



# ROOTS TUBERS & BANANAS

## RTB PERFORMANCE MONITORING REPORT FOR 2015

APRIL 2016



RESEARCH  
PROGRAM ON  
Roots, Tubers  
and Bananas



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

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## ACRONYMS

3G	Three-generation potato seed multiplication
ARI	Advanced research institute
BBTD/V	Banana bunchy top disease/virus
Bioversity	Bioversity International
BMGF	Bill and Melinda Gates Foundation
BXW	Banana Xanthomonas wilt
CBSD	Cassava brown streak disease
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
Cluster	Cluster of Activities
CMD	Cassava mosaic disease
CRP	CGIAR Research Program
DNA	Deoxyribonucleic acid
DRC	Democratic Republic of the Congo
ENDURE	Expanding utilization of roots, tubers and bananas and reducing their post-harvest losses
FP	Flagship project
GBS	Genotyping-by-sequencing
GM	Genetically modified
HQCP	High-quality cassava peel
Humidtropics	CGIAR Research Program on Integrated Systems for the Humid Tropics
IAU	Independent Audit Unit
ICVs	Improved cassava varieties
IDO	Intermediate Development Outcome
IEA	Independent Evaluation Arrangement
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
LB	Late blight
Livestock & Fish	CGIAR Research Program on Livestock and Fish
M&E	Monitoring and evaluation
NaCRRRI	National Crops Resources Research Institute, Uganda
NARO	National Agricultural Research Organization, Uganda
NARS	National agricultural research system
NGO	Nongovernmental organization

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NIRS	Near-infrared spectroscopy
NRI	Natural Resource Institute, UK
OFSP	Orange-fleshed sweetpotato
PVS	Participatory varietal selection
RBM	Results-based management
RHUL	Royal Holloway University of London
RTB	CGIAR Research Program on Roots, Tubers and Bananas
SASHA	Sweetpotato Action for Security and Health in Africa
SNP	Single nucleotide polymorphism
SPHI	Sweetpotato for Profit and Health Initiative
t	Tonne
W1/2/3	Window 1/2/3 – CGIAR Funding system

## **PART I: TECHNICAL REPORT**

## A. KEY MESSAGES

### A.1 Synthesis of progress and challenges

The CGIAR Research Program on Roots, Tubers and Bananas (RTB) moved ahead strongly in research and outcome delivery, as reflected in the 2015 Independent Evaluation Arrangement (IEA) review, which noted that “in spite of the complexities and challenges of successfully implementing a multi-crop and multi-partner CRP, RTB has made notable progress in the past four years and is already delivering results, in spite of budget cuts. RTB is well-directed and reaching a reasonable number of its near-term milestones and is working towards achieving its goals, particularly those concerning productivity and nutritional improvement” (<http://bit.ly/24xsQcq>). In the same positive spirit, the Independent Audit Unit (IAU) evaluation, also carried out in 2015, commented: “RTB has done an impressive job in structuring the CRP to best minimize costs and obtain consensus” (unpublished audit report).

RTB centers broadened their collaborations to over 220 partners from 72 national agricultural research systems (NARS), 68 universities and advanced research institutes (ARIs), 21 nongovernmental organizations (NGOs), and 24 private sector companies.

RTB research covers six crops—bananas (and plantains), cassava, potato, sweetpotato, yams, and other roots and tubers—still organized around seven disciplinary Themes<sup>1</sup> in 2015 (<http://bit.ly/1hzeWAN>). RTB finalized the move to a new program structure, based on flagship projects (FPs) and clusters of activity (cluster), starting from January 2016 (<http://bit.ly/1qGmOqk>). FPs and cluster business cases were laid out by RTB scientist teams, including partners, and were subjected to an intensive external review process in May/June 2015. Detailed feedback from this review, the IEA evaluation, and donors, as well as broad discussions among the RTB teams, informed the cluster design and their integration into FPs and the new program structure. This set the scene for the submission of the Preproposal for RTB Phase II, which was highly rated by the Independent Science and Partnership Council.

In 2015 RTB had eight ongoing, internally funded competitive grants (“complementary funded projects”), guided by RTB Theme leaders, on discovery research and cross-center and cross-crop technological innovations, as well as four ex-post impact assessment studies.

The results-based management (RBM) pilot, which began in 2014, continued with Banana *Xanthomonas* wilt (BXW), potato seed, and next-generation breeding. The pilot was extended to small-scale cassava processing in 2015 with two workshops in Nigeria, to co-develop an impact pathway and shared monitoring and evaluation (M&E). To support RBM, RTB developed with the CRP on Dryland Systems a planning, monitoring, evaluation, and learning information technology platform.

RTB was awarded and initiated a Bill and Melinda Gates Foundation (BMGF) funded project on sustainable cassava seed systems in Nigeria (<http://bit.ly/23yhIdE>). In coordination with Bioversity and IITA, RTB was pre-awarded two gender post-doctoral fellows by the CGIAR Consortium, who will focus on integrating gendered knowledge and preferences into banana breeding in East Africa and genomics-assisted cassava breeding for gender-responsive outcomes in Nigeria.

The RTB-ENDURE project in Uganda (“Expanding utilization of roots, tubers and bananas and reducing their post-harvest losses”), funded by the European Union and the International Fund for Agricultural Development (IFAD), has engaged all RTB centers (<http://bit.ly/1VQKsM6>) in the development of promising

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<sup>1</sup> **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 post-harvest technologies, value chains, and market opportunities; and **Theme 7:** Enhancing impact through partnerships.

post-harvest innovations in cooking banana (reducing post-harvest loss), cassava (extending shelf life), potato (storage technology), and sweetpotato (silage for pig feed) (<http://bit.ly/1XWnhIM>).

## A.2 Synthesis of two most significant achievements

### 1. Opportunities from high-quality cassava peel

An ongoing collaboration between RTB centers IITA and CIAT, together with the CRPs Humidtropics and Livestock & Fish, led to a technology for turning waste cassava peels (20% of root weight) into a high-quality cassava peel (HQCP) mash for livestock feed (<http://bit.ly/1WpGIBW>; <http://bit.ly/1JCb2OX>). The mash has been tested by feed millers for its suitability to substitute for 15% or more of maize in feed rations. Livestock feeding trials with poultry (500 egg layers and 22,000 broilers) and sheep have been financed by the millers with very encouraging results. The mash is expected to sell for at least half the price of maize (US\$180/t). With around 15m t of cassava peel produced in Nigeria annually, HQCP mash could provide a significant portion of livestock production needs, create rural employment for women and men, and remove an environmental hazard (<http://bit.ly/240PAnf>).

### 2. New true potato seed, self-compatible diploid land races

The identification of four naturally self-compatible diploid accessions opens the door to breeding for heterosis not previously possible in potato. Diploid potato is usually self-incompatible, prohibiting selfing that is needed to generate homozygous lines necessary for improving parental materials. A search for self-compatibility in diploid landraces began in 2008 with 48 accessions. Average seed set (number of seeds/number of flowers pollinated) in evaluations over two to five years ranged from 0 to 255 ±38. Four diploid accessions consistently demonstrated average seed set values above 30 over three years. Plants grown with highest seed set will be used for diploid breeding to (1) efficiently mobilize outstanding alleles, (2) select favorable stable gene combinations, and (3) facilitate the fast removal of deleterious alleles.

## A.3 Financial summary

The total budget for RTB approved, including carry over budget from 2014, after a reduction in March and a retroactive reduction in October 2015 of 17% (\$3.9m) by CGIAR, was \$78.2m. This comprised \$21.9m (28%) W1/2 funding and \$56.3m (72%) bilateral and W3 funding. Total expenditure was \$72.2m (92% of budget); \$20.4m (28%) is from W1/2 and \$51.8m (72%) from W3, bilateral, and centers' other funds. W1/2 expenses reached 93% execution of the revised budget, and W3, bilateral, and centers' other funds expenditure reached 92% of the budget. Of total expenditures, 6.1% was on gender research and 15% was reported as collaboration with non-CGIAR partners.

## B. IMPACT PATHWAY AND IDOS

Aggregated targets at the program level as per 2014 were revised for 2015 (see Table 1).

**Table 1: Intermediate Development Outcomes (IDOs) and aggregated targets for RTB**

IDOs	Targets (2022)
Increased incomes and employment	20,000,000 people (50% women) increased their income 30,000 small and medium enterprises operating profitably in the RTB seed and processing sectors
Increased productivity	8,000,000 farm households increased RTB crop yield through the adoption of improved varieties and sustainable management practices
Improved diets for poor and vulnerable people	10,000,000 people (50% women) have improved their diet quality
Enhanced benefits from ecosystem goods and services	

IDO's	Targets (2022)
More sustainably managed agro-ecosystem	1,900,000 ha of current RTB crops production area converted to sustainable cropping systems
Mitigation and adaptation achieved	Capacity to deal with climate risks and extremes increased for at least 2,000,000 HH
Equity and inclusion achieved	At least 35% increase in # of female and young beneficiaries of at least 700,000 HH perceived to have better control over assets and resources
Enabling environment improved	Individual capacities improved for at least 9,500 individuals (50% women) in research for development partner organizations Capacity for innovation increased in at least 60 development-focused organizations, including women's networks and alliances At least 5 partnership and scaling models tested in a minimum of 5 target countries and adjusted to be fit for purpose
National partners and beneficiaries enabled	Regulatory frameworks, policies, and national programs in relevant areas under implementation in at least 20 country per policy change

## C. PROGRESS ALONG THE IMPACT PATHWAY

### C.1 Progress toward outputs

Principal achievements are listed by RTB disciplinary Theme below. Further detail is available in the crop reports (<http://bit.ly/1Q4DSux>) and complementary funded project reports (<http://bit.ly/1YrFCUU>).

#### Genetic resource conservation, use, and improvement (Themes 1 and 2)

**Understanding the yam genome:** IITA genotyped 384 accessions of the yam species *Dioscorea alata* (364 landraces and 20 breeding lines), representing different regions of Africa, Asia, and the Pacific by using 24 simple sequence repeats. Results revealed wide genetic diversity in *D. alata*, with a diversity structure linked to geographic origins, ploidy level, and morpho-agronomic characteristics. Eighteen different groups of genetically close varieties were identified. RTB centers will use these data to enhance the use of *D. alata* genetic resources in breeding programs and to conserve this species' genetic resources.

**Sweetpotato genome discovery:** While assembling sequences of small interfering ribonucleic acid of sweetpotato for metagenomic analysis, CIP researchers made a remarkable discovery: all 291 accessions analyzed contained one or more transfer DNA (IbT-DNA1 and IbT-DNA2) sequences of the plant pathogenic bacteria *Agrobacterium rhizogenes* and *Agrobacterium tumefaciens*. One of the two transfer DNAs is present in all cultivated sweetpotato clones, but not in wild relatives. Studying these genes in sweetpotato and wild relatives may shed light on domestication and guide crop improvement.

**Accelerating banana breeding:** A set of diploid populations, segregating for important traits such as pest/disease resistance and bunch and fruit characteristics, was developed by IITA in conjunction with the National Agricultural Research Organization (NARO) in Uganda. All hybrids were phenotyped for weevil resistance and were genotyped, the single nucleotide polymorphism (SNP) marker allele calling completed, and a linkage map constructed. A similar approach is underway for resistance to nematodes, Fusarium wilt, and dwarfism. Genomic selection in conjunction with Palacky University, Czech Republic, resulted in the establishment of a training population of 320 phenotyped and genotyped hybrids and the development of two highly accurate predictive models. This work will allow rapid hybrid selection when plants are just a couple of months old.

On the basis of a combination of recent biotechnologies, RTB scientists of Cirad, Bioversity, and partners improved the published genome assembly to address challenges in banana breeding. Additional sequencing data were produced, a denser genetic map was created with DArTseq markers, and the first



optical map for banana was constructed. A new bioinformatics tool was developed to integrate these multiple sources of NextGen Sequencing data and improve the reference sequence. The generic tools were made publicly accessible on a new version of the Banana Genome Hub (<http://bit.ly/1pZwQ5v>).

**More precise cassava breeding:** The first genome-wide association study map for cassava in Latin America and the Caribbean was developed by CIAT, which used 18,000 SNPs to complement earlier work done by IITA and partners in Africa. These SNPs will have wide application in accelerating breeding, and the first emphasis will be on linking the quality traits identified by high-throughput near infrared spectroscopy (NIRS) phenotyping to markers that breeders can deploy. For example, researchers identified genes that may regulate hydrocyanic acid accumulation in roots (a major constraint for fresh root market).

CIAT developed methodologies for high-throughput phenotyping of cassava for quality and post-harvest traits, based on NIRS of 103 cassava genotypes. With a single spectrograph taking only seconds (plus sample preparation), it is possible to evaluate a wide range of traits such as root dry matter, levels of hydrocyanic acid, and postharvest physiological deterioration (a major post-harvest challenge that renders roots unusable after 3–7 days). Twelve genotypes were identified with low levels of post-harvest physiological deterioration. CIAT is now working on using NIRS to predict more complex traits such as cooking time, fermentation time, and “poundability,” a key consumer trait in much of West Africa.

**Testing genetically modified (GM) potatoes for late blight (LB) resistance:** In Uganda, loss due to LB can be up to 60%, forcing farmers to spray fungicides often as much as 15 times to protect their crops. The Kachwekano Zonal Agricultural Research and Development Institute of NARO, near Kabale, has tested 12 highly resistant GM potato events in confined field trials. CIP provided the trial varieties from ‘Desiree’ and one from the local variety ‘Victoria’. The results have been spectacular. All GM plants have shown extreme levels of resistance compared with the non-GM plants of the same varieties. This marks an important milestone in the development and future deployment of biotech potato varieties to farmers in Africa that will reduce losses and lower the cost of production significantly.

#### **Pest and disease management and farmer access to clean seeds (Themes 3 and 4)**

**Pest risk under climate change:** In a cross-crop consultative intervention of all RTB centers, key regional target pests and diseases were identified for pest risk analysis (PRA). Accordingly, a PRA workshop was held in October 2015 in Rwanda with the RTB centers, NARS and national plant protection organization representatives from Burundi, Democratic Republic of Congo (DRC), Uganda, and Rwanda. Five draft PRA documents were developed for key banana diseases (Banana bunchy top disease [BBTD], BXW, and Foc Tr4.), cassava brown streak disease (CBSD), and potato pests (*Tuta absoluta* and *Tecia solanivora*). As part of a PRA, several surveys and activities were carried out to develop surveillance strategies. Distribution of cassava whiteflies and green mites was documented, and in the case of the latter, the potential distribution was mapped. PRAs will guide the development of climate-responsive pest management strategies in RTB Phase II.

**Cassava diseases in Asia:** The journal *Plant Disease* published an article reporting the first presence of Cassava mosaic disease (CMD), which devastated cassava in Africa, on plantations in Cambodia (<http://bit.ly/1Qz1UOH>). During the past three years, CIAT has worked with IFAD and a broad range of national partners to establish a network of experts to monitor and manage rising pest threats in Asia, principally cassava mealybug and cassava witches broom disease. The network has made progress in helping farmers combat those pests, working with local partners to develop pamphlets, news releases, and videos as well as training trainers. RTB is already applying these tools to eradicate or contain CMD.

**Affordable potato pest control product:** A new, CIP-developed attract-and-kill technology offers a cost-effective way to control two potato tuber moth species in the field and at storage sites. The co-formulation includes the pests’ sexual pheromone, which attracts males, and a contact insecticide that kills them. The

product is the result of lab research and partnering with the private sector for access to active ingredients. A registration dossier for the product was submitted to SENASA, the Peruvian authority for agricultural product registration, in December 2015. Production and commercialization of the products AdiosMacho-Po® and AdiosMacho-St® in Peru by a private sector partner should begin in 2016 or 2017.

**Preserving sweetpotato planting material:** Conserving quality sweetpotato planting material for the next planting season is a major challenge in regions with extended dry seasons. In Uganda, CIP and the Natural Resource Institute (NRI), UK, developed and promoted a “Triple S” system (storage, sand, sprouting) in which small sweetpotato roots were stored in sand and watered for sprouting before seasonal rains begin (<http://bit.ly/1XtTC0d>). The Triple S method was tested in Ethiopia and compared well with other vine conservation methods: an average of 82% of roots successfully sprouted after four months of storage.

### **Cropping systems and post-harvest technologies (Themes 5 and 6)**

**Improving cassava drying efficiency:** As part of an effort to help cassava starch and flour producers reduce waste and increase profits, CIAT, CIRAD, and IITA researchers conducted a benchmarking study of common drying technologies in Thailand and Vietnam. They determined that while large-scale flash drying has 80–90% average energy efficiency, small-scale operations (less than 50 t/day) have 40–60% average energy efficiency. Using computer-based simulations, RTB researchers proposed optimal flash dryer dimensions and operating conditions for different production capacities and guidelines for dryer design. The research team shared these findings with key stakeholders from 10 countries at a workshop in Thailand in 2015 (<http://bit.ly/1ZhkIHx>; <http://bit.ly/1S1o2Dd>).

**Adding value to banana:** Under the RTB-ENDURE project, a multipartner (public-private), gender-responsive effort is underway to reduce post-harvest losses and promote product differentiation in cooking banana value chains in central and western Uganda. The project is promoting the planting of robust cultivars with longer shelf lives and the marketing of cooking bananas in different units (bunches, peeled fingers, unpeeled fingers, and clusters) (<http://bit.ly/1SZOZcZ>). The new presentations, which are sorted, graded, identified, and labeled by cultivar, proved to be less susceptible to damage and easy to package. These outputs are supported by improved plantation management, sucker staggering to even-out production, and improved harvesting practices. (<http://bit.ly/1S3BkiB>).

### **Impact through partnership (Theme 7)**

Research under Theme 7 is reported under sections C.3 (impact), D (gender), and F (capacity building).

## **C.2 Progress toward the achievement of research outcomes and IDOs**

Progress was made toward the achievement of RTB IDOs (see Table 1) as detailed for selected IDOs below.

### **IDO: Productivity—variety releases**

**Disease-resistant cassava:** The national cassava program in Uganda released an IITA-developed, virus-resistant cassava breeding line (MM2006/130) in response to the dual pandemic of CMD and CBSD. Named ‘NARO-CASS 2’, the variety is likely to be suitable for large parts of the cassava-growing mid-altitude zones of East and Central Africa, representing about 8 million households, where CMD and CBSD are devastating cassava fields. The variety has a “sweet” taste and is good for home consumption and processing for flour, starch, and ethanol. It is currently being multiplied through a certified seed system implemented by the National Crops Resources Research Institute (NaCRRI), NGOs, and the private sector.

**Resilient and adaptable potato:** The CIP variety 392797.22 is grown in all of China’s potato-producing regions just four years after its national release. Originally developed and released in Peru in 1998 as ‘Unica’, the variety combines good quality, disease resistance, drought tolerance, and stable high yield.

CIP sent 'Unica' to the Qinghai Academy of Agriculture and Forestry Sciences, China, in 2001, and it was released in Qinghai Province as 'Quinshu 9' in 2006 and nationally in 2011. By 2015, 'Qingshu 9' was planted in China's 13 main potato-producing provinces with an initial estimate of total potato planting area of over 120,000 ha grown by around 360,000 farm households. The variety's yield is normally over 30 t/ha, compared with 20 t/ha as the average; total production for 2015 was over 3.6m t. The price varied from \$150/t to \$300/t, so the total additional value of 'Qingshu 9' in 2015, given the additional 10 t/ha, was \$180m–\$630m. This value will no doubt increase, as several private companies were producing 'Qingshu 9' seed potato for small-scale farmers in 2015.

**IDO: More sustainably managed agro-ecosystems—Progress toward controlling BBTB:** Under the alliance for control and recovery from BBTB in sub-Saharan Africa (<http://bit.ly/1SLdh7T>), partnerships among Cirad, IITA, and Bioversity with local organizations continued in 15 pilot sites in eight African countries to implement strategies for recovering banana production. This included creating supply chains for virus-free planting material, targeted to reestablishing fields after a banana-free period. Pilot site experiences were compared and contrasted among countries to develop alternative recovery strategies for different banana and plantain production systems. Lessons learned from advanced sites in DRC, Burundi, and Malawi were shared with teams in other countries. In-country capacity was strengthened through training that included surveillance surveys and eradication of infected plants. In parallel, researchers compared three methods for detecting BBTB in plants, determining that loop-mediated isothermal amplification assays are the best option. Field trials in Nigeria were conducted to assess the response of 39 *Musa* genotypes to the banana aphid and BBTB. Results indicated partial resistance in various varieties: CARBAP hybrid D535 (AAB), Fougamou (ABB), Gros Michel (AAA), Ney Poovan (AB), and PITA 21 (AAB).

**IDO: Improved diets for poor and vulnerable people—Achieving impacts on woman and child health by combining orange-fleshed sweetpotato (OFSP) promotion with health services ("Mama SASHA"):** In western Kenya, the BMGF-funded "Mama SASHA" intervention was implemented through the Sweetpotato Action for Security and Health in Africa (SASHA) project by CIP and PATH's Kenya Country Program, in collaboration with multiple partner organizations. From 2010 to 2014, SASHA worked with pregnant and lactating women to improve their nutrition and health status and that of their children through the dissemination of planting materials of vitamin A-rich OFSP, together with better access to health services and nutrition counseling. This led to the following outcomes (<http://bit.ly/1Nx8gen>):

- Frequency of intake of vitamin A-rich foods, including OFSP, was higher ( $p < 0.001$ ) among 218 women who fully participated (with redemption of vouchers for vines and additional nutritional counselling) than those who partially participated (323) or resided in control areas (740).
- Dietary diversity scores were higher (5.35 out of 12;  $p < 0.001$ ) among women (and their households) who fully participated than those who partially participated (score = 4.59) or resided in control areas (score = 4.37).
- Drawing on repeated cross-sectional data at baseline and endline, using a difference-in-difference approach, a 7% reduction in stunting and an 8% reduction in prevalence of vitamin A deficiency was observed among children under 2 years whose mothers had fully participated. At baseline, stunting prevalence was 25% among children 6–23 months of age; at endline prevalence was 19% among children whose mothers fully participated and 27% among children in control areas.
- Women in intervention communities had (1) significantly slower declines in nutrition status (mid-upper arm circumference) since being recruited by the second trimester of their pregnancy and by 9 months postpartum, and (2) significantly reduced risk of being vitamin A deficient.

These outcomes of Mama SASHA show that the integrated agriculture-nutrition-health intervention can improve food consumption behavior as well as contribute to impacts on key health challenges such as vitamin A deficiency and stunting if women participate in all aspects of the intervention.

**IDO: National partners and beneficiaries enabled—partnering for high-quality potato seeds and national strategies:** The three-generation (3G) potato seed multiplication strategy breaks the seed bottleneck by reducing the number of specialized multiplications from five generations to just three. CIP and its national partners pioneered the 3G approach and supported the development of rapid multiplication techniques in Kenya, Rwanda, and Uganda. More than 15,000 smallholder growers gained knowledge and skills on potato production technologies and best practices, and saw average yields increase by 20%. Part of the success of the 3G approach came from targeted, strategic public-private partnerships all along the seed value chain. Building on this progress during 2015, the CIP-led Seed Potato for Africa Program contributed to national strategies for root and tuber crops in Ethiopia, Kenya, Malawi, and Rwanda, and facilitated the establishment of three regional potato boards in Ethiopia and national root and tuber platforms in Malawi and Ethiopia. CIP worked in partnership in 10 countries to provide technical backstopping, advanced breeding lines, and capacity development with 28 NARS, 12 extension bodies, six national and eight international NGOs, four regional agricultural bodies, eight ARIs, as well as 21 national and international private sector entities.

### C.3 Progress towards impact

The book **“Crop Improvement, Adoption, and Impact of Improved Varieties in Food Crops in Sub-Saharan Africa”** written with involvement of RTB scientists, provides the most up-to-date information about cassava, yam, potato, and sweetpotato from 1970 to 2010 (<http://bit.ly/1Tcc5um>):

- **Cassava:** IITA and NARS in 17 countries released 367 improved varieties (more than 80% IITA-bred or parents) making up for 40% of the total cassava area.
- **Potato:** CIP was involved in 42 of the 45 varieties released over the past decade, covering about 35% of the potato areas in Ethiopia, Kenya, Malawi, Rwanda, and Uganda.
- **Sweetpotato:** Of the 60 new varieties released by the NARS in Burundi, Mozambique, Rwanda, Tanzania, and Uganda since 2000, 19 were CIP bred and 7 were from CIP parents. Adoption rate of improved varieties was 7% of the sweetpotato area, although rising after sharply increased investment in sweetpotato breeding.
- **Yam:** IITA and NARS developed or identified 78 yam varieties, about 28% of the yam area (13% with IITA-related varieties).

Genotyping-by-sequencing (GBS) was used as an alternative to relying on farmer or expert elicitation: 917 accessions collected from 495 farming households across Ghana were genotyped at 56,489 SNP loci, along with a “reference library” of 64 accessions of released varieties and popular landraces. Using this library, 282 accessions from farmers’ fields were classified as released varieties—about 30% of the sampled 917 accessions. Further analysis using subsets of SNP markers reproduced results obtained from the full-set of markers, suggesting that GBS can be done at higher DNA multiplexing, thereby reducing the costs of variety fingerprinting. Results show that genome-wide SNP markers from increasingly affordable GBS methods, coupled with complementary cluster analysis, are a powerful tool for variety identification and tracking adoption of crop varieties (<http://bit.ly/1XVG9yg>). This tool has been implemented in a new RTB-supported study in Nigeria, and analysis is in progress.

Survey data from a sample of about 850 households from six states in southwest Nigeria was used to analyze the effects of the adoption of improved cassava varieties (ICVs) on asset ownership among smallholder farmers. The linear regression with endogenous treatment effects showed that adoption of ICVs is positively related to asset ownership and that ICVs had greater impact on asset ownership among female-headed households. The empirical results suggest that improved agricultural technologies can play a key role in strengthening asset ownership of smallholder farmers for increased agricultural productivity

and income generation. ICV adoption rate was 48%, and the awareness rate was 68%. The proportion of adopters among the exposed farmers was 71%, confirming that exposure is very important in achieving a high rate of ICV adoption. Therefore, policy and programs that increase farmers' awareness, such as radio jingles and farmer field schools approaches, should be implemented (<http://bit.ly/1XVGICAL>).

## D. GENDER RESEARCH ACHIEVEMENTS

**RTB–University Gender Partnership:** This effort includes eight US and one Canadian university. The goal is to increase capacity to integrate gender into RTB agricultural research projects and provide professional development opportunities for a new generation of visiting scholars. Six graduate students completed research projects. A University of San Francisco student found that in Ghana, OFSP is preferred over traditional white/yellow-fleshed sweetpotato, as indicated by consumers' marginal willingness to pay (<http://bit.ly/1WnVYPR>). At Clark University, one student found that Lao women manage cassava pests, but their knowledge of symptoms and causal factors of pest and diseases is low—a critical gap to address. Another student used a gender-disaggregated framework to examine key variables that guide the adoption decision of improved agricultural technologies for new banana cultivars. Reports are being finalized for publication in peer-reviewed journals.

**Gender-responsive guidelines for banana farming:** A standardized methodology was implemented in nine African pilot sites jointly by IITA and Bioversity to understand gender norms, practices, and experiences in intra- and inter-households as well as the community dynamics related to banana farming (household survey, gender seasonal calendar, daily activity schedule, and a community profile). Results were used to develop guidelines for implementing organizations to incorporate gender-responsive strategies into the design, implementation, and M&E of BSTD management.

**Gender differentiated end-user preferences of cassava:** The RTB cross-center project on cassava processing, in Benin, Cameroon, Nigeria, Sierra Leone, and Tanzania, involving Cirad, IITA, NRI CIAT, and national partners, has a strong work package on sensory analysis, consumer preferences testing, and physico-chemical characterizations of cassava-based products. The influence of gender on hedonic responses was assessed using statistical analysis. Questionnaires including gender-differentiated roles and labor allocation were used to interview stakeholders all along the food chain (retailers, processors, consumers) to understand gender differences in perception of the quality of cassava products. Results in Benin confirmed the diversity of *gari* products and of consumers' preferences. Gender differences were pronounced across different regions and provided a benchmark of product quality attributes to guide breeding for appropriate processing varieties and also for future improvements of *gari*-processing equipment, which includes women as primary users.

**Gender responsive framework for participatory varietal selection:** With support from RTB, a CIP training manual on participatory varietal selection (PVS) was improved by adding gender-sensitive elements at each step of the selection process. The manual, "How to Conduct Participatory Varietal Selection in Potato: A Gender Responsive User Guide", will support training of trainers (<http://bit.ly/1CXUowV>). A three-day PVS gender training module was completed and tested in Ethiopia - the training manual has been downloaded more than 100 times (<http://bit.ly/1S7EIAz>). A sex-disaggregated PVS database for Peru was finalized, including an open-access digital platform that allows researchers or extensionists to upload and analyze quantitative data on trait selection.

**Gender research in Malawi:** The CIP-led gender research on potato seed management in Malawi showed that societal gender norms and roles may result in male bias in extension, preventing women from accessing and using new information effectively. Women were not considered capable of hosting demonstration plots. Women were afraid to speak in public, and norms about deferring to men meant



that even during training they were unable to ask questions and have them answered. Extension officers need to challenge their own stereotypes regarding gender roles in communities and create spaces for women. A positive finding was that where extension services disseminated gender-related messages, such as the importance of women's involvement in marketing, women's participation in potato marketing was perceived to increase (<http://bit.ly/1XVuMXd>, <http://bit.ly/26sgpzA>).

## E. PARTNERSHIPS BUILDING ACHIEVEMENTS

**Highlights of collaboration with CRPs:** RTB, Livestock & Fish, and Humidtropics jointly developed HQCP for animal feed (described under A.2). RTB and the CRP on Policies, Institutions and Markets collaborated on priority assessment and gender-responsive value chain methodologies (<http://bit.ly/1Valmsw>) and initiated collaboration on more user-responsive policies for clonally propagated seed systems where formal certification is challenging. Under the RTB umbrella, CIP planned collaboration with the International Rice Research Institute and the International Maize and Wheat Improvement Center on intercropping of short-cycle potato into cereals-based agri-food systems. RTB and the CRP on Climate Change, Agriculture and Food Security engaged in joint fund raising for climate smart breeding, exploring donor contacts with joint presentations. HarvestPlus's work on biofortified cassava and high vitamin A banana varieties is a strong collaboration between the CRP on Agriculture for Nutrition and Health (A4NH) and RTB. In the context of its RBM pilot, RTB linked with Humidtropics innovation platforms and stakeholders in Uganda and DRC for building capacities and scaling of the BXW management approach.

**Multi-crop partnership:** Collaboration with the Royal Holloway University of London (RHUL) allowed Bioversity, CIAT, CIP, and IITA to access RHUL experience in new testing and analytical methods to profile and characterize large sets of metabolites for all major RTB crops. Metabolomic profiling helped to identify biochemical pathways associated with specific crop quality characteristics. In the case of banana, this allowed researchers to propose the first set of putative biomarkers for texture and ripening.

**Banana:** In 2015, MusaNet held its plantain characterization workshop with 12 national African genebanks, and was widely consulted in updating the Global Strategy for conservation and use of *Musa* genetic resources. ProMusa knowledge-sharing network ([www.promusa.org](http://www.promusa.org)), managed by Bioversity, welcomed 53 new members, bringing the total memberships to 703. A total of 121 additional people registered to receive the InfoMus@newsletter. The online platform received 112,344 visits (50% increase over 2014) by 87,866 users from 221 countries.

**Cassava:** The NEXTGEN cassava project is a collaboration led by Cornell University with equal involvement of IITA, NaCRRI, and the National Root Crops Research Institute, Nigeria, and shared work with RTB on gender-differentiated trait preferences (<http://bit.ly/1SzINGF>). RTB furthermore supported the establishment of the Asia Cassava Breeders Network facilitated by CIAT. Its first meeting, in late 2015, led to agreements on regional germplasm exchange, uniform testing protocols, and shared capacity building.

**Potato:** Through the IssAndes project, funded by the European Union, CIP worked with 20 partners in Bolivia, Ecuador, and Peru to influence policies and promote cross-sectoral innovations that link food security with nutrition in rural areas in the Andes (<http://bit.ly/23BsAaF>). RTB-CIP also supported the creation of AsiaBlight, an Asian network to improve collaboration and knowledge sharing on the management of potato LB. The first meeting of AsiaBlight was held in Beijing during the World Potato Congress in July 2015, with over 50 participants from an array of countries.

**Sweetpotato:** CIP's multipartner, multi-donor 10-year program "Sweetpotato for Profit and Health Initiative" (SPHI) brings together more than 26 partners for collective efforts to achieve widespread uptake of sweetpotato in order to significantly reduce malnutrition of children under the age of 5. Phase

1 addressed the lack of sufficiently adapted varieties, adequate quantities of quality planting material at key planting times, and effective delivery systems; Phase 2, which began in 2014, focuses on scaling. SPHI is supported by a knowledge platform (<http://bit.ly/1puAzHM>). By 2015, it was recognized that committed partnerships required improved governance (<http://bit.ly/1XtcTPn>). Consequently, nine organizations agreed to make up the Steering Committee, with CIP and FARA as co-leaders and joined by RTB, HarvestPlus, Helen Keller International, Farm Concern International, NRI, PATH, and North Carolina State University. Five donors joined the Program Advisory Committee: BMGF, United States Agency for International Development, UKaid, Irish Aid, and the Alliance for a Green Revolution in Africa.

## F. CAPACITY BUILDING

RTB provided short-term training (workshops, courses, seminars, symposia, congresses, etc.) to 36,542 persons (17,104 men, 19,438 women) and longer term training to 185 participants (96 men, 89 women). Broken down, the picture for short-term training is as follows:

- 2,401 trainees (58% female) on banana topics, ranging from breeding to marketing, included gender training as well as training of trainers and community change agents. Trainees spanned the banana value chain—from breeders and genebank curators, to extensionists, smallholders, nursery managers, and other growers, to representatives of processors and small and medium enterprises.
- 1,797 participants (38% female) on cassava topics including integrated pest and disease management, genetic transformation, post-harvest, agronomy, production, and gender and youth.
- 16,981 trainees (37% women) on potato research in on-the-job training, planning meetings, field visits, demonstration plots, farmers' field schools, workshops, and congresses. Trainees were farmers, NARS scientists, students, government officials, NGOs, faculty, and RTB scientists.
- 15,235 participants (73% women) on sweetpotato crop production, agronomic management, post-harvest, value chains, nutrition, scientific skills, biosafety, and media training. Trainees included NARS and their partners, extensionists, technicians, students, officials from government and NGOs.
- 126 (17% female) yam breeders and technicians were trained on positive selection and yam quality management protocols for seed and yam-breeding techniques.

## G. RISK MANAGEMENT

**Governance:** Key risks associated with the overall governance and execution of RTB have been addressed through the establishment of the ISC in 2015, which provides “an institutional mechanism for check-and-balance within the program” (IEA 2016, <http://bit.ly/24xsQcQ>), with clear and specific roles and responsibilities (see A.1). This effective governance structure ensures the right degree of checks and balances between the responsibilities assigned to the lead center and the RTB management structure. In 2015, the ISC formed an internal working group on risk management, which will build on the lead center's procedures for risk analysis and mitigation.

**Contract and budget delays:** In 2015, RTB was exposed to a high level of systemic risk with the very late signing of the contracts between the CGIAR Consortium and RTB for the extension phase 2015–2016 only in June 2015, with a knock effect delaying the program participant agreement with RTB-participating centers. Risk was compounded by two reductions in the overall level of funding that had been committed and which could potentially lead to reputational damage of RTB and lead center among program participants and partners. RTB managed the risk related to the late signature and allocation of funds from the Consortium to RTB flexibly by authorizing participating centers to spend part of the programmed budget, based on the trust that signature with the CGIAR Consortium was only a question of time.

**Workload balance:** The IEA and IAU reviews, the preparation of the Preproposal, the late signature of contracts, repeated budget cuts, delayed approval of 2014 budget carry-over, as well as the ongoing CGIAR reform process, overloaded not only RTB management structures but also impacted every single scientist in his/her research activities. The strategy to handle this adverse effect was to focus on major strategic priorities to reduce work overload while ensuring program integrity.

## H. LESSONS LEARNED

**Investment in RBM:** An RTB brief sums up the results of the stakeholder workshops of the RBM pilot and the lessons learned (<http://bit.ly/1S90uib>). Involving users in co-developing impact pathways was a key improvement in designing program components. A participatory approach for designing interventions gives responsibility and ownership to each implementing stakeholder. M&E frameworks based on impact pathways need to consider the dispersion of M&E principles and models across many bilateral projects. In conclusion, RBM can improve partners' buy-in but is intensive in terms of the time and resources to be invested. Rather than quickly expanding RBM across the whole portfolio, a staggered approach is proposed: emerging insights from the pilots will lead to continuous learning and improvement of the M&E systems, and allow for a gradual scaling across the portfolio of RTB FPs and clusters.

**Congruence analysis:** In 2013–2014 RTB participating Centers and partners carried out a priority assessment (PA) for the major RTB crops, using a common methodology (<https://goo.gl/qt7ZFy>). The objective was to determine the expected impact that investment into the principle research options for each crop would generate in terms of the key variables of adopted area, economic benefits (internal rate of return, net present value), poverty reduction, and number of beneficiaries reached. Priority Assessment results are being used to provide evidence of demand for RTB research support, research prioritization and budget allocation. In light of Recommendation 4 of the IEA (2016), in 2015 RTB started a congruence analysis which shows a relatively good fit between the technology options with highest potential impact and the research and delivery clusters in the new RTB structure. Results of the congruence analysis will also be taken into consideration in the final decisions on the budgets for RTB Phase II and in resource mobilization.

**Gender integration:** Gender integration research is focusing on a few key areas with shared methodologies across centers. One key focus is on plant breeding and genomics to link gender responsive trait preferences with variety development (in strong collaboration with the NEXTGEN project). The new approach translated into a pair of linked post-doctoral fellowships in the area of gender and breeding. Annex 1 and 2 also show (1) increase in gender relevant publications, tools and technologies (2) increasing participation of female trainees and (3) training content dedicated to gender capacity development.

**BSTD pilot site approach:** Action research through community action plans involved new skills, community engagement, and stages of work not called for in surveys or replicated experiments. And although progress is slower, results address more of the potential challenges along the impact pathway than does scientist- and student-directed research. The RTB team will use the lessons from implementation and community successes as a stepping stone to new proposals in 2016.

**Pest/Disease:** In the cross-crop PRA project (see C.1), RTB centers set up action sites in collaboration with national partners. The combination of modeling results with data obtained from household and field surveys will provide a near-unique dataset for the analysis of climate impacts on pests and diseases and livelihoods. This should provide an evidence base to support regional and national adaptation planning to reduce the risks for the introduction of new pests and diseases, and to build the necessary national capacity and system resilience in a context of climate change.



## Annex 1: RTB indicators of progress in 2015<sup>2</sup>

Indicator	Deviation narrative (if actual is more than 10% away from target)	2015 <sup>3</sup>		2016
		Target (if available for 2015)	Actual	Target
<b>KNOWLEDGE, TOOLS, DATA</b>				
1. Number of flagship "products" produced by CRP	--	23	23	23
2. % of flagship products produced that have explicit target of women farmers/NRM managers	--	22%	26%	25%
3. % of flagship products produced that have been assessed for likely gender-disaggregated impact	--	44%	44%	50%
4. Number of "tools" produced by CRP	--	65	62	67
5. % of tools that have an explicit target of women farmers	--	32%	30%	34%
6. % of tools assessed for likely gender-disaggregated impact	Researchers have been sensitized to importance of gender research and are applying gender disaggregation more widely than anticipated	16%	23%	18%
7. Number of open access databases maintained by CRP	--	18	16	22
8. Total number of users of these open access databases	Specialized nature of scientific databases suggests target should be revised downwards	90,000	6,979	105,000
9. Number of publications in ISI journals produced by CRP	--	108	103	120
10. Number of strategic value chains analyzed by CRP	Value chain approaches are given greater consideration in bilateral projects reflected in increased number of analyses	9	22	11
<b>CAPACITY ENHANCEMENT AND INNOVATION PLATFORMS</b>				
13. Number of trainees in short-term programs facilitated by CRP (male)	Better balance (%) between male/female participation	22,000	17,104	23,000
14. Number of trainees in short-term programs facilitated by CRP (female)	Stronger promotion of women's participation	10,000	19,438	10,500

<sup>2</sup> Indicators not relevant for RTB are left out. See explanations for indicators of progress still in construction: <http://bit.ly/1UmnQTU>

<sup>3</sup> Targets for 2015 and 2016 as given in the Performance Matrix for the RTB Extension Phase 2015–2016.

Indicator	Deviation narrative (if actual is more than 10% away from target)	2015 <sup>3</sup>		2016
		Target (if available for 2015)	Actual	Target
15. Number of trainees in long-term programs facilitated by CRP (male)	The achievement was almost double; reflecting better tracking system in Centers	55	96	60
16. Number of trainees in long-term programs facilitated by CRP (female)	The achievement was almost double; reflecting better tracking system in Center	55	89	60
<b>TECHNOLOGIES/PRACTICES IN VARIOUS STAGES OF DEVELOPMENT</b>				
18. Number of technologies/NRM practices under research in the CRP (Phase I)	--	58	60	60
19. % of technologies under research that have an explicit target of women farmers	--	14%	17%	16%
20. % of technologies under research that have been assessed for likely gender-disaggregated impact	Researchers have been sensitized to importance of gender research and are applying gender disaggregation more widely than anticipated	14%	25%	16%
23. Number of technologies /NRM practices field tested (phase II)	Reduction in W1/2 and other disruptions to implementation lowered practices entering testing	92	60	96
27. Number of technologies/NRM practices released by public and private sector partners globally (phase III)	Closer tracking has revealed more progress than anticipated	32	49	33
<b>POLICIES IN VARIOUS STAGES OF DEVELOPMENT</b>				
28. Numbers of policies/ regulations/ administrative procedures analyzed (Stage 1)	Closer tracking has revealed more progress than anticipated	4	7	5
29. Number of policies/regulations/administrative procedures drafted and presented for public/stakeholder consultation (Stage 2)	Closer tracking has revealed more progress than anticipated	2	9	3
30. Number of policies/regulations/administrative procedures presented for legislation(Stage 3)	Closer tracking has revealed more progress than anticipated	1	7	1
31. Number of policies/regulations/administrative procedures prepared passed/approved (Stage 4)	Closer tracking has revealed more progress than anticipated	1	4	1
32. Number of policies/regulations/administrative procedures passed for which implementation has begun (Stage 5)	--	2	3	1

Indicator	Deviation narrative (if actual is more than 10% away from target)	2015 <sup>3</sup>		2016
		Target (if available for 2015)	Actual	Target
<b>OUTCOMES ON THE GROUND</b>				
33. Number of hectares under improved technologies or management practices as a result of CRP research	Includes adoption of technology released prior to start-up of RTB	430,000 (new)	430,000 (new)	447,000 (new)
34. Number of farmers and others who have applied new technologies or management practices as a result of CRP research	Total	1,720,000 (new)	1,720,000 (new)	1,780,000 (new)
	34 (a) number of women farmers concerned	490,000 (new)	490,000 (new)	510,000 (new)
	34 (b) number of male farmers concerned	1,220,000 (new)	1,220,000 (new)	1,270,000 (new)

## Annex 2: Performance indicators for gender mainstreaming with targets defined

Performance Indicator	CRP performance approaches requirements	CRP performance meets requirements	CRP performance exceeds requirements
<b>1. Gender inequality targets defined</b>	<i>Sex-disaggregated social data collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations</i>	<i>Sex-disaggregated social data collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations</i> <u>AND</u> <i>The CRP has defined and collected baseline data on the main dimensions of gender inequality in the CRP's main target populations relevant to its expected outcomes (IDOs)</i>	<i>Sex-disaggregated social data collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations</i> <u>AND</u> <i>The CRP has defined and collected baseline data on the main dimensions of gender inequality in the CRP's main target populations relevant to its expected outcomes (IDOs)</i> <u>AND</u> <i>CRP targets changes in levels of gender inequality to which the CRP is or plans to contribute, with related numbers of men and women beneficiaries in main target populations</i>
<p>In terms of defining <b>gender inequality targets</b>, RTB performance meets requirements.</p> <p>In 2015, the RTB gender team has worked with scientists and flagships and cluster leaders to:</p> <ul style="list-style-type: none"> <li>• Ensure that gender is mainstreamed into all clusters and flagships and in new project proposals;</li> <li>• Provide technical backstopping in the development and implementation of survey instruments, tools, and checklists to facilitate collection and analysis of sex-disaggregated data (e.g. baseline study conducted for banana end-user preferences, Participatory Varietal Selection was finalized and the manual is also linked to an open-access digital platform, curriculum and guidelines for gender – responsive pest and disease management strategies developed, etc);</li> <li>• Collect sex-disaggregated baseline data (both qualitative and quantitative) related to access to resources, decision making, gender division of labor, participation in different aspects of production and marketing, and gender-related constraints and benefits in technology adoption. Data were collected for: <ul style="list-style-type: none"> <li>○ Banana beverage value chains (Burundi, DRC, Rwanda, Tanzania, and Uganda)</li> <li>○ Cassava value chains (Nigeria, Colombia)</li> <li>○ Potato and banana seed systems (Malawi and Burundi)</li> <li>○ Management of banana priority pests and diseases (Burundi, Malawi, and DRC)</li> <li>○ Target population environments for new banana hybrids in East African highlands—identification of gendered trait preferences</li> </ul> </li> </ul> <p>RTB has a total of 15 cases in GENNOVATE, led by the RTB center-delegated gender focal points. They have completed the data collection and coding exercises, and are in the process of analysis and writing articles. The case studies have been conducted in RTB's main target areas.</p>			

Performance Indicator	CRP performance approaches requirements	CRP performance meets requirements	CRP performance exceeds requirements
<p><b>2. Institutional architecture for integration of gender in place</b></p>	<ul style="list-style-type: none"> <li>• CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, have written TORs</li> <li>• Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy</li> <li>• CRP M&amp;E system has protocol for tracking progress on integration of gender research</li> </ul>	<ul style="list-style-type: none"> <li>• CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, have written TORs, <u>and funds allocated to support their interaction</u></li> <li>• Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy</li> <li>• CRP M&amp;E system has protocol for tracking progress on integration of gender research <u>AND</u></li> <li>• A CRP plan approved for capacity development in gender analysis</li> </ul>	<ul style="list-style-type: none"> <li>• CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, have written TORs, <u>and funds allocated to support their interaction</u></li> <li>• Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy</li> <li>• CRP M&amp;E system has protocol for tracking progress on integration of gender research</li> <li>• A CRP plan approved for capacity development in gender analysis</li> </ul> <p><u>AND</u></p> <ul style="list-style-type: none"> <li>• The CRP uses feedback provided by its M&amp;E system to improve its integration of gender into research</li> </ul>
<p>In terms of defining institutional architecture for integration of gender in place, <b>RTB performance meets requirements.</b></p> <p>The RTB gender team was growing. The Program Management Unit recruited a full-time gender research coordinator; currently four gender researchers in Bioversity, three in CIP, and five in IITA are contributing directly to RTB gender work. In addition, IITA and Bioversity, together with RTB, pre-awarded two new post-doctoral fellows by the CGIAR Consortium gender post-doctoral fellowships (2016–2017) program.</p> <p>In programmatic aspects, RTB integrated gender into its institutional architecture in the following way:</p> <ul style="list-style-type: none"> <li>• Gender is mainstreamed across complementary-funded projects and the 2015 product portfolio.</li> <li>• The set-up of the new 2016 RTB program structure by FPs and clusters includes clear guidelines and expected results for gender integration, aligned with the crosscutting IDO on equity and inclusion.</li> <li>• Gender and youth are fully mainstreamed in the proposal for RTB Phase II, with a dedicated cluster in flagship project 5.</li> <li>• Five graduate students successfully completed their field research in various RTB's project sites under RTB-university gender partnership initiative.</li> <li>• Capacity development events were conducted (e.g., gender training in nutrition and value chain interventions in Ethiopia, Participatory Varietal Selection (PVS) training for partner institutions.</li> </ul>			



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