic gender research via case studies in nine countries. This strategic research will improve understanding of how gender norms may enable or constrain the achievement of IDOs and will inform RTB’s ToC, in order to achieve lasting and equitable improvements in agricultural outcomes.

[6] Bernet, T., G. Thiele, and T. Zschocke., Eds. (2006). Participatory Market Chain Approach (PMCA): User Guide. Lima, International Potato Center (CIP), Papa Andina; Donovan, J. and D. Stoian (2012). 5Capitals. A Tool for Assessing the Poverty Impacts of Value Chain Development. Technical Bulletin no. 55. Rural Enterprise Development Collection no. 7.

During the extension period, RTB will identify opportunities for leadership training and research and travel grants for young women and men scientists to enhance gender and diversity in the workplace. RTB is building a partnership with International Programs in the College of Life Sciences and Agriculture at Cornell University to link graduate students with gender, social science, and statistical expertise to existing RTB projects. The initiative will promote two-way learning and provide students with practical experience while increasing RTB's capacity to conduct gender research.

4. PARTNERSHIPS

4.1 Engaging partners in delivery flagships

Central to putting RBM in place is developing strong alliances with stakeholders, especially of the downstream development partners who should share accountability for achieving outcomes. RBM flagship pilot workshops will convene the stakeholders potentially involved with a selected RTB flagship at both focus country and subregional levels, including subregional organizations such as the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). They will be jointly planned with Humidtropics and potentially other CRPs (see Section 4.3). During the workshops, stakeholders and partners will validate, contextualize, and improve the generic delivery flagship impact pathways for the focus country. This should inform the impact pathway at the subregional level. The central method used for an actor-centered ToC will be Participatory Impact Pathway Analysis (PIPA), drawing also on Outcome Mapping (http://bit.ly/1etZmjh and http://bit.ly/1hl6HGM).

Each flagship will involve strengthening alliances with a set of development partners, including governmental organizations, such as extension departments, nongovernmental organizations (NGOs) of different scale, and both private sector small- and medium-enterprises as well as larger enterprises. For example, private sector involvement in potato seed production in east Africa facilitated by CIP created entrepreneurial opportunities for young and female farmers and boosted the supply of quality, affordable seed to smallholder farmers. As part of its learning agenda, RTB will track and monitor the kinds of partners that actually deliver the outcomes most efficiently and cost-effectively for each flagship. The program will build on these as part of RBM.

4.2 Partnership platforms

RTB actively collaborates with crop research association meetings, especially the participation of National Agricultural Research Systems (NARS) partners. The African Potato Association Conference, the International Conference on Tropical Roots and Tubers, and the International Society for Tropical Root Crops amongst others provide fora to share vision, science progress, and plans.

The Global Cassava Partnership for the 21st Century (GCP21) is hosted at CIAT. It brings together diverse stakeholders, including advanced research institutes (ARIs) and NARS, to improve cassava productivity toward the goal of alleviating hunger and poverty. GCP21 has evolved into a partnership platform fully engaged with RTB. RTB will support the GCP21 triennial international meeting in China in 2015.

The Global Musa Genetic Resources Network (MusaNet, www.musanet.org), hosted by Bioversity International, is composed of *Musa* scientists, collection curators, and other stakeholders. MusaNet brings together people from all regions to optimize the effort to conserve, add value, and promote the use and safe distribution of a wide range of *Musa* genetic diversity. MusaNet provides a partnership platform for the RTB flagship "Increased understanding of and access to Musa diversity to improve smallholder banana farm and food systems" (see Annex 2, BA4).

RTB will promote and seek funding for other stakeholder initiatives—for example, a consortium to work on new strategies for detecting and managing major bacterial diseases of RTB crops (http://bit.ly/1l2D8Me) and a rapid response mechanism for the threat of Fusarium TR4, which could have disastrous consequences for smallholder banana producers in Africa and elsewhere.

4.3 Cross-CRP collaboration

RTB will actively pursue cross-CRP collaboration to exploit complementarities and enhance critical mass.

RTB proposes to work on and in collaboration with the systems CRPs in their action sites. After a joint workshop in 2013, RTB and Humidtropics are working closely together to exploit this opportunity and (1) increase the demand pull and improve the relevance of their research agendas; (2) create a space for collaboration on system-level research and learning; and (3) facilitate the integration of impact pathways across research programs, as Humidtropics can significantly expand the outreach of commodity research programs with NARS and other stakeholders. As mentioned, RTB and Humidtropics are already interlinking the implementation of their respective RBM pilots (http://bit.ly/1l2CI8M).

RTB will deepen collaboration with other CRPs during the extension phase. This includes joint research on gender (see Section 3) on composite and shared technologies such as use of waste for feed with the CRP on Livestock and Fish, developing OFSP and its uptake with A4NH, and value chain development with PIM. These collaborations are detailed in the collaboration matrix (see Annex 3) showing roles and linkages. RTB is reaching out to other CRPs to share ideas about constructing ToCs and impact pathways.

4.4 Governance and management

Cirad has fulfilled all the criteria of a global partner and has joined RTB, with members on both the Steering Committee and the Management Committee. An equal partner in accessing complementary funding on a matching funds principle, Cirad has become a dynamic member of several research projects and leads one, through IRD. Its role is expected to grow further during RTB extension, for example, in postharvest work.

The RTB Steering Committee transformed the Scientific Advisory Committee envisaged in the original proposal into a Program Advisory Committee (PAC), whose broader functions complement—not duplicate—existing competencies at the center level. The PAC was activated early in 2014 and includes six members with expertise in gender, partnership, evaluation and ToC, and capacity strengthening. At least one of the PAC's scientists helps to keep cutting-edge science a priority. In light of the "Review of CRP Governance and Management" (CGIAR 2014),[7] the PAC and the Steering Committee will agree the changes to comply with the recommendation for a single governance body in 2015.

Theme leaders will continue in their current roles during the extension phase. A new role of flagship coordinator will be introduced as part of the RBM pilot. A shift to a matrix structure is envisaged from 2017: flagship coordinators will play a more central role and the number of Theme leaders will be reduced.

5. REGIONAL COLLABORATIONS

Different types of regional collaboration play a key role in going to scale by facilitating spill-over of technology and cross-border collaboration to address common problems and exploit shared opportunities. The formally constituted regional and subregional networks provide access to political leadership and can create a space to contribute to setting evidence-based priorities for scaling-up and

[7] See: http://bit.ly/1gXE0vN

facilitate engagement at the national level. As such, RTB is active in the Comprehensive Africa Agriculture Development Programme (CAADP) and is committed to seeking alignment with sub-regional and national plans. Hence RTB is pursuing linkages with ASARECA, the West and Central African Council for Agricultural Research and Development, the Centre for Coordination of Agricultural Research and Development for Southern Africa, and the Forum for Agricultural Research in Africa. RTB contributed to ASARECA's 2013 annual meeting in Bujumbura, Burundi (http://bit.ly/MUJiiH). One key concern is to develop a shared M&E system for RBM, an effort now being pursued with M&E staff at ASARECA who will join stakeholder workshops as a part of the RBM pilot. The subregional organizations were actively consulted during the RTB priority assessment (Annex 1) and helped to identify participants in the expert consultation. In Latin America, the Inter-American Institute of Cooperation in Agriculture played an especially active role in the expert consultation with linkages through its website. Findings from the RTB priority assessment will be shared and validated with the subregional organizations to improve alignment.

RTB has also actively engaged with commodity-specific regional networks to support collective action and knowledge sharing across countries. These include Regional Banana Research for Development (R4D) networks BARNESA (Banana Research Network for Eastern and Southern Africa): Eastern and Southern Africa; BAPNET (Banana Asia Pacific Network): Asia and the Pacific; MUSALAC (Red Latinoamericana y del Caribe para la Investigación y el Desarrollo de las Musáceas): LAC; and Innovate Plantain: Western and Central Africa.

Large development NGOs can also facilitate regional collaboration as flagships go to scale. The Great Lakes Cassava Initiative (GLCI), managed by Catholic Relief Services (CRS), is one potential model. GLCI operated in Burundi, the Democratic Republic of Congo, Kenya, Rwanda, Tanzania, and Uganda. It reached 1.35 million farmer families by distributing healthy cassava planting material of farmer-accepted, disease-tolerant varieties to help alleviate food insecurity and increase incomes. In this example, a CGIAR center, IITA, provided research support on critical aspects of disease identification and management and varietal testing as part of a broad collaboration.

6. PHASED WORK PLAN COVERING THE 2 YEAR EXTENSION PERIOD UNTIL 2016

6.1 Results-Based Management

As mentioned previously, during 2015–2016 RTB will transition from a Theme/output-based planning and reporting scheme to one centered on flagships and RBM. The work plan for the extension period concentrates on three components: (1) defining the ToC and the RBM framework with a strong focus on the development of selected RTB flagships, (2) implementing regular M&E of progress toward results, and (3) using feedback from M&E to manage the program (see Annex 4). An RBM pilot began in 2014 with four flagships. RBM will be implemented for four to six more flagships during the extension phase.

For the **delivery flagships** the sequence of activities in the RBM pilot includes:

- Stakeholder mapping followed by stakeholder workshops to validate the flagship construct, co-construct impact pathways, and define shared accountabilities with development partners.
- Inventory available technologies for the flagship and baseline (using surveys, expert opinions, and secondary sources), showing current adoption of technologies within targeted countries.
- Conduct needs assessment for KM, capacity strengthening, and gender research to accelerate uptake.

- Implement jointly participatory technology development, capacity strengthening, and outcome support guided by impact pathway.
- Convene periodic reflection workshops with partners to report on outcome successes and for updates (every six months or yearly).
- Commit 50% of incremental budget in RTB for capacity strengthening and other actions to enhance outcomes in delivery flagship pilots. Approval of funding will draw on feedback from M&E on achievement of progress indicators during the first year of the flagship (see 6.4).

As mentioned above, the RBM pilot for **discovery flagships** will focus initially on the "next-generation breeding" flagship and use a different set of metrics, linked to genetic gain, including:

- Level of engagement with next and end users to determine priorities and preferences for traits (with gender disaggregation), and to plan and track participatory processes.
- Change in level of priority assigned to target traits as a result of new options for identification and selection.
- Ex-ante values for defined changes in selected traits, to set economic values for selection indexes.
- Cost per trait per genotype for new tool applications compared to conventional screening methods.
- Number of landrace varieties brought into breeding populations as a result of identifying traits with advanced tools.
- Change in length of the breeding cycle projected for use of new tools and methods.
- Change in heritablity of target traits using new tools and methods compared to traditional practices.
- Change in investment into RTB breeding by public and private institutions resulting from the promise of advanced tools and methods.

These metrics will be the basis for the introduction of a stage-gate process for managing breeding and trait pipelines using a breeding assessment tool (jointly with the Bill & Melinda Gates Foundation).

The third category of RTB flagships, the **learning & support flagships**, will come into the RBM pilot flagship set during 2016. Building on progress and secured funding, the suggested flagship is the "Framework for analyzing and intervening in RTB seed systems." As this type of flagship achieves outcomes via the other flagship (types), a specific ToC and set of progress indicators will be designed to assess results.

A key element of the RBM pilot is the **development of a user-friendly M&E system which includes outcomes**—both in the sense of conceptual/methodological underpinnings as well as referring to a software/user platform. This system will be nourished by partner M&E systems/data (see Section 5). Apart from internal usage for inputting and updating/planning and reporting function, a **dashboard** function is foreseen, showing key R&D outcome indicators available online for stakeholders.

6.2 Knowledge management, capacity strengthening, and communication

All flagship pilots will give attention to KM, capacity strengthening, and communication based upon the needs assessment. Interventions in these areas will be designed along the impact pathway. Events and mechanisms will be developed to ensure good cross-fertilization between flagships on roles and results of KM interventions with RTB and with other CRPs, working closely with the CGIAR working group on KM and communications for CRPs (KMC4CRPs: http://bit.ly/R6GXnY). The RBM pilot on cassava processing

(involving IITA, CIAT, Cirad, Natural Resources Institute) has been selected as a learning laboratory for KM with more intensive support and analysis by KM specialists.

RTB will foster the progressive implementation of the CGIAR Open Access and Data Management Policy across all program participants. As a CGIAR Consortium initiative, Open Access will require system-wide integration for achieving resource-efficient and end user-oriented processes. At this early stage, the variety of RTB crops and publication databases indicates a necessity for interoperability of these databases to increase impact of our results. The methodology for the implementation of the Open Access and data management policy at RTB will be developed during this extension period, and be fully implemented by the end of 2018.

RTB can play a defining role in accelerating the KM efforts of its partner Centers. At present, Centers will likely lead the Open Access implementation of KM. But RTB can help to set standards for data collection and reporting that will be in the best interest of other Centers to adopt. The common adoption of these practices will reduce reporting redundancy, increase the linkages between Centers, and accelerate the diffusion of data to stakeholders globally. RTB will create incentives for participating Centers to adopt CGIAR metadata standards and common platforms and thereby use Open Access and KM as crosscutting tools to improve the linkages among research, crops, and data.

6.3 New discovery research

RTB is committed to sustaining high-quality discovery research as it moves to RBM. Building on small grants, RTB has developed a bank of crosscutting (cross-crop/cross-center) discovery research proposals. RTB partners will proactively seek funding to implement these during the extension period. Proposals in the bank include:

- **In-situ conservation network of RTB agrobiodiversity**. The proposal seeks to establish a global network of benchmark genetic reserve sites to systematically monitor and/or manage the dynamic in-situ conservation of RTB landraces and crop wild relatives, thereby investigating and/or sustaining their role in providing food security, resilience, and ecosystem services towards future options for agricultural production.
- **Bacterial diseases in RTB crops**. This proposal has four objectives:
  - Understanding population dynamics to support pathogen-centered management of bacterial diseases.
  - Developing tools for rapid diagnostic and surveillance of bacterial diseases.
  - Pathogen-informed next-generation breeding for durable resistance to bacterial diseases, including genetic modification and gene-editing components.
  - Strengthening capacity and networking in control of bacterial diseases within RTB (RTB Bacterial Disease Initiative).
- **Strengthening breeding informatics and high-density genotyping** to make existing high-density marker databases usable by breeders and establish a pipeline to routinely generate high-density genotypic data of all phenotyped materials. This effort will be incorporated within a shared platform for RTB bioinformatics based on http://cassavabase.org/ and other tools. Additional resources for work in cassava on high-density genotyping form part of a proposal with the Consortium Office.

6.4 Program preparation, reporting, and evaluation

In 2017 the product portfolio will be fully restructured by flagships (level n-2) with linked ToCs, organized in flagship groups (level n-1). The criteria for grouping at n-1 will be defined in the pre-proposal for second phase. The current preliminary set of flagships will be revised and tentatively agreed in early 2015. Subsequently, flagship teams will describe research activities and products envisaged for the second phase and each prepare an evidence-based business case of their contribution to outcomes. The flagship business cases will be reviewed in coordination with the PAC and Steering Committee to ensure value for money. Research activities and products that do not clearly fit or significantly contribute will be dropped in order to ensure a more coherent and focused product portfolio.

The evaluation of RTB by CGIAR (Independent Evaluation Arrangement) is scheduled for 2015. It will provide further guidance on the programmatic adjustments needed to manage for results with additional information available from the RBM pilot.

7. BUDGET 2015–2016

Budgeting by Themes continues throughout the extension period. IDOs and indicators are still being developed, so it is difficult to estimate budget by IDOs at the moment. Each flagship is expected to develop a strong business case as a condition for inclusion in second phase.

A budget increase of 10% is requested for 2016. The additional amount will be obligated through the existing mechanism of complementary funding and aligned with the new flagships being developed. Half of this increase will be awarded to delivery flagships in the RBM pilot for capacity strengthening and outcome support based upon their business case, and the other half to new discovery research (see 6.3).

Table 4. Budget estimates for 2015 and 2016

Funding Sources / THEMES	2015 (USD ,000)				2016 (USD ,000)			
	Window 1&2[8]	Window 3	Bilateral	Total	Window 1&2	Window 3	Bilateral	Total
Theme 1. Unlocking the value and use potential of genetic resources[9]	3,652	855	811	**5,318**	2,785	855	811	**4,451**
Theme 2. Accelerating the development and selection of cultivars with higher, more stable yield and added value	9,028	2,411	12,805	**24,244**	9,480	2,411	12,805	**24,696**
Theme 3. Managing priority pests and diseases	4,090	1,385	1,414	**6,888**	4,294	1,385	1,414	**7,093**
Theme 4. Making available low-cost, high-quality planting material for farmers	2,548	3,285	4,707	**10,540**	2,676	3,285	4,707	**10,668**
Theme 5. Developing tools for more productive, ecologically robust cropping systems	1,196	430	2,100	**3,727**	1,256	430	2,100	**3,787**
Theme 6. Promoting postharvest technologies, value chains, and market opportunities	1,860	3,957	3,557	**9,375**	1,953	3,957	3,557	**9,468**
Theme 7. Enhancing impact through partnerships	3,483	3,236	1,068	**7,787**	3,657	3,236	1,068	**7,962**
Theme 8. Results-Based Management[10]	980	0	0	**980**	1,817	0	0	**1,817**
Gender research[11]	4,319	592	1,224	**6,136**	5,344	592	1,224	**7,161**
Management	1,999	0	0	**1,999**	2,039	0	0	**2,039**
TOTAL	**33,155**	**16,152**	**27,687**	**76,994**	**35,301**	**16,152**	**27,687**	**79,140**

[8] Window 1&2 are funds provided to the RTB to use as it chooses across the agreed product portfolio. Window 3 and bilateral funds are awarded to member CGIAR Centers directly which are consistent with and mapped into the RTB product portfolio. Window 3 includes a 2% contribution to the Consortium.

[9] High density genotyping for cassava – provision agreed with CO.

[10] The RBM budget includes the additional US $700,000 approved by CGIAR for the RTB RBM pilot.

[11] Here shown as separate budget line – however in practice this is integrated into Themes for ongoing research.

8. ANNEXES

Annex 1. RTB Priority Assessment

A priority assessment of research opportunities was one of the must-have conditions for approving the original proposal. This was finalized in 2013, following a six-step process developed as a common framework for all crops (Fig. I).

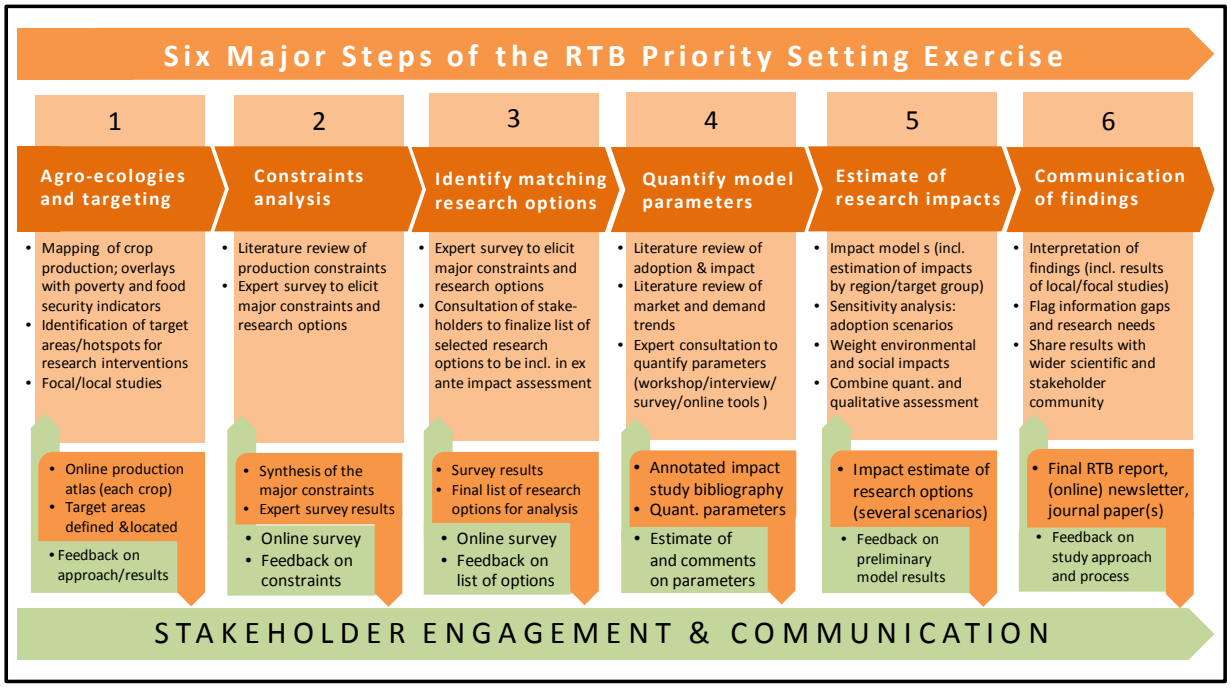

Figure I. Priority assessment process.

The basic tool for the expert surveys was a structured questionnaire with questions about the major constraints for each crop. The rationale behind conducting expert surveys was twofold: (1) to engage the global scientific/stakeholder community in identifying research options to be included in the RTB priority assessment and (2) to ensure that research options selected for the ex-ante assessment address key constraints and opportunities to small-scale production, processing, and marketing in target areas. To facilitate the participation of especially national and local-level experts, the questionnaires were provided in different languages (English, Spanish, and French for all crops and, in the case of potato, also Chinese, Russian, and Portuguese). Besides conducting the surveys in several regional meetings relevant to each crop, they were also available online through a link on the RTB webpage. The constraint analysis and identification of research options (steps 2 and 3 of the framework) carried out a total of 1,681 expert surveys for all of the five crops (Table I).

Table I. Overview of expert survey final sample disaggregated by region and crop.

	SSA	LAC	Asia and Pacific	Others	Global	Total per crop
Cassava	200	32	35	8	40	**315**
Potatoes	59	127	170	18	37	**411**
Sweet potatoes	68	27	90	4	27	**216**
Bananas	184	176	125	4	34	**523**
Yams	176	6	7	6	21	**216**
Total per region	**687**	**368**	**427**	**40**	**159**	**1,681**

Table II highlights some of the results of the expert surveys, showing the top four constraints identified for each crop. To give an overview of the range of results the table also shows the lowest ranked research option for each crop. Although the differences in mean scores appear relatively small because they are on a scale of 1 to 5—with many responses clustering at 3—in fact, even mean differences of 0.20 are likely to be of statistically significant at 5% level.

For the first time among RTB Centers, priority assessment considered including gender disaggregation of the mean global scores (Table II). Results of the expert survey show gender-linked differences, which are still being analyzed. For example, female sweetpotato experts scored technology options higher on average than their male counterparts, and female experts generally gave higher scores on health and environmental risks of pesticide use. It proved to be more difficult for experts to score gender implications of research options, as originally expected. An alternative approach that used qualitative assessments with focus groups was designed for implementation in 2014. These assessments should help guide the selection of research options in different localities to ensure that new technology has positive effects on gender equity, or at least does not make things worse, while considering all trade-offs.

An ex-ante evaluation of selected research options was then carried out. The selection of the research options was largely based on the expert survey results and complemented with focus groups discussions with experts for each of the crops.

Table II. Top four highest ranked research options by crop according to global mean score and lowest ranked research option for each crop.

	Global	LAC	SSA	Asia/P	Male	Female
Crops and Research Options	*Mean score*	*Mean score*	*Mean score*	*Mean score*	*Mean score*	*Mean score*
BANANAS and PLANTAINS						
Breeding for high yield	4.21	4.14	4.40	4.05	4.25	4.07
Management of fungal leaf disease (excl. resistant varieties)	4.11	4.40	3.88	3.85	4.16	3.91
Breeding for resistance to fungal leaf diseases	4.11	4.45	3.82	3.85	4.15	3.95
Strategies to improve soil fertility (micro-nutrients and fertilizer)	4.08	4.18	4.18	3.82	4.12	3.89

	Global	LAC	SSA	Asia/P	Male	Female
Crops and Research Options	*Mean score*	*Mean score*	*Mean score*	*Mean score*	*Mean score*	*Mean score*
Breeding for cold tolerance/highland hardiness (lowest ranked)	*2.69*	*2.62*	*2.57*	*2.92*	*2.67*	*2.75*
CASSAVA						
Improving shelf-life of cassava roots	4.24	4.28	4.10	4.11	4.23	4.27
Improving production and distribution of elite planting materials	4.24	4.18	4.16	3.79	4.21	4.36
Cassava mosaic disease (disease management)	4.24	3.89	4.29	3.73	4.20	4.34
Developing cassava products for industrial applications (flour and starch)	4.18	4.36	4.04	4.10	4.14	4.27
Breeding for low temperatures/winter hardiness (lowest ranked)	*2.64*	*2.65*	*2.98*	*3.05*	*2.69*	*2.51*
POTATOES						
LB control and management	4.71	4.63	4.77	4.77	4.68	4.80
Breeding for LB resistance	4.60	4.56	4.52	4.66	4.57	4.78
Breeding for drought tolerance/water use efficiency	4.51	4.56	4.34	4.62	4.47	4.67
Breeding for earliness	4.49	4.48	4.66	4.52	4.49	4.49
Breeding for resistance to mites (lowest ranked)	*2.89*	*2.93*	*2.90*	*2.88*	*2.80*	*3.23*
SWEETPOTATOES						
Improving the quality of planting material (e.g., elimination of diseases)	4.35	4.29	4.71	4.15	4.30	4.48
Pro-vitamin A (beta-carotene) (breeding)	4.28	4.21	4.70	4.02	4.20	4.51
Breeding for high yield	4.26	4.21	4.61	4.10	4.21	4.41
Improving production and distribution of elite planting materials (formal seed systems)	4.21	4.21	4.46	4.08	4.19	4.27
Breeding for low sugar content (non-sweet) (lowest ranked)	*2.73*	*2.52*	*2.59*	*2.86*	*2.65*	*2.94*
YAM						
Improving shelf-life of yam tubers	4.30	4.50	4.47	*n.d.*	4.25	4.58
Improving soil fertility (micro-nutrients, fertilizer, organic matter)	4.17	4.17	3.98	*n.d.*	4.15	4.41
Improving small-scale processing of yam for human consumption	4.13	3.80	4.23	*n.d.*	4.02	4.55
Improving technologies for farmer-based production and distribution of planting	4.10	4.50	4.13	*n.d.*	4.15	4.13

	Global	LAC	SSA	Asia/P	Male	Female
Crops and Research Options	*Mean score*	*Mean score*	*Mean score*	*Mean score*	*Mean score*	*Mean score*
materials(informal)						
Breeding for tolerance to low temperatures (lowest ranked)	*2.56*	*2.80*	*2.85*	*n.d.*	*2.47*	*3.00*

An economic surplus model was used for the assessment and was extended to include estimations of the potential number of beneficiaries and poverty reduction effects. A cost-benefit analysis was carried out for some of the highest ranked research options, working with experts to estimate the assumptions underpinning adoption and benefits (Table III). (We are aware that this analysis has its restrictions and is not fully comprehensive.) The total net present value (NPV) of research investment for these five illustrative technologies ranges from US $5,300M to $12,200M, with internal rate of return (IRR) to investment of at least 34%. Results will be shared with stakeholders and used to guide investments in the RTB portfolio as it evolves toward flagships (http://bit.ly/1cy7ofP). There is not a perfect fit between the research options identified and analyzed in the priority assessment and the proposed set of flagships. Hence the priority assessment should be used as one source of information to aid in decision-making.

Table III. Ex-ante assessment of research options for RTB crops: some results of the economic surplus model.

Technology	Adoption Ceiling		All Benefits				Number of Beneficiaries				Poverty Reduction	
	Lower adoption	Higher adoption	Lower adoption		Higher adoption		Lower adoption		Higher adoption		Lower adoption	Higher adoption
	'000 ha	'000 ha	NPV (m USD)	IRR	NPV (m USD)	IRR	'000 households	'000 persons	'000 households	'000 persons	'000 persons	'000 persons
BBTV	413	793	1,198	56%	2,756	74%	2,063	10,030	3,966	19,013	725	1,400
Cassava high-yielding varieties with CMD and CBSD resistance	2,610	5,200	1,201	69%	2,420	82%	21,100	136,000	42,000	272,000	1,000	2,010
Potatoes with LB resistance	774	1,548	1,803	62%	3,738	80%	2,109	9,466	4,217	18,932	306	616
OFSP	673	1,346	531	34%	1,232	50%	2,999	14,675	5,998	29,349	451	908
Yam clean planting materials and agronomic practices	660	2, 190	589	40%	2,076	58%	2,420	17,860	8,050	59,520	190	630

Annex 2. RTB Flagship List (preliminary)

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
DELIVERY FLAGSHIPS				
BA	**Banana**			
BA 1	Preemptive, emergency, and ongoing response capacity to fungal diseases affecting smallholder banana and plantain systems	• Tools and guidelines for disease detection and surveillance, healthy soils, biological control, quarantine, and prevention • Clean planting material • Resistant cultivars • Associated crops • Advocacy and capacity strengthening • Gender-specific management practices • Rational-effective integration of chemical control in an integrated pest management (IPM) approach	Bioversity, IITA, NARS, government agencies, NGOs, private sector	Southeast Asia as point of departure; other banana-growing regions in Africa, LAC, and elsewhere in Asia
BA 2	Recovery, containment, and quarantine strategies for BBTD	• Strategies to ensure low-cost, BBTV-free planting material • Tools for piloting integrated community approaches to recover BBTD-affected areas • Spatial model for epidemiological understanding of virus-vector dynamics • Studies of germplasm and virus to understand vector effectiveness, symptom expression, virus resistance and diversity, and co-occurrence • Quarantine and containment strategies, including surveillance methods and diagnostic tools • Resistant cultivars (transgenic and other emerging techniques) • Biological control of aphids	Bioversity, IITA, NARS, government agencies, NGOs, private sector	Africa, South and Southeast Asia; as risk avoidance in LAC
BA 3	Gender-specific, integrated management of BXW disease	• Diagnostic tools for detection and guidelines for surveillance • Early warning system for detection and rapid mobilization of action • Recommendations for the production and distribution of clean planting materials • Cultural control packages for within-field eradication and to limit further disease spread • Genetically modified resistant and infection-escaping varieties • Capacity strengthening in quarantine and prevention	Bioversity, IITA, NARS, government agencies, NGOs, private sector	East & Central SSA, South and Southeast Asia, and LAC as per type of wilt

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
BA 4	Increased understanding of and access to Musa diversity to improve smallholder banana farm and food systems	• Gendered assessment of farmers' needs and consumer preferences for banana cultivar traits • Collecting Musa diversity and capturing indigenous traditional knowledge • Characterization and deeper understanding of Musa diversity • Phenotyping Musa genetic resource (GR)? for important traits • Documenting Musa GR • Access and benefit sharing for Musa GR	Bioversity, IITA, CIRAD, NARS, government agencies, NGOs, private sectors	Global
BA 5	Improved banana varieties	• Breeding strategy of global relevance, taking into account gender-differentiated consumer preferences • Phenotyped and genotyped varieties • Molecular markers for different traits (resistance to Sigatoka, weevils, nematodes, and Fusarium; parthenocarpy) • Hybrids released at national level and conserved at the Musa International Transit Center • Guidelines for seed handling and fruit palatability	IITA, Bioversity, NARO, FHIA, Taiwan Banana Research Institute, Queensland University of Technology	Global, with differentiation according to regionally preferred traits
CA	**Cassava**			
CA 1	Varieties with added value in new and high growth industrial markets for cassava	• Production practices for sustainable intensification and reduced cost • Seed systems • Processing systems • Linkage to markets	CIAT, IITA, Cirad, NRI; Vietnam: IAS, Nam Loc U.; Thailand: Kasetsart U., Dept of Agr., TTDI; China: CATAS; Brazil: Embrapa Colombia: Corpoica; Paraguay: Codipsa; Nigeria: FMARD, NRCRI, FUNAAB, WASCO, Nestle; Côte d'Ivoire: Nestle, CNRA; Ghana: CRI; Uganda: NaCRRI	Mekong Delta; China; S. Brazil; Colombia; Paraguay; Nigeria
CA 2	Varieties for improved profitability and sustainability in traditional food markets	• Production practices for sustainable intensification and reduced cost • Seed systems • Processing systems • Linkage to markets	CIAT, IITA; Indonesia: CRIF; Brazil: Embrapa; Caribbean: Clayuca; Nigeria: NRCRI, FUNAAB; Benin: INRAB; Ghana: CRI; Cameroon: IRAD; Tanzania: ARI; Uganda:	SSA; Indonesia; Colombia; NE Brazil; Caribbean Basin

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
			NaCRRI; DRC: INERA; Sierra Leone: SLARI; Liberia: CARI; Zambia: ZARI;	
CA 3	Farmer and consumer-accepted high vitamin A cassava	• Production practices for sustainable intensification and reduced cost • Seed systems • Processing systems • Linkage to markets	CIAT, IITA, Cirad; Haiti: CRS, MARNDR; Colombia: Corpoica; Nigeria: NRCRI; Ghana: CRI; Cameroon: IRAD; Tanzania: ARI; Uganda: NaCRRI; DRC: INERA; Sierra Leone: SLARI	SSA; Haiti; Colombia
CA 4	Preemptive, emergency, and ongoing response capacity to manage emergent biological constraints in Asia and the Americas (Cassava mealybug, whiteflies, frogskin, and witches broom)	• Farmer- and consumer-accepted varieties • Production practices for sustainable intensification and reduced cost • Seed systems • Processing systems • Linkage to markets	CIAT; Vietnam: IAS, Nam Loc U.; Thailand: Kasetsart U., Dept of Agr., TTDI; China: CATAS; Brazil: Embrapa Colombia: Corpoica; Caribbean: Clayuca	Mekong Delta; NE S. America; Caribbean Basin
CA 5	Farmer cassava yields boosted through effective management of CBSD, CMD, and whiteflies	• Efficient disease diagnostics and surveillance • Safe international movement of germplasm prevents movement of infected planting materials • Farmers access clean seed systems and community phytosanitation • Farmers utilize cassava varieties with resistance to CBSD, CMD, and whiteflies • IPM, including biological control of whiteflies • IPM supported by effective public policies and education • Improved management practices enhanced by strong cassava markets	IITA, GCP21, Cirad; Nigeria: NRCRI; Benin: INRAB; Ghana: CRI; Cameroon: IRAD; Tanzania: ARI; Uganda: NaCRRI; DRC: INERA; Sierra Leone: SLARI; Liberia: CARI; Zambia: ZARI;	Africa
CA 6	Improved technology and knowledge for small- to medium-scale	• Life-cycle assessment/waste management • Protocols for high product quality • Varieties with appropriate processing traits	CIAT, IITA, Cirad, NRI, GCP21; Andean: Univalle (Col.); Brazil: Embrapa; Caribbean:	SSA, Asia, LAC (Andean zone, Northeast

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
	cassava processing centers	• New products, including research on access to gender-responsive credit • Production and seed systems to meet processor demand • Training in best practices; knowledge dissemination	Clayuca; Nigeria: NRCRI, FUNAAB; Cameroon: IRAD; Tanzania: ARI; Uganda: NaCRRI; DRC: INERA; Sierra Leone: SLARI; Liberia: CARI; Zambia: ZARI;	Brazil), Caribbean
PO	**Potato**			
PO 1	Client-oriented approaches to rapidly access quality seed	• Robust, market-demanded candidate varieties. • Seed technologies and business models (3G). • On-farm seed quality and ICM technologies. • Locally adapted protocols for seed quality control. • Options for demand creation with seed and ware potato. • Scaling strategies and evidence base.	CIP NARIs	SSA
PO 2	Agile potato	• Accelerated breeding methods and tools. • Dynamic improved populations for variety selection and breeding. • Options for demand expansion. • Fast track systems for effective variety identification and release. • Strategies for ecological intensification of farming system with potato. • Strategies for going to scale.	CIP, Technituber Ltd. (India), BRAC & PROSHIKA (Bangladesh), Institute in Yunnan, Gansu, Qinghai (China), Cooperatives (Kyrgyzstan), FAO (Azerbaijan)	Southern and Central Asia
SW	**Sweetpotato**			
SW 1	Candidate OFSP varieties	• Seed system support platforms • Enhanced agronomic practices and extension methods • Nutrition evidence base and training for target groups and intermediaries • Communication and policy advocacy platforms • Models and tools for upgrading OFSP value chains • Rapid breeding methods and tools • Partnership models for going to scale • Sustainable intensification framework, including dual-purpose use of OSFP	CIP, SUN, CAADP, Save the Children, CARE, WorldVision, HKI, PATH, Unilever, CCCAP	Asia, SSA, the Caribbean
YA	**Yam**			

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
YA 1	Affordable, pest- and disease-free seed yam planting materials	• Improved farmer-preferred, market-demanded yam varieties • Sustainable production and protection practices • Business plans for profitable seed and ware yam production and marketing systems • Effective clean seed yam production technologies • Protocols for functional quality control (certification systems) • Novel high-ratio propagation techniques	IITA, Cirad, NARS, NGOs	West Africa
PM 1	**Production Models** and planting material alternatives suited to different market, production and livelihood systems, resulting from yield gap, market and gender analyses	• Decision and monitoring tools for growers to guide labor- and resource-efficient intensification process, with reduced fallow cycles and sustained productivity • Technology choices for particular constraints and gender-differentiated needs (clean planting material, cultivar choice, pest and disease management) • Guidelines for healthy soils based on crop associations, rotations, and amendments • Productive varieties, including clonal selection of superior lines	Bioversity, CIAT, CIP, IITA,NARS, NGOs	Africa, South and Southeast Asia as points of departure; other banana-growing regions in LAC and elsewhere in Africa and Asia
DI	**DISCOVERY FLAGSHIPS**			
DI 1	RTB transformational breeding platform utilizing genomics, metabolomics, and phenomics	• Integrated RTB breeding data management systems • Genetic diversity access, assessment, and incorporation into value-added germplasm pools • Capacity strengthening • Linkage to high-ratio multiplication clean seed systems • Accelerated and decentralized participatory breeding and selection methods • Gender-responsive baseline assessment of farmers' needs	Bioversity, CIAT, CIP, and IITA, The Royal Holloway University of London, Cornell University, Yale University	SSA (West and East), Asia, LAC
DI 2	Genetically improved RTB varieties with game-changing traits	• Proof of concept of transgenic RTB varieties • Stewardship and advocacy for science-based management • New GM technologies • Prototypes with game-changing traits • Ex-ante/ex-post socioeconomic studies	Bioversity, CIAT, CI, and IITA, IRD	Need to map out target geographies by trait

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
		• Capacity building towards development		
DI 3	Global network of RTB in-situ conservation monitoring sites	• Monitoring system: methods, tools, and databases • Best practices: tested in-situ conservation strategies, methods, and tools • Backup repository for threatened diversity • Ecosystem services model for RTB staples • Functional policies and incentive systems • Memory banks for collective knowledge systems	Bioversity, CIAT, CIP, IITA, CIRAD, IRD, University of Birmingham, NARS and NGOs in national and international settings, Conservation practitioners, National and international genebanks and breeders, Policy makers	Asia/Oceania, LAC, SSA
LS	**LEARNING & SUPPORT FLAGSHIPS**			
LS 1	Global RTB development store	• Community of practice of RTB staff and partners on development brokering • Packaged, gender-differentiated RTB products • Customer support and delivery systems • Capacity development of next users for product uptake • Capacity strengthening for RTB staff/research partners on impact culture • Policy analyses and advocacy	Bioversity, CIAT, CIP, IITA, NARS, government agencies, NGOs, private sector	Global
LS 2	Predictive models, diagnostic tools and IPM solutions for climate change-induced pest and disease risks and outbreaks	• Pest risk analysis,, surveillance strategies and diagnostic tools for target pests and pathogens developed • Analysis of risks through pathogen evolution • Pest and disease models and risk maps extended and improved • Impacts of climate change on regional pest and disease distribution, crop losses, and livelihoods analyzed • Generic pest and disease modeling platform for the analysis of climate change impacts on resulting crop yields	Bioversity, CIP, CIAT, IITA, NARS, icipe, KSU, UoL, CIMMYT, IRRI, ICRISAT, FAO	Global with regional assessments in Africa (Kivu region), Asia, and LAC
LS 3	Demand-oriented solutions for value adding through improved postharvest and risk management	• Use of waste and animal feed • Value chain risk and loss management toolbox • Market analyses for identification of opportunities for value adding through postharvest treatment, processing, and product differentiation	Bioversity, CIAT, CIP, IITA, NRI, Cirad, CRS	Global

Code	Flagship Product (Centerpiece)	Linked Products	Centers/Partners (selection)	Geographic Area(s)
LS 4	Framework for analyzing and intervening in RTB seed systems	• Community of practice on RTB seed system • Diagnosis of key bottlenecks constraining RTB seed systems • Capacity-building modules for framework use • Principles and practices for gender mainstreaming in seed interventions • Guidelines on best practices for RTB seed systems interventions	CIP, Bioversity, IITA, CIAT, WUR, SLU, KSU; several NARS	Global

Annex 3. Collaboration Matrices with CRPs

3.1 Humidtropics

Topic	RTB Role	Humidtropics Role	Value Addition
GIS mapping and targeting	Support to capture information on the extrapolation domains of RTB technology or germplasm	Lead construction of databases and compilation of results	Targeting framed within a broader agro-ecological and livelihoods setting
Researcher-led trials on advanced germplasm	Lead in planning, implementation, and evaluation	Participate in field days	Improved integration of next and end users in breeding pipeline
Participatory varietal selection trials	Facilitate access to farmers of varieties or near-ready varieties and enable data collection and feedback to research	Provide supportive environment for farmer participatory research and farmer empowerment to build local innovation capacity	Accelerated adoption as barriers overcome to local adoption
R4D and innovation platforms	Provide technologies and research services	Facilitate and promote broadened impact pathway and joint learning around it	Creates a shared environment for feedback to research, adaptation of technology, and user engagement for uptake
Improved RTB seed systems	Understand requirements/conditions for farmer versus commercial seed production	Understand farmer requirements/conditions for seed acquisition (producing, buying), market, and policy environment	
Agro-ecological intensification of mixed RTB cropping and livestock systems	Support to understand multiple role of RTB technologies, germplasm	Lead in integrating diverse production system components and understanding livelihood trade-offs (household typology)	Integration of RTB cropping in broader system
Gender in value chains	Determining gender-differentiated labor division, decision-making, and benefit-sharing in RTB value chains	Determining gender-differentiated labor division, decision-making, and access to assets in rural livelihood systems	Better understanding of trade-offs between value chain and other livelihood activities according to gender

3.2 Policies, Institutions and Markets (PIM)

Topic	RTB Role	PIM Role	Value Addition
Foresight	Contribute with crop models	• Leadership by PIM; cost sharing • Use the IMPACT model to generate mid- and long-term projections of supply and demand of RTB crops	Improved alignment of RTB investment with market opportunities
Ex-ante assessment	Run ex-ante impact assessment models for promising RTB technologies based on rates of return	Use the IMPACT model to enhance ex-ante impact assessment of RTB technologies in a holistic model, including multiple commodities	More robust ex-ante assessment, with information on indicators of economic welfare and food security in a more continuous manner, instead of every 5–10 years
Value chain tools methods (e.g., PMCA and 5capitals) and assessments	• Apply tools • Share lessons with others through PIM value chains platform • Contribute to tool and method development in specific value chain contexts to enhance integration of targeted user groups. • Seek backward linkages to technology development and improve gender equity	• Coordinates development of tools • Provide tools and methods for value chain development and guide their development • Include gender in PMCA and other value chain methods • Understanding the role of small farms in global markets: the role of small and family farms in supporting the local economy and food security	Improved tools and methods and accelerated learning
Gender analysis	Sex disaggregation of data in baseline and other surveys	Developing guidelines for collecting sex-disaggregated data	Improved uniformity and quality of sex-disaggregated data across CRPs
Geospatial mapping	Geospatial mapping with RTB maps	Collaboration through the CG-wide geospatial working group for common ontology and interoperability of databases	

3.3 AGRICULTURE FOR NUTRITION AND HEALTH (A4NH) & POLICIES INSTITUTIONs AND MARKETS (PIM)

Topic	RTB Role	A4NH Role	PIM Role	Value Addition
Breeding/germplasm development	• Leads overall breeding program • Supports and uses high-throughput diagnostics for vitamin levels and other quality traits	Leads high-throughput diagnostics (NIRS platform) for vitamin levels and other quality traits (minerals, sugars, dry matter, etc.)	None	Ensure that nutritional traits embedded in varieties with good agronomic and consumer-preferred traits
Nutritional efficacy and bioavailability studies	User of information in breeding programs	Primary responsibility	None	Ensure nutritional efficacy in released varieties
Delivery and Evidence/ Advocacy	Leads on key agriculture value chain delivery and contributes to cost effectiveness studies	Leads on the nutrition evidence and public delivery related to improving nutrition and health in target populations	None	Advocacy for nutrition friendly value chains
Value chain coordination, food processing, food industry, and assessing nutrition and health outcomes	Leads key value chain actors related to agri-business, with a particular focus on gender relations as RTB commercialization increases. Joint work on processing and foods	• Focus on looking at incentives and arrangements as they relate to consumption and improving nutritional quality (including gender), standards for biofortified products, and food safety • Joint work on processing and foods.	• Research on value chain approaches and application of new communication technologies (e.g., price info, financial transfers via cell phones) • Policies affecting value chains, economics of value chain transformation (e.g., scaling up to supermarkets, etc.)	
Assessing RTB value chains for nutrition and health	Shares in implementation of assessment methods, contributing a crop-specific perspective	Contribute with tools and methods for assessments of nutritional quality, food safety, and health benefits	Contribute with tools and methods for value chain assessment	
Projections & trends in technology impacts, production, consumption, utilization of RTB crops	Provides information on RTB crops and parameters of most promising technologies; brings RTB perspectives and demands in different regions	--	Contribute with tools, methods, and analysis to assess impact and major drivers of trends; provides baselines and scenarios	Trends and projections rooted in deep understanding of RTB production systems at regional levels

Topic	RTB Role	A4NH Role	PIM Role	Value Addition
Integrated value chain development and impact assessment	• Engendering existing tools for value chain interventions (PMCA) and impact assessment (5Capitals). • Develop the concept of coaching in gender and value chains.	Application of gendered tools in nutrition-sensitive value chains	Scaling of tool application and creation of a community of practice for joint learning on the development of inclusive value chains between researchers and development practitioners	

3.4 LIVESTOCK AND FISH

Topic	RTB Role	Livestock and Fish Role	Value Addition
Feed	Selection of varieties suited to feed and validation of options for utilizing waste in RTB crop production and processing for feed	Developing optimal feed technologies and animal production systems adapted to specific RTB crops and waste products	Expanded utilization of RTB crops for feed

Annex 4. Timeline of phased work plan

	Year 2015				Year 2016			
WORK AREA	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**
RBM Framework								
Complete flagship set (level n-2) defined / level n-1 defined	Q1							
Selection of 2-3 additional flagships per year for stakeholder validation; based on preliminary business cases	Q1				Q1			
Stakeholder mapping followed by stakeholder workshops and validation of flagship ToC/Impact pathways		Q2	Q3			Q2	Q3	
Inventory of scalable technologies and baseline data collection	Q1	Q2			Q1	Q2		
Definition of set of metrics for discovery flagship “next generation breeding” and Baseline for Next Gen, using breeding assessment tool	Q1							
Introduction of stage gate process for managing breeding and trait pipelines using breeding assessment tool		Q2						
Design of specific ToC and progress indicators for learning & support flagships			Q3					
Preparation of business cases for flagships				Q4				Q4
Prioritization of research products and reorganization of product product by flagship groups (level n-1)						Q2	Q3	Q4
M&E								
M&E concept (methodological) – IDOs, indicators, metrics	Q1	Q2						
M&E data platform/user interface (software) programming			Q3	Q4				
M&E data per flagship inputted				Q4	Q1	Q2		
M&E platform & dashboard for RTB scientists/stakeholders							Q3	Q4
KM/Communication/Capacity strengthening								
Needs assessment for KM, Capacity strengthening and gender research in delivery flagships	Q1				Q1			
Develop mechanisms to ensure cross-fertilization between flagship roles and results of KM interventions with RTB and other CRPs	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Development of a methodology (set metadata standards and common platforms) to introduce Open Access and Data management policy for RTB			Q3	Q4				
Open Access/user friendly interfaces							Q3	Q4
Gender Mainstreaming								
Preparation of gender action plan	Q1	Q2						
Integration of gender in research cycle	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Capacity strengthening for gender research (workshops, coaching, mentoring)	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

	Year 2015				Year 2016			
WORK AREA	**Q 1**	**Q 2**	**Q 3**	**Q 4**	**Q 1**	**Q 2**	**Q 3**	**Q 4**
Promote gender audits by Centers, assess organizational policies, assess technical capacity of staff		Q2	Q3					
Framework to institutionalize procedures for mutual responsibilities for mainstreaming gender			Q3					
Contribute to CGIAR "norms and agency" study via country studies	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Program preparation, reporting and, evaluation								
Business cases for flagships reviewed in coordination with SC and PAC				Q4				Q4
Start of unified government structure	Q1							
Design of matrix management							Q3	Q4
Evaluation of the Independent Evaluation Arrangement (CGIAR)	Q1	Q2	Q3	Q4	Q1			
Final Report of first phase of RTB								Q4
Pre-proposal for RTB second phase	Q1							
Full proposal for RTB second phase					Q1			
New contracting complete for RTB second phase								Q4

Annex 5. Glossary

Business case	Describes the flagship together with the needed research and outcome support activities and the partners who will be involved. A central element is the theory of change with a description of the IDOs or other changes which will be achieved. This should be supported by evidence that the flagship can achieve the results proposed and of the cost effectiveness of the investment required.
Flagship	The combination of flagship products, linked products, impact pathway, and strategic objectives is referred to for simplicity as a "flagship." It requires a work package comprising both the research needed to develop and improve the products and the outcome support including capacity strengthening that is also required to achieve the strategic objective. Gender aspects are taken into consideration in an integrative manner to improve user orientation and adoptability of technologies and to improve gender equity.
Flagship product	• Is a significant measurable and time-bound deliverable, based on an output of research that results from a research activity or set of related activities attributable to RTB. • Is used by a well-defined group of next users who may be either researchers or development actors, with strong evidence of demand pull from these users. • Responds to a clear need/demand of end users to improve livelihoods • Has potential for large-scale impact directly or indirectly.
Funding windows	Window 1 and 2 are funds provided by donors to the RTB to use across the agreed product portfolio. Window 3 and bilateral funds are allocated to CGIAR Centers directly and are consistent with and mapped into the RTB product portfolio. Window 3 includes a 2% contribution to the Consortium.
Impact pathway	A map of the pathway of change that outlines the expected sequence to achieve IDOs. RTB pays particular attention to the actors involved along this pathway, beginning with the behaviour changes amongst next users of research products and the ways they interact with final users of these products to promote their uptake, use and influence.
Intermediate development outcome (IDO)	Represent changes that occur in the medium term that are intended to affect positively the welfare of the targeted population or environment, and which result, in part, from research carried out by the CGIAR and its partners. The intermediate development objectives are attributable to CRP-level activities and are necessary precursors and logically linked to the SLOs (Independent Science and Partnership Council 2012b: 3).

Level n-1, n-2	CGIAR defined a common structure with aggregated levels for all CRPs: • level n: the whole CRP • level n-1: the components that add up to the whole CRP, most recently called: Flagship project • level n-2: the components of each Flagship Project, called 'cluster of activities. Each Flagship project has specific objectives and may produce several outputs and research outcomes in order to achieve in due course two or three IDOs (rarely more). Each Flagship is structured in Clusters of activities. A Cluster of activities has its own objectives and produces outputs and research outcomes. A Cluster can be further decomposed into sub-components.
Outcome support	Creates the capacities, development partnerships, and innovation environment for product delivery to take outcomes to scale. It is an activity with development partners and other stakeholders which complements the traditional role of CGIAR in generating research products by making it more likely that these products are adopted or used by beneficiaries.
Results based management	A management strategy focusing on performance and achievement of outputs, outcomes and impacts. It can be used with partners to plan, cost, implement, monitor and measure the changes from cooperation, rather than just the inputs provided or activities conducted.
System Level Outcomes (SLO)	The high level impact goals of the CGIAR: Reduction in rural poverty; Increase in food security; Improving nutrition and health; and more sustainable management of natural resources[12]
Theory of Change (ToC)	Presents an explicit identification of the ways by which change is expected to occur from output to outcome and impact along an impact pathway. The ToC questions the assumptions about causality underlying the relationships between outputs, outcomes and impact. In ToC the assumptions present the mechanisms of change.

[12] DRAFT "Glossary of Evaluation Terms (Adapted for CGIAR from OECD-DAC glossary), CGIAR Independent Evaluation Arrangement (IEA), October 2013.

www.rtb.cgiar.org

A broad alliance of research-for-development stakeholders & partners