



RTB

Plan of Work and Budget 2021

J A N U A R Y 2 0 2 1



RESEARCH
PROGRAM ON
Roots, Tubers
and Bananas

Alliance



CGIAR Research Program on Roots, Tubers and Bananas
Lead Center: International Potato Center

Flagship Project 1: Discovery research for enhanced utilization of RTB genetic resources
Leader: Luis-Augusto Becerra (International Center for Tropical Agriculture - CIAT)

Flagship Project 2: Adapted productive varieties and quality seed of RTB crops
Leader: Maria Andrade (International Potato Center - CIP)

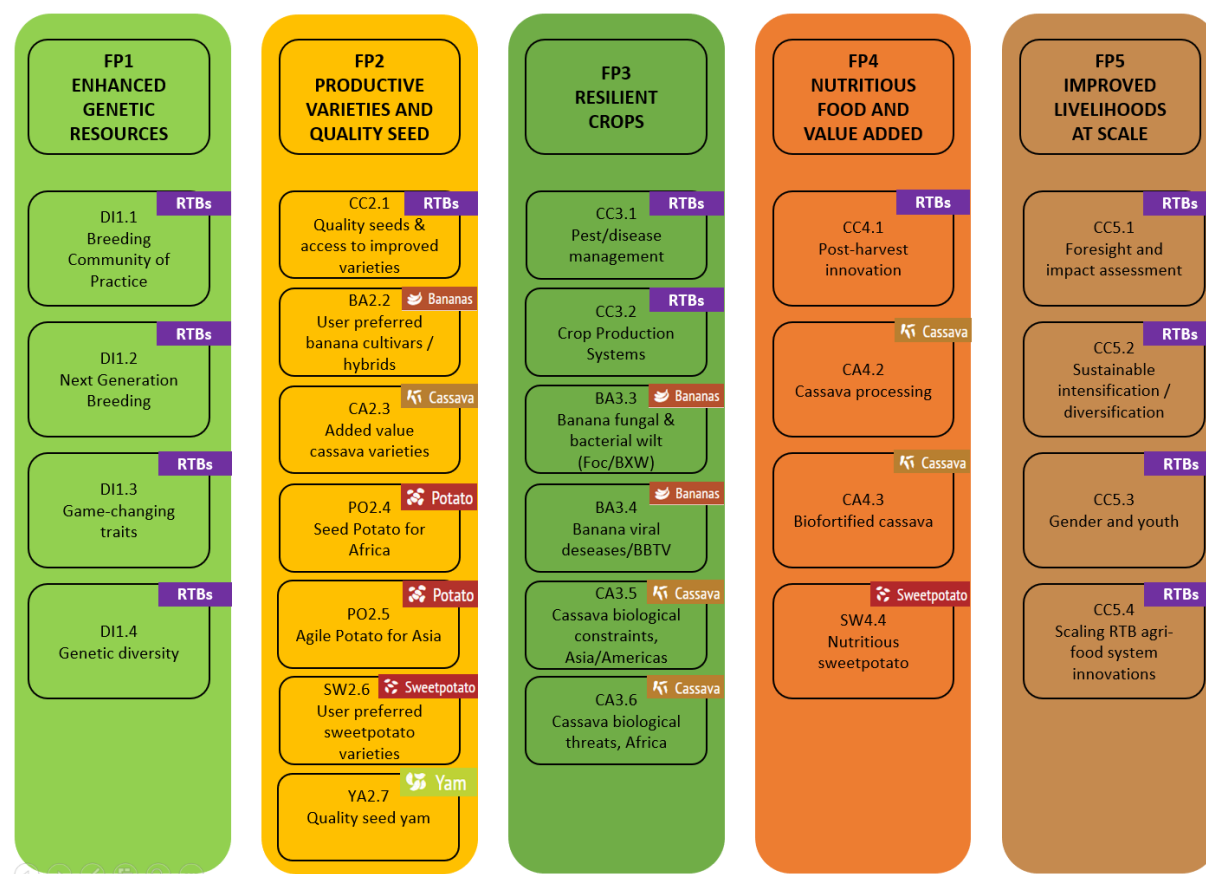
Flagship Project 3: Resilient RTB crops
Leader: James Legg (International Institute of Tropical Agriculture - IITA)

Flagship Project 4: Nutritious RTB food and added value through postharvest intervention
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RTB Flagship projects with their cross-cutting and crop-specific clusters



CGIAR Research Program on Roots, Tubers and Bananas

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

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ACRONYMS

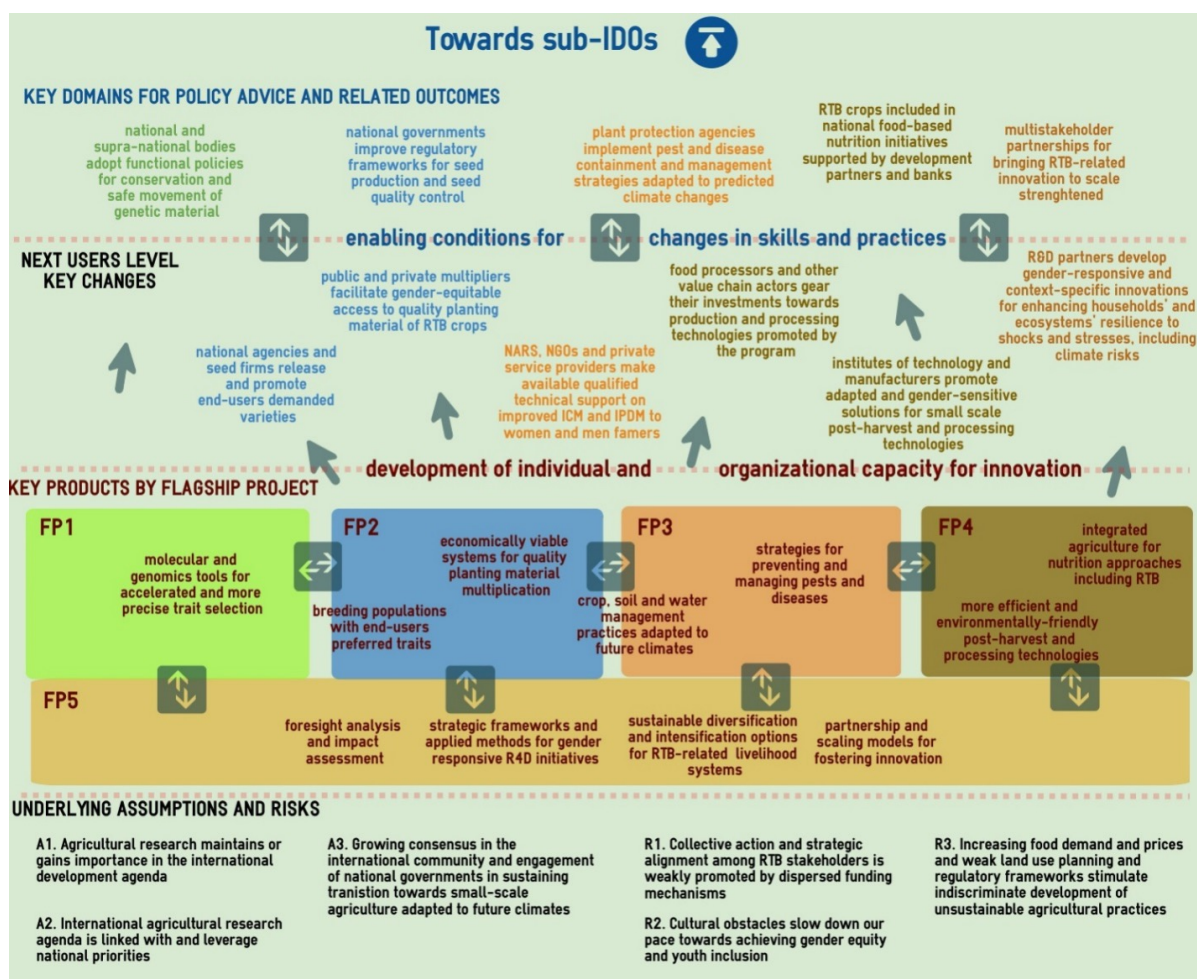
A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
ACAI	African Cassava Agronomy Initiative
AC4TR4	African Consortium for Foc TR4
AgDx	Agricultural Diagnostics Alliance
AGROCALIDAD	National agricultural health services in Ecuador
AI app	Artificial Intelligence application
AKILIMO	The cassava agronomy advice tool (Swahili “smart – agriculture”)
BASICS	Building an Economically Sustainable, Integrated Seed System for Cassava in Nigeria
BBTD/V	Banana bunchy top disease/virus
BCoP	Breeding Community of Practice
BigData	CGIAR Platform for Big Data in Agriculture
Bioversity	Bioversity International
BAPNET	Banana Research Network for Asia-Pacific
BMGF	Bill and Melinda Gates Foundation
BPAT	Breeding Program Assessment Tool
BreedBase	Breeding management and analysis software
BXW	Banana Xanthomonas wilt
CBSD	Cassava Brown Streak Disease
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CIALCA	Consortium for Improving Agriculture-based Livelihoods in Central Africa
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
CST	Cassava Seed Tracker
CRISPR/Cas	Clustered regularly interspaced short palindromic repeats/CRISPR associated protein
CRP	CGIAR Research Program
CSP	Cost Sharing Percentage
DFID	Department for International Development
DARTSeq	Diversity Arrays Technology Sequencing
EiB	CGIAR Excellence in Breeding Platform
ePIA	Ex-post Impact Assessment
FINPLAN	2021 Revised CGIAR Research Financing Plan
FoC TR4	Fusarium oxysporum f. sp. Cubense Tropical race 4
GBI	CGIAR Gender and Breeding Initiative
GE	Golden egg
GEF	Global Environment Facility
GMO	Genetically modified organisms
GPR	ground-penetrating radar
HZPC	Dutch seed company
ICT	Information and Communications Technology
ICT4BXW	Citizen Science and ICT for advancing the prevention and control of Banana Xanthomonas Wilt (BXW) in East and Central Africa
IBRC	Iwate Biotechnology Research Center
IDO	Intermediate Development Outcome

IITA	International Institute of Tropical Agriculture
ILCYM	Insect Life Cycle Modelling software
KASP	Kompetitive allele specific PCR
KEPHIS	Kenyan plant health service
MEL	Monitoring Evaluation and Learning Platform
MELIA	Monitoring Evaluation Learning and Impact Assessment Community of Practice
MINAM	Peruvian Ministry of Environment
MUSALAC	Red Latinoamericana y del Caribe para la Investigación y el Desarrollo de las Musáceas
NARO	National Agricultural Research Organization, Uganda
NARS	National agricultural research system
NASC	National Agricultural Seed Council
NBA	National Biosafety Authority in Kenya
NGO	Nongovernmental organization
ODK	Open Data Kit
OFSP	Orange-Fleshed Sweetpotato
PIM	CGIAR Research Program on Policy, Institutions and Markets
PMU	Program Management Unit of RTB
POWB	Plan of Work and Budget
PROMUSA	Knowledge platform on banana
R4D	Research for Development
RTB	CGIAR Research Program on Roots, Tubers and Bananas
SBCC	State of knowledge on biofortified cassava and country
SENASA	National agricultural health services in Peru
SPIA	Standing Panel on Impact Assessment
SSA	Sub-Saharan Africa
Sub-IDO	Sub-Intermediate Development Outcome
SWCA	South West and Central Asia
ToC	Theory of Change
TRICOT	Triadic comparisons of technologies
W1/2/3	Window 1/2/3 – CGIAR Funding system

NARRATIVE

1. ADJUSTMENTS / CHANGES TO RTB THEORY OF CHANGE

The CGIAR Research Program on Roots, Tubers and Bananas (RTB) looks forward to its final year of successful implementation as an outstanding partnership collaboration. The 2021 POWB will consolidate key innovations developed during the phase and ensure a successful transition of work with these vitally important clonally propagated crops into One CGIAR. The POWB is informed by both the opportunities and the challenges which the COVID-19 pandemic has presented. Progress towards its impact pathway has been monitored through more than [100 milestones over the period 2017-2020](#) with a limited number of overall changes (3%) due to adjustments and synergies implemented by flagship projects during annual reporting¹.



The pandemic offers opportunities due to increased demand for locally produced and transformed food products in short supply chains which are less vulnerable to the interruption in international trade. The mobility restriction imposed by the pandemic increased the vulnerability of women and other marginalized groups in terms of access to food, markets and labor opportunities, potentially worsening inequalities. RTB is conducting research about contextually specific impacts on food security, and potential remediation measures.

In 2021 we will seek to embed the collective assets and legacy products of RTB known as the [golden eggs](#) in One CGIAR as part of our theory of change. One example is the ongoing joint work with the System Management Office to incorporate principles of RTB Scaling Readiness in its [Performance and Results Management Framework \(PRMF\) 2022-2030](#). Building on the very positive 2020 CGIAR Advisory Services [Review](#) we will

¹ The adjustment of milestones did not impact on the overall Theory of Change of the program.

nurture legacy knowledge assets through a catalogue of program innovations that includes and extends the golden eggs. The catalogue synthesizes innovations developed since 2012 with ToC, sustainability plan and partners to make them widely available for future users in One CGIAR.

RTB efforts in capacity development of next users for innovation are affected by termination of the program one year earlier than originally planned for phase 2. For example, RTB has many successful activities with seed companies in releasing and promoting end-user demanded varieties (e.g. the RTB-led [BASICS](#) project [promoting commercial sales](#) of improved cassava seed) and clusters (e.g. PO2.4), but shortened timeframe means full impacts will not be achieved.

RTB contributed to a continental declaration and road map supporting biofortification to be submitted to the next [African Union](#). In 2021, we will consolidate this progress in advocacy with a broader set of crops, working together with A4NH.

We will build on the outstanding collaboration of the RTB Breeding Community of Practice (i.e. cluster DI1.1) with the Excellence in Breeding Platform (EiB) and contributing to One CGIAR Genetic Innovation research. In 2020, we conducted a [Hackathon](#) together with EiB to improve market segments and linked product profiles with four breeding programs and this will be extended to other breeding programs this year.

2. PLANS AND EXPECTED PROGRESS TOWARDS OUTCOMES

This section presents key innovations and expected outcomes for each flagship project. New strategic partnerships and interventions with high cross-cutting relevance are highlighted.

Flagship Project 1 (FP1): Discovery research for enhanced utilization of RTB genetic resources

FP1 develops and applies leading-edge science for faster and more precise development of user-demanded varieties, overcomes the limitations of conventional breeding for clonal crops, and enhances the long-term conservation and use of genetic diversity.

Improving breeding pipelines. Under DI1.1, through the Breeding Community of Practice (BCoP), collaboration for more effective breeding will be enhanced through workshops and training events around product profiles. With at least 6 breeding pipelines that follow specific product profiles developed for well-defined market segments, following the learnings of a BCoP-EiB hackathon in 2020. Furthermore, the BCoP will continue working closely with the gender team to ensure that the information generated by the G+ tools for gender responsive breeding is used to inform product profiling. Citizen science using the TRICOT method and participatory varietal selection are being expanded to include food product testing in addition to agronomic traits. Crop ontologies are being expanded to capture inputs from varietal selection, so that end-user preferences are incorporated into the digitized databases.

Implementing genomic tools to enhance breeding. KASP markers developed in banana for varietal identification for true-to-type will be used by breeding programs and are being tested in plantain. MusaBase will be further developed in support of banana breeding and with the trait ontology being updated, with new tools to upload genotyping data (SSR assays produced for QC in breeding, as well as the raw data for the high density data generated by DArT and other providers), plant responses to pathogens, sensory data, etc. In addition, DArTSeq data will be used to estimate breeding values of landraces and hybrids and will guide selection of parents in breeding programs. The reference genome of water yam (*Dioscorea alata*) is expected to be published in 2021, then supporting development of genomic tools. The genetic architecture of hydrogen cyanide variation in cassava is being elucidated, which will lead to the development of molecular markers to enable selection for low cyanide.

A collaboration with IBRC in Japan is developing new genomic resources to fast-track the yam breeding cycle, including the sequencing of breeding stocks.

Advancing game-changing traits. Trials to generate the required evidence for a regulatory dossier to document the safety for human and animal health and the environment of the 3R Victoria 172 potato variety are continuing with a second multi-location trial.

The success of CRISPR/Cas technology to make targeted changes in specific genes and the prospect of a non-GM regulation of the genome edited products has led to higher investment into genome editing. Therefore, validation of edited target genes to promote resistance to *Xanthomonas phaseoli* pv. *manihotis* (Xpm) in cassava and to BXW in banana will be carried out. The cluster actively participates in the One CGIAR Community of Practice (CoP) for Genome Editing in Agriculture launched in 2020.

Conserving and utilizing genetic resources. The information system for in situ monitoring of RTB crop diversity will be restructured with additional information on in situ occurrence of RTB crops, additional hotspots of diversity and a suite of resources such as guidelines, protocols, toolkits, training materials, references, projects, photos. Genetic analysis of in situ collections of potato will identify novel diversity, informing key priorities for collections in Peru. Contributions of gender roles in in situ conservation will be studied.

Improved cryopreservation protocols for potato and sweetpotato will increase efficiency of ex situ maintenance of germplasm, available for use by national and international partners. Likewise, optimized protocols of germination of wild banana seed will be published to help establish collections of banana CWRs.

Flagship Project 2 (FP2): Adapted productive varieties and quality seed of RTB crops

To address complex questions of variety adoption and seed systems, FP2 is implementing strategies to accelerate genetic gains, improve the efficiency of RTB breeding pipelines, and shorten the breeding cycle. Bottlenecks in production and distribution of quality seeds are reduced using rapid multiplication and integrative systems-oriented, gender-equitable, and evidence-based seed systems interventions.

Promoting the seed systems toolbox. The CC2.1 cluster will focus on implementing a communication strategy to promote the [seed systems toolbox](#), including a formal launch of the website <https://tools4seedsystems.org>, and designing a “seed hub”. Advocacy with scientific leaders and donors will position seed systems R&D in One CGIAR using the toolbox and the seed hub as main assets as part of a nurturing plan for the Seed Systems Toolbox golden egg.

Quality seed production. The use of rooted apical cuttings as potato seed is being scaled in Kenya, Ethiopia and Uganda, and tested in Tunisia, Cameroon, Nigeria and Rwanda. A toolbox for high ratio yam propagation and good agronomic practice for quality seed yam production under rainfed conditions using single-node cuttings will be disseminated.

ICT solutions for marketing and certifying seed. An SMS and IT based platform to assist farmers and markets to access seed and ware potato-Viazi Soko IT Platform, is being deployed in East Africa. Likewise, the Seed Tracker (ST) tool is being piloted for e-certification in Nigeria and Tanzania for quality assurance of seed of RTB crops, especially cassava, and piloting will start in Ghana.

Variety releases in Africa, Asia and LAC. Important releases in 2021 include four NARITA banana hybrids in Tanzania, which will be multiplied by at least three companies for distribution to farmers in North Central Tanzania. Late blight resistant varieties will be the first CIP potato varieties to be released in Nigeria and a first release in Cameroon since 1992. Two potato varieties biofortified with iron and zinc, resistant to late blight and PVY virus adapted for tropical highland and mid-elevation ecologies are being tested for adaptation in Bangladesh. Eight sweetpotato varieties of different types (short-season, non-sweet OFSP, high iron OFSP and purple flesh) will be released or registered in Peru, Bangladesh, India, Tajikistan, Mozambique, Malawi, and Zambia. Two improved varieties of white Guinea and water yam combining higher and stable tuber yield with greater resistance to pests and diseases and with desired food quality will be submitted for official release in Nigeria and Cote d’Ivoire. Importantly, as a result of genomics work in FP1, four cassava varieties developed using molecular breeding including genomic selection are being released in Nigeria, as well as a landrace with excellent cooking qualities.

Progress in improving breeding populations. As part of the strong collaboration with EiB, banana breeding efficiency will be increased through parental improvement and evaluating breeding values. On station field trials and citizen science approaches will be used to validate previous high throughput phenotyping that predicted ‘climate-smart’ banana cultivars.

Segregating populations will be screened at the Leibnitz Institute, Germany, to determine the genetics of CBSD and CMD resistance in cassava. Collaborations with two national cassava breeding programs in Vietnam will help modernize and empower the programs to increase their genetic gains in local farmer fields and develop CMD resistant varieties. Progress in advancing biofortified cassava is taking place in different countries, with some being readied for release.

Seed stocks of H1 hybrid populations with elevated genetic gains from the implementation of heterosis breeding in sweetpotato will be multiplied for evaluation in Bangladesh, India (90 days harvest OFSP) and other countries in SWCA, as well as Southern Africa (high iron OFSP).

Zero tillage and mulching in rice-potato systems, using short season potato varieties is being tested in India, bringing environmental and production benefits. Data collection will prepare the way for piloting this innovation beyond 2021.

Flagship Project 3 (FP3): Resilient RTB crops

FP3 works to close yield gaps arising from biotic and abiotic threats and to develop more resilient production systems, thereby strengthening food security and improving natural resource quality and sustainability.

Advancing digital solutions in pest and disease management. The two golden eggs of FP3 are important areas of innovation. The first, in CC3.1, is a platform to integrate digital pest and disease surveillance tools used by FP3 team members and partner institutions (Agricultural Diagnostics Alliance, AgDx). Standardized web service API specifications will facilitate the exchange of data between pest/disease identification and surveillance databases. The second golden egg assembles a basket of management strategies for banana Fusarium wilt, Tropical Race 4 (Foc TR4). Components ready for piloting and/or uptake include tolerant banana clones, beneficial microorganisms as IPM components and the open data kit (ODK) real-time surveillance strategies for monitoring and early warning for TR4. A special issue journal publication in 2021 will present the ‘state of the art’ for TR4 and its control.

Scaling novel technologies. Banana fiber paper seed wraps have been shown to be highly effective in preventing potato cyst nematode damage in potatoes in Kenya. This approach will be tested more widely in East Africa and assessed for its effectiveness in protecting cassava and sweetpotato against root knot nematode damage in 2021. The potato work will be ready for scaling in Kenya in 2021.

Supporting decision making. Insect life cycle modelling software (ILCYM) was developed for potato pests but is now being used more widely for other pest/disease systems, including whitefly virus vectors on cassava. ILCYM risk maps are being used by national partners in Colombia, Ecuador, and Peru for *Bactericera cockerelli* management with potato, and risk maps are being used in the same region for potato yellow vein virus disease, *Tecia solanivora* and *Epitrix*. Amongst the ICT tools developed through FP3 for pest/disease surveillance, some of the strongest progress is anticipated in 2021 for *Tumaini*, a free app that diagnoses diseases of banana, already downloaded more than 2000 times, and this number is expected to increase greatly in 2021. Additionally, a new offline version is being released. Drone and satellite surveillance systems are also being rolled out for banana bunchy top virus management. When applied at scale, these approaches offer great potential to deliver early detection, which can then be supplemented with phytosanitary management procedures developed through BA3.4. In CA3.5 an AI system has been developed for assessing whitefly infestation levels on cassava (*Nymphstar*). It is in final piloting stage and will be rolled out in 2021. In CA3.6 a molecular database has been developed for the large-scale epidemiology and surveillance of strains of cassava bacterial blight (CBB).

Strengthening Long Term Partnerships. The partnership with the BigData platform will expand in 2021 for AgDx and the scaling of ICT tools, and FP3 will work closely with the University of Georgia and Penn State University on both innovation development/refinement as well as scaling. Latin American partners - Instituto Colombiano Agropecuario (ICA), INIAP and Agrocalidad Ecuador, INIA and SENASA in Peru – will be critical for the scaling of the potato purple top surveillance, study and control work. The universities of Cambridge and West of England will partner in modelling BBTD and novel low-cost diagnostics for BBTV respectively, whilst national research agencies – PPRI in Vietnam and PPC in Laos will be key partners in the CMD research and management work in South-East Asia. The novel Pest Risk Management Plans (PRiMPs) being developed by FP3 teams will be piloted together with Fera (UK), and their validation and scaling will be done with several national plant protection organizations in target countries in Latin America, Asia and Africa.

Flagship Project 4 (FP4): Nutritious RTB food and added value through postharvest intervention

FP4 broadens the nutritional potential of RTB crops and contributes through postharvest innovations to the fuller, equitable and sustainable utilization of RTB crops for healthier diets and improved income opportunities for men and women.

Advancing innovations from research to uptake. FP4 will advance 11 innovations from proof of concept to adoption by next users. Innovations in the last stage, like the [Small-scale flash drying](#) of cassava will be scaled with increased involvement of National Agricultural Research System (NARS) partners. Piloting will begin of truck-mounted mobile gari cassava processing units to bring the factory to the field. Ready for uptake innovations such as the innovative healthy baby toolkit or hotfill Orange Flesh Sweetpotato (OFSP) puree will move to next stage with the private sector actively participating. The FP relies on more than 20 strategic partners across NARS, Academia, Private Sector, Government and Advance Research Institutions to provide a long-term sustainability to RTB results.

Consumer studies. Studies will be published on nutritional and antinutritional properties for RTB-based food products, and the effect of biodegradable packaging material and stored peeled cooking bananas on consumer preferences. The [RTBFoods](#) project will continue work on phenotyping tools and protocols to assess postharvest quality and increase further adoption of improved varieties. [Consumer preferences analysis and delivery of complementary innovations](#) are at the core to scale OFSP.

Gender and climate change focused results. This cross-cutting dimension is well represented across the 9 key milestones planned for FP4 in 2021 (Table 2.A) Gender is addressed in consumer driven locally adapted post-harvest technologies. Climate change mitigation is targeted through increased energy efficiency during production of cassava flour and starch.

Flagship Project 5 (FP5): Improved livelihoods at scale

FP5 dynamizes and enables contributions of other FPs to achieve impact at scale and is engaging other CRPs in a broad system and scaling² perspective. It develops tools, approaches and best practices to support more evidence-based, sustainable, equitable and cost-efficient scaling of innovation.

Collaborating to increase scaling opportunities. FP5 hosts and supports several projects that are geared towards increasing income, productivity, enhancing dietary quality and improving soil management practices. FP5 contributes scaling support to other projects such as ACAI/ AKILIMO, OFSP Puree, Flash Dryer and TRICOT. In 2021, the ICT4BXW project will continue to provide banana agronomy advice using digital platforms to more than 74,000 farmers in Rwanda, further expanding its work through a 3-year scaling investment from GIZ.

Two initiatives started in 2020 will be strengthened in 2021: 1) develop climate smart recommendations for breeding and agronomy at scale in collaboration with CCAFS, 2) test and validate tools for gender-responsible scaling of RTB innovations.

Assessing contributions and measuring change. In 2021, CC 5.1 will implement: adoption studies of cassava pest and disease management, soil management technology and improved varieties in SSA and SEA; pest and disease management strategies for banana in Malawi and Tanzania; adoption and nutritional impact of OFSP varieties in Malawi; measuring poverty, nutrition and gender impacts of adoption of different RTB crops in Uganda (See Table 2B). Additionally, Cluster 5.4 will develop Outcome Stories on how Scaling Readiness contribute to increased R4D scaling performance and development outcomes.

Integrating gender across technical topics. The gender and youth cluster will continue to engage with teams integrating gender in technical topics including: a) the development of gendered-customer and product profiles with EIB; b) co-leading the development of a white paper on gender and seed systems; c) supporting the inclusion of gender and youth as cross cutting issues in the webinar series for International Year of Plant Health. and d) linking the information from its golden egg on gender responsive AR4D portal to the GENDER Platform.

The team has taken a leading role in discussions about how to support innovation and scaling in One CGIAR, that will continue with more strength in 2021. It will work to position its golden egg, Scaling Readiness, within the One CGIAR Research and Innovation Strategy 2030 and related Performance and Results Management Framework.

² Today, the processes of adoption and diffusion of innovations are generally labeled as the scaling of innovations (Sartas et al., 2020)

3. FINANCIAL PLAN FOR THE COMING YEAR, INCLUDING USE OF W1/W2

The budget presented in table 3 and 4 for the W1&2 allocations is based on the [2021 Revised CGIAR Research Financing Plan \(FINPLAN\)](#), shared by the System Office on the 21st of December 2020. W3 and bilateral projections are based on the data from each program participant.

The RTB 2020 funding target for W1&2 is USD 18.96M. This scenario is based on the total 2021 FINPLAN allocations which were reduced to 90% of the 2021 targeted allocations in the original 2019-2021 FINPLAN.

In 2021, the implementation of the ten earmarked proposals approved at the end of 2019 will continue. They were approved based on internal competitive calls focusing on those areas of collective action and cross-cutting collaboration where there is the highest programmatic added value. Also, during 2021 RTB is continuing with the second year of two scaling projects. Non-earmarked funds have been allocated by flagship and program participants in line with the agreed flagship and cluster priorities. The distribution by flagship shows a similar share as in 2020. The two flagships with the highest W1&2 allocations are FP1 and FP2, followed by FP5, FP3 and FP4. The budget allocation through competitive calls has modified the relative distribution of funds at the cluster level but not significantly at the flagship level.

It should be noted that the current figures do not include W3 and Bilateral projects that are waiting for formal approval. Carry-over from 2020 should be approved by the System Management Office in February 2021 and will be utilized to complete the [unfinished milestones](#) and MELIA studies (i.e. table 2B) accounting for USD 3.74M.

RTB budgeted USD 60,000 for the final reporting and program closure in 2022 in accordance with the FINPLAN.

TABLES

TABLE 2A: PLANNED MILESTONES

FP	Mapped to Sub-IDO	2022 FP outcomes	Milestone	Source	Means of verification	Gender marker	Youth marker	CapDev marker	Climate Change marker	Risk assessment	Justification for medium/high
1	Enhanced genetic gains	Outcome 1.1: For each RTB crop, populations with at least 3 end-users preferred traits and adapted to 2 targeted regions are available	Enhanced institutional capacities in regulation and stewardship of RTB crops with game-changing traits	New/changed	Scientific publications and reports	NA	NA	2	NA	Low	
1	Enhanced genetic gains	Outcome 1.1: For each RTB crop, populations with at least 3 end-users preferred traits and adapted to 2 targeted regions are available	Gene-edited RTB crops with enhanced traits for breeding and / or direct release	New/changed	Scientific publications and reports	NA	NA	1	NA	Low	
1	Enhanced adaptive capacity to climate risks / Enhanced capacity to deal with climatic risks and extremes	Outcome 1.4: At least 20% of newly developed RTB breeding populations with enhanced resilience to climatic shocks available for testing in FP2	Platforms for high-throughput phenotyping for climate resilience under implementation for at least 3 RTB crops	Identical to proposal	Scientific publications and reports	NA	NA	NA	1	Low	
2	Enhanced individual capacity in partner research organizations through training and exchange	Outcome 2.8: Every year, 8,000 R&D stakeholders (50% female) trained through short term programs on designing and implementing smallholder-oriented breeding programs and sustainable seed systems	150 individuals (50% female) trained through long term programs (e.g. MSc and PhD students)	Identical to proposal	Program and Projects reports	1	NA	2	1	Low	
2	Increased availability of diverse nutrient-rich foods	Outcome 2.4: Annual production of at least one nutrient rich RTB crop increased by 5-10% in 10 targeted countries	3,500,000 households, of which at least 25% are female headed, adopting nutritious varieties	Identical to proposal	National statistics, Adoption study reports, Project reports, Modelling, disaggregated data used in adoption studies	2	NA	NA	NA	Low	
FP	Mapped to Sub-IDO	2022 FP outcomes	Milestone	Source	Means of verification	Gender marker	Youth marker	CapDev marker	Climate Change marker	Risk assessment	Justification for medium/high

2	Diversified enterprise opportunities	Outcome 2.1: 20,000,000 people (4,000,000 HH), of which 50% are women, increased their annual income by increasing RTB sales and diversifying market strategies	5,000 profitable decentralized seed business created, of which 30% are run by women and young people	Identical to proposal	Study reports, Project reports	NA	NA	2	NA	high	There is a high risk related to quality assurance as it not possible to ensure quality of 1000's of small-scale seed multipliers scattered throughout the landscape. Refer to main changes in the logic of the cluster.
2	Gender-equitable control of productive assets and resources	Outcome 2.6: At least 35% increase in number of female and young beneficiaries of at least 500,000 HH perceive to have better control over assets and resources	At least 25% of HH adopting improved varieties/seeds are female headed households	Identical to proposal	Specific study reports and disaggregated data used in adoption studies and other documents	2	1	1	1	Medium	The medium risk consider that the new varieties are available, and farmers do not have any limitation in adoption.
2	Conducive agricultural policy environment	Outcome 2.7: Regulatory frameworks for seed production and seed quality control (including QDS) under implementation in 10 countries	Benefit-sharing mechanisms protecting custodian farmers' rights and facilitating the exchange of Musa genetic resources piloted in 3 countries and recommendations formulated	Identical to proposal	Annual reports and official document of relevant stakeholders	NA	NA	NA	NA	Low	
2	Closed yield gaps through improved agronomic and animal husbandry practices / Enhanced genetic gains	Outcome 2.2: At least 5,000,000 HH increased their annual RTB yield by at least 10%	Increased number of farmers HH adopting improved post-harvest techniques including adapted storage facilities, especially for on-farm seed management	Identical to proposal	Adoption study reports, Project reports	2	1	2	1	Low	
2	Closed yield gaps through improved agronomic and animal husbandry practices / Enhanced genetic gains	Outcome 2.2: At least 5,000,000 HH increased their annual RTB yield by at least 10%	Increased number of farmers HH adopting improved varieties	Identical to proposal	National statistics, Adoption study reports, Project reports, Modelling	1	1	1	2	Medium	Farmers willing to try new varieties
2	Conducive agricultural policy environment	Outcome 2.7: Regulatory frameworks for seed production and seed quality control (including QDS) under implementation in 10 countries	RTB included in national food security related policies and initiatives in at least 10 countries	Identical to proposal	Annual reports and official document of relevant stakeholders	0	0	1	1	Low	
2	Increased conservation and use of genetic resources	Outcome 2.3: Targeted breeding programs increased by 10% the diversity of the	Traditional knowledge of the landraces and wild relatives for RTB crops in 5 countries documented for traits of	Reworded/ rephrase	Scientific publications, reports	NA	NA	NA	NA	Medium	COVID-19 may limit

		genetic base used (e.g. number of banana wild species used as parental lines)	importance, traditional uses, and other cultural and socio-economic aspects	d from proposal							documentation process
F P	Mapped to Sub-IDO	2022 FP outcomes	Milestone	Source	Means of verification	Gender marker	Youth marker	CapDev marker	Climate Change marker	Risk assessment	Justification for medium/high
3	Enhanced adaptive capacity to climate risks / Enhanced capacity to deal with climatic risks and extremes	Outcome 3.3: Capacity to deal with climate risks and extremes increased for at least 1,000,000 HH	At least 60% of developed IPM/ICM management strategies assessed in terms of adaptation to future climates	Identical to proposal	Scientific publications and reports	NA	NA	2	1	Low	
3	Increased resilience of agro-ecosystems and communities, especially those including smallholders	Outcome 3.2: 1,800,000 ha of current RTB production area converted to sustainable cropping systems	Gender-sensitive, context - specific agronomic practices adopted in 1,200,000 HH, of which at least 25% are female headed households	Identical to proposal	National statistics, Adoption study reports, Project reports, Modelling, disaggregated data used in adoption studies	2	NA	NA	NA	Medium	7. Other: Adoption study may not be feasible due to COVID-19
3	Reduced pre- and post-harvest losses, incl. climate change / Closed yield gaps through improved agronomic and animal husbandry practices	Outcome 3.1: In areas affected by pests and diseases, RTB yield restored to previous infection conditions by at least 1,500,000 farmer HH, of which at least 25% are female headed households	Individual and community strategies for IPM equally adopted by male and female farmers in 1,200,000 HH	Identical to proposal	National statistics, Adoption study reports, Project reports, Modelling, disaggregated data used in adoption studies	1	1	1	1	High	7. Other: Extremely costly to get any reliable data on this and so the evidence will likely be lacking.
3	Increased resilience of agro-ecosystems and communities, especially those including smallholders	Outcome 3.2: 1,800,000 ha of current RTB production area converted to sustainable cropping systems	Results provided by prediction models used for developing or updating national and regional strategies	Identical to proposal	Program and Project reports, Annual reports of relevant stakeholders	1	1	1	1	Low	
4	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	Outcome 4.7: 60 development-focused organizations, including women's networks and alliances, having increased their capacity for innovation (e.g. enhanced human capital and improved collaboration network in relevant domains) to scale up fuller utilization of RTB	At least 60 organizations and businesses in 10 countries invested in human resources (at least 33% female beneficiaries) and organizational development to scale up production and dissemination of nutritious RTB foods and value-added products	Identical to proposal	Annual reports of relevant stakeholders	2	2	2	0	Low	

4	Diversified enterprise opportunities	Outcome 4.1: 700,000 households, 25% of which are female headed, have increased their income by 15-20% by increasing and diversifying RTB sales (food, feed, industrial raw material and seeds)	Increased RTB sales and employment, of which 33% directly benefit women and young people, created in RTB value chains (measured at intervention site level for selected countries)	Identical to proposal	Study reports, Project reports	1	1	0	1	Medium	7. Other: This milestone requires scaling out of innovations to stakeholders in RTB value chains. This process is ongoing in selected countries, but slower than anticipated at the time of the initial proposal.
FP	Mapped to Sub-IDO	2022 FP outcomes	Milestone	Source	Means of verification	Gender marker	Youth marker	CapDev marker	Climate Change marker	Risk assessment	Justification for medium/high
4	Conducive agricultural policy environment	Outcome 4.6: Food-based nutrition programs/ initiatives promoting RTB crops under implementation in at least 10 countries	RTB crops and products actively promoted by mainstream national nutrition programs in at least 10 countries, with commercial sector investments in highly nutritious RTB foods in at least 2 countries	Identical to proposal	Study reports, Annual reports of relevant stakeholders, projects reports	1	0	0	0	Medium	7. Other: COVID-19 pandemic may slow down interaction with stakeholders and promotion in national programs
5	Enhanced institutional capacity of partner research organizations / Enhanced individual capacity in partner research organizations through training and exchange	Outcome 5.9: At least 1,500 research/development staff in RTB and in mixed-type partner organizations across prime target countries with strengthened research and innovation capacities including gender-responsive and transformative research	At least 1,500 users of RTB knowledge sharing mechanisms with strengthened capacity for designing, implementing and assessing RTB research	Identical to proposal	Project and Program reports, Annual reports of relevant stakeholders and partners	1	1	2	NA	High	7. Other: Participation and mobility restrictions due to COVID-19 may influence engagement in capacity building
5	Increased capacity of beneficiaries to adopt research outputs	Outcome 5.8: At least 66 cases where RTB crops/technologies are newly included in policies or programs executed by government agencies, NGOs, and/or private sector	At least 44 bi-annual stakeholder meetings held across target countries for co-design of impact pathways and M&EL around implementation, including needs assessment and customized product development	Identical to proposal	Project and Program reports	0	0	1	NA	Medium	7. Other: Policy makers are not convinced of need for a policy change and policy processes may take longer than expected. There is an additional risk related to the absence of data to validate the milestone

5	Gender-equitable control of productive assets and resources	Outcome 5.6: At least 35% increase in number of female and young beneficiaries of at least 200,000 HH perceive to have better control over assets and resources	Equitable SDI options for market-driven household income improvement under implementation in at least 5 countries	Identical to proposal	Annual reports of relevant stakeholders, study reports	2	2	1	NA	Medium	7. Other: On-going uncertainty with COVID-19 pandemic makes it difficult for us to predict possible activities in the field and funding situations.
5	Optimized consumption of diverse nutrient-rich foods	Outcome 5.3: Diet quality indices increased by 20% for at least 300,000 farmer households	Multistakeholder initiative implemented at regional/district for whole-diets improvements in at least 10 countries	Identical to proposal	Annual reports and official document of relevant stakeholders, study reports	0	0	1	NA	Medium	7. Other: COVID-19 may limit initiative and coordination among stakeholders
5	Diversified enterprise opportunities	Outcome 5.1: Income increased by 20% for at least 550,000 HH	Multistakeholder partnerships in at least 10 landscapes (region/district administrative level) promoted system intensification and diversification options in RTB-based farming	Identical to proposal	Annual reports and official document of relevant stakeholders, study reports	0	0	1	NA	Medium	C7. Other: COVID-19 impacted in existing partnership building efforts. Target number may be reduced.
F P	Mapped to Sub-IDO	2022 FP outcomes	Milestone	Source	Means of verification	Gender marker	Youth marker	CapDev marker	Climate Change marker	Risk assessment	Justification for medium/high
5	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	Outcome 5.10: At least 5 partnerships and scaling models tested in a minimum of 5 target countries and adjusted to be fit for purpose	Performance of at least 5 partnerships and scaling models in a minimum of 5 target countries assessed, and cross-country experiences shared	Identical to proposal	Study reports, Project reports	0	0	1	NA	Low	
5	Closed yield gaps through improved agronomic and animal husbandry practices	Outcome 5.2: Whole-farm productivity increased by 25% for at least 1,000,000 HH	Whole-farm productivity approaches included in national/regional policies and development initiatives in at least 10 countries	Identical to proposal	Annual reports and official document of relevant stakeholders, study reports	0	0	0	0	Medium	7. Other: COVID-19 may limit initiative and coordination among stakeholders

TABLE 2B: PLANNED EVALUATIONS/REVIEWS, IMPACT ASSESSMENTS AND LEARNING EXERCISES

CRP	FP	Status	Planned studies/learning exercises in the coming year	Geographic scope	Who is commissioning this study?
Ex-post Impact Assessment					
RTB	5	Ongoing	Estimated ex post impacts of deployment of improved yam seed technologies in Ghana and Nigeria	Ghana, Nigeria	Bilateral project plus cluster
Program/project adoption or impact					
RTB	5	New	Understanding on pathways and determinants of adoption of improved cassava varieties in Uganda	Uganda	Cluster CC5.1
RTB	5	Ongoing	Impacts of the adoption of soil technologies in cassava productivity and farmers livelihood in Thailand	Thailand	Cluster CC5.1
RTB	5	New	Understanding on pathways and determinants of adoption of improved cassava varieties in Tanzania	Tanzania	Cluster CC5.1
RTB	5	New	Documenting impacts on farmers livelihood and poverty reduction in Uganda	Uganda	Cluster CC5.1
RTB	5	New	Measuring poverty, nutrition and gender impacts of the adoption of sweetpotato, bananas, potatoes and beans varieties in Uganda	Uganda	Cluster CC5.1
RTB	5	New	Measuring productivity, income and gender impacts of the adoption of improved cassava varieties and pest & disease management in Vietnam	Vietnam	Cluster CC5.1
RTB	5	New	Measuring impacts of natural resource management in RTB based farming systems: the case of soil fertility and soil erosion control in cassava-based systems in Thailand	Thailand	Cluster CC5.1
RTB	5	Ongoing	Adoption of BBTD control approaches and its impacts on banana farmers' livelihoods in BBTD-affected areas of Malawi	Malawi	Cluster CC5.1
RTB	5	Ongoing	Adoption and impact of the recommended banana agronomic practices on farmers' welfare among banana growing households in Uganda and Tanzania	Uganda and Tanzania	Cluster CC5.1
RTB	5	New	Measurements of adoption and impacts of improved cassava varieties in Tanzania	Tanzania	Cluster CC5.1
RTB	5	New	Diffusion, adoption and nutritional impacts of Orange flesh sweetpotato varieties in Malawi	Malawi	Bilateral project & Cluster CC5.1
RTB	5	Ongoing	Impacts of COVID -19 crisis on sustainable livelihoods in rural Andes of Peru	Peru	Bilateral project & Cluster CC5.1
RTB	5	Ongoing	Assessing the impacts of the adoption of improved cassava processing equipment on household income in the lake zone of Tanzania	Tanzania	Cluster CC5.1
Qualitative Outcome Study					
RTB	5	New	Science publication on contribution of Scaling Readiness to increased R4D scaling performance and development outcomes (DL 1.9)	West Africa, East Africa, Central America, Central Africa	Earmarked Funded Project Scaling Readiness with support of External Outcome Story Consultant
Foresight analysis					
RTB	4	New	Development of aseptic shelf-stable sweetpotato puree for innovative food uses foresight study (baseline evaluation)	Kenya	CIP DDBIO project
RTB	2	New	Foresight analysis to estimate demand and geographic distribution of future demand and gender-differentiated trait preferences with AfricaYam project phase-II funded by BMGF	West Africa	BMGF
Other MELIA activity					
RTB	4	New	Entrepreneurial learning in farmer business schools: processes and early-stage outcomes	Philippines	Cluster CC4.1, WUR
RTB	4	New	Farmer business schools: what have we learned? What are we doing differently?	Philippines	Cluster, WUR

TABLE 2C: PLANNED MAJOR NEW COLLABORATIONS (CGIAR INTERNAL OR WITH NON-CGIAR COLLABORATORS)

Partner Name	Brief description of collaboration and value added	FP
CGIAR Internal Partnerships		
CGIAR Genebank Platform	A lot of the research done in FP1, particularly with view to improved ex situ conservation protocols can only happen in close collaboration with the genebank platform. Access to more banana germplasm.	1,2
CGIAR Excellence in Breeding Platform; CGIAR Gender Platform	RTB gender and breeding initiative is translating insights from the G+ tool implementation to an operational EiB template co-owned by breeders. Inclusion of sensory trait information and social differentiation	1,4,5
CGIAR Big Data Platform	Contributions to data tool development such as AgroFIMs used for big data collection of agronomic data and keep track of all the GIS data layers and might help in AI applications. Also, efficiently implement AgDxAPI	2
CGIAR Excellence in Breeding Platform	Design of seed delivery profiles and collaboration with breeders to ensure that seed system R4D is well positioned in the breeding pipeline.	2
CGIAR Research Program on Rice	The CRP on RICE has substantial overlap with PO2.5 with respect to farm diversification and sustainable intensification of rice-potato systems. This collaboration will strengthen our activities and allow us to adopt a systems' thinking rather than a single crop approach.	2
CGIAR Research Program on Policy, Institutions and Markets	Conduct work on policy options for vegetatively propagated crops in Vietnam as the regulatory framework guiding seed systems in Vietnam undergoes considerable changes. Collaborative engagement in Kenya and Malawi on OFSP puree work to enhance economic opportunities for women and youth under the RTB Scaling Fund. Policy and institutional analysis of seed systems for vegetatively propagated crops, innovations for sustainable intensification. Country-level assessments of the performance of value chains, and strategies for improving efficiency and inclusion. Willingness to pay for improved cassava planting materials in Nigeria.	2,4,5
CGIAR Research Program on Agriculture for Nutrition and Health; HarvestPlus	CIP and HarvestPlus are collaborating in harmonizing M&E systems to track biofortification of banana and plantain impact of biofortification and at scale, developing common theories of change, methods, indicators and tools for measurement; enhanced M&E systems will improve tracking of beneficiaries and design of impact studies; collaboration has been renewed for 2021	2,4,5
CGIAR Research Program on Livestock; CGIAR Research Program on Maize	Cross CRP Learning on Scaling of Innovation with ILRI Impact at Scale Program	5
CGIAR Gender Platform	Active collaboration on the Gender and Scaling work with the CGIAR Gender Platform will be continued. Closely collaborating with the Gender Platform will increase the likelihood that Gender and Scaling tools will serve at larger scale by contributing to planning of three modules directly and indirectly, implementing COVID-19 studies (if funded) and participating in webinars.	5
CGIAR Standing Panel on Impact Assessment (SPIA)	The Standing Panel on Impact Assessment is a key partner in the field of ex post impact assessment. SPIA will bring resources and quality check to provide convincing and rigorous evidence of RTB outcomes and impacts	5
CGIAR System Organization	Support scaling of innovation at CGIAR System Organization level by actively contributing to developing science-based Performance and Results Management Framework and stage-gating.	5

Non-CGIAR Partnerships		
BAYER; Excellence in Breeding	BCoP is collaborating with EiB in the gender-responsive product profile development, market segment definition and product profile development process.	1, 2
BTI (Boyce Thompson Institute), USA	Development and curation of RTB crop ontologies, including mapping of crop-specific traits to species-neutral concept, thus enabling search across species, which is needed for comparative genetics. Development of terms submission workflow, and integration into the BreedBases and fieldbooks. Breeding data management and analysis pipeline for improved selection efficiency. For boiled cassava, the Breedbase team provided support to define an ontology of postharvest quality traits and to format datasets of postharvest quality traits and NIRS spectra for uploading to Cassavabase.	1, 2, 4
Cornell University; Michigan State University	Hale Tufan will be engaged as a resource person for gender and breeding to the extent possible through existing collaborative arrangements, e.g., RTBFoods	1
Instituto del Bien Comun, Peru	For 2021, civil society organization IBC takes on a more important role in the Peru cassava work. COVID-19 has seriously impacted the ability of the local University to engage students, and access to the Indigenous communities is much more difficult due to self-isolation practices. CIAT has adapted the approach to work closely with IBC to engage directly with Yanesha staff, who are able to continue working in communities.	1
KALRO, Kenya; NARO, Nigeria	Performs field trial of genome-edited banana and 3R potato if funds become available. KALRO has contributed to the release of Bt cotton whereas TELA maize and BSVR cassava are in the queue. If released, IITA and CIP will revigorated their partnerships.	1
Tropic Biosciences	Collaborating with IITA for developing black Sigatoka resistant banana using genome-editing induced gene silencing. IITA is focusing on banana cultivar Dwarf Cavendish while Tropic Biosciences is working on Grain Nain.	1
Wageningen University, Netherlands	WUR researchers are an important partner for research activities in gender and youth (Margreet van der Burg), social aspects of seed systems (Conny Almekinders) and gender and scaling (Cees Leeuwis), farm systems (Jeroen Groot), ex-post impact assessment, methodology development in measurements effects (graduate students). A statistics training will be conducted in the use of mixed models in agricultural data analysis (Daniela Bustos-Korts and Fred van Euweljk).	1,4,5
YANAPAI, Peru	NGO conducting field work such as sample collection, field trials, in situ conservation support etc. Due to their passion and professionalism we managed to harvest and analyze our samples despite the complete lock down in Peru.	1
BARI, Bangladesh Agriculture Research Institute; BAU, Bangladesh Agriculture University; BRAC Bangladesh Rural Advancement Committee; ICAR, Indian Council of Agricultural Research; CTCRI, Central Tuber Crops Research Institute (India); Institute of Botany, Plant Physiology and Genetics (Tajikistan):	Carry out accelerated breeding for OFSP and purple flesh sweetpotato (PFSP), multiply seed stocks of elite breeding material, including H1 populations derived from heterosis breeding for 90-day OFSP, and its dissemination in India and Bangladesh.	2

Non-CGIAR Partnerships		
Community of Excellence on Seed Systems Development	RTB CC2.1 scientist co-lead of three background papers to position seed systems work in the One CGIAR research strategy and investment portfolio.	2
Economic Community of West African States (ECOWAS)	ECOWAS very recently showed an interest on scaling out yam seed system innovations across ECOWAS countries in West Africa. A ten years joint yam seed improvement program (ECOYAM) was designed and waiting for securing funding for its implementation at nine ECOWAS countries	2
HZPC, Netherlands	HZPC is a Dutch seed company CIP is engaged with in a 5-year breeding project called TAP-5. In a joint breeding effort, HZPC's processing material is crossed with CIP's (sub)tropically adapted material. There is an increasing need for improved and adapted processing varieties in Asia, as available material is of poor quality and old, or expensive as much is imported.	2
IBRC (Iwate Biotechnology Research Center), Japan	Development of new genomic resource to fast-track breeding cycle, more specifically conducting next generation sequencing of breeding stocks and genetic study population as well as supporting with analysis of sequence data	2
Instituto de Investigação Agrária de Moçambique IIAM; Department of Agricultural Research Services DARS (Malawi), Zambia Agriculture Research Institute ZARI (Zambia)	Increase true seed stocks of elite crosses for H1 hybrid populations of high iron OFSP in Southern Africa.	2
Mango Tree	Develop pedagogical materials for the next users of the tools we developed	2
MEDA-RAPID, Tanzania	MEDA (MEDA - Tanzania RAPID Banana) organizes and assists public and private partners with multiplication of banana to increase efficiency and create a viable business. The seed systems are not only crucial for the distribution of new hybrids but also for the guarantee of enough diversity and healthy plant material. Climate change is predicted to shorten the lifetime of the plantations and the need for healthy and climate smart planting material will increase in the future.	2
Ministere de l'Agriculture et du Developpement Rural (MINADER), Cameroon	Collaborate to refine and update seed regulations and protocols for seed quality assurance in Rwanda, Uganda and Cameroon	2
National Potato Council of Kenya (NPCK), Kenya	Viazi Soko Platform (seed and ware potato marketing platform) in Kenya - PO2.4 is supporting the platform to expand service provision and become operational - NPCK hosts the Viazi Soko Platform	2
NARO, Nigeria	Breeding matooke and complementing the breeding work of IITA and the on-station validation trials of 'climate smart' varieties. Also contributing in the implementation of the national banana breeding program.	2,5
National Seed Certification Service (NSCS), Uganda		2
Nature Source Improved Plants (NSIP), USA	The company will genetically characterize 1000 banana varieties	2
Royal Holloway University of London (RHUL), UK	Royal Holloway University of London collaborate with yam program in characterization of the metabolomic and proteomic profiles of genotypes from breeding pipeline and industrial biotechnology applications	2
Tanzanian Official Seed Certification Institute (TOSCI), Tanzania	TOSCI evaluated the application file for release of new banana hybrids.	2

Non-CGIAR Partnerships		
ASOMUSACEAS	Thermal chamber and nursery management and operation, planting material distribution amongst farmers.	3
Cambridge University, UK; University of West England, UK	Development of BBTV spread prediction models using the data collected within the BA3.4 project. Draft models based on BBTV Australia data set has been developed and the same framework will be used for BBTV SSA model using data published from this work and new data sets being compiled for this study.	3
General Directorate of Agriculture (GDA), Cambodia; PPC. Laos	Field surveys and harmonization of lab protocols for virus and phytoplasma	3
INERA, DR Congo	Drone image and field boundary data collection	3
INIA, Mozambique; Alliance of Bioversity International and CIAT	NPPO focal person; Foc TR4 surveillance in Mozambique; awareness raising activities and implementing FocTR4 exclusion (quarantine) measures. Co-organize the virtual MasterClass on Fusarium TR4, and virtual mini symposium.	3
Instituto Colombiano Agropecuario (ICA), Colombia	Registration of elite fields and nurseries for propagation of clean planting material. Disease diagnostics laboratories for seed certification.	3
Instituto Colombiano Agropecuario (ICA), Colombia; Instituto Nacional de Investigaciones Agropecuarias (INIAP), Ecuador; Instituto Nacional de Innovación Agraria (INIA), Peru; Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA), Peru	Collaboration in field surveillance, harmonization of laboratory protocols and epidemiological analysis of pests and disease surveillance data.	3
Keele University, UK	Collaborating with IITA by providing nano-formulated botanical oils for evaluation of effect against feeding behavior of cassava whiteflies.	3
PPRI, Vietnam; Leibniz Institute, Germany	Field surveys, virus genome analysis and harmonization of lab protocols to determine the genetics of CBSD and CMD resistance in cassava	3
Stellenbosch University, South Africa	Fusarium sample analysis.	3
Universidad Nacional de Colombia (UNAL)	Field research co-executor and evaluation of yield and disease incidence.	3
University of Georgia; CGIAR Big Data Platform	Support from BigData will be important to efficiently implement AgDxAPI	3
West Virginia University, USA	Machine learning algorithms using satellite and UAV imagery for mapping banana and plantains for disease surveillance	3
Bamber and Burton (B&B), SinnovaTek	B&B will test innovative puree processes using microwave technologies (from SinnovaTek) in Kenya. This is aimed at increasing the shelf-life of OFSP puree without the application of cold-storage.	4
Base of the Pyramid (BoP) Inc.	BoP Inc. will coordinate with CIP to assess consumer behaviors in the urban environment and food system, as well as linkages with the private sector	4
Centre Africain de Recherche sur Bananiers et Plantains (CARBAP), Cameroon; NARO, Uganda; NRCRI, Nigeria	Provide suitable plantain material for postharvest experiments. CARBAP will also be involved in consumer preferences studies. NaCCRI postharvest handling and processing, quality and market analysis.	4

Non-CGIAR Partnerships		
Hanoi University of Science and Technology (HUST), Vietnam	National institute with vast expertise in postharvest, food processing and value addition, including of RTB crops. Focus on the assessment of urban consumer preferences in Vietnam and contribute to the adaptation of assessment protocols	4
Kwara State University, Nigeria; Université d'Abomey-Calavi, Benin	Partnership on invitro and in vivo analyses of cassava-based products: lafun, fufu and gari, and on consumer preferences and post-harvest quality of cassava-based products (lafun, gari)	4
NaCRRI, Uganda; Universidad Nacional de Colombia (UNAL)	Collaboration to develop medium-throughput and high-throughput phenotyping methods to characterize the quality of boiled cassava: sensory analysis, texture analysis, water absorption, NIRS predictions, etc.	4
Natural Resources Institute (NRI), UK	Determination of acrylamides on RTB products with CIP and Food safety training in nutritional value chain of RTB crops.	4
Natural Resources Institute (NRI), UK; CGIAR Research Program on FISH	There will be a cross-CRP collaboration for assessing opportunities and constraints for the integration of RTB and Fish agri-food systems in the Great Lake region.	4
North Carolina State University, USA; United States Department of Agriculture (USDA), USA	Consumer acceptance and sensory evaluation of boiled potato and sweetpotato. Determination of dielectric properties for African sweetpotato through microwave processing in Kenya.	4
South Dakota State University, USA	Expert in using Cellulose obtained from agricultural residues as a viable substitute for biofilms production that is low density, biocompatibility, biodegradability, low toxicity, and a stiff and robust structure.	4
Universidad del Valle (Univalle), Colombia	Collaboration with Univalle (Cali, Colombia) on process engineering for more efficient and cost-effective cassava processing.	4
University of Antioquia	Joining forces between CIAT and University of Antioquia for a comprehensive analysis of sour cassava starch produced in the Cauca (Colombia): Functional properties; characterization of microbiomes responsible for lactic acid fermentation; effect of location and technological level on end-product quality.	4
ARIFU	Arifu is a digital service provider that provides agricultural knowledge, information and services to farmers. Arifu will be one of the core scaling partners under the AKILIMO Scaling Fund project and will also play a key role in scaling the ICT4BXW tools in the Scaling Phase of the GIZ-funded ICT4BXW project 2021-2023.	5
Michigan State University (MSU), USA; University of Naples, Italy; Virginia Tech, USA	Methodology development and graduates' students for ex post studies on policy analysis, ex ante and ex post impact assessment	5
University of California, Davis	PhD candidate and former associate director of the Feed the Future innovation lab for horticulture of UC Davis, Erin McGuire provides technical support to the Gender and Scaling work; writing manuscript; developing and testing guidelines. We will built collaborations by testing our guidelines with one of the Feed the Future projects.	5
VIAMO, UK	As part of the ICT4BXW project, VIAMO is scaling some of the digital decision support tools for BXW control and banana agronomy advise developed under the project in Rwanda. VIAMO will play a key role in scaling the ICT4BXW tools in the Scaling Phase of the GIZ-funded ICT4BXW project 2021-2023.	5

TABLE 3: PLANNED BUDGET

	Planned budget					Comments on major changes
	Carry-Over W1/2 2020 *	W1/2**	W3/ bilateral	Center Own fund	Total ***	
FP1	750,668	4,514,520	5,767,438		11,032,626	Three clusters will receive funds through earmarked projects. One scaling project is mapped under this flagship and its budget appear as part of the W1/2 allocation.
FP2	792,353	3,815,451	21,256,466		25,864,270	One cluster will receive funds through earmarked projects.
FP3	760,002	3,386,419	4,165,506		8,311,927	Three clusters will receive fund through earmarked projects. One scaling project is mapped under this flagship and its budget appear as part of the W1/2 allocation.
FP4	389,235	1,301,308	4,185,280		5,875,823	Two clusters will receive funds through earmarked projects
FP5	601,572	3,472,302	6,755,108		10,828,982	Three clusters will receive fund through earmarked projects. Funds allocated to this flagship to ensure a backstopping function for scaling projects appear as part of the W1/2 allocation.
Innovation Catalogue Sustainability Plan		460,000			460,000	These funds are allocated to finalize a full catalogue of all RTB Innovations reported in the past years available (consult CGIAR innovation results) for developers and users and to ensure a selected number of those receiving support, to develop and implement a sustainability plan linked to One CGIAR initiatives and national plans.
CRP Management & Support Cost	449,601	2,010,000			2,459,601	This line includes costs related with program governance and management and USD 260,000 to support project management officers in each center and to cover staff time of the five flagship leaders. It also includes USD 200,000 for performance bonuses ³ allocated to clusters teams that showed outstanding results.
CRP Total	3,743,431	18,960,000	42,129,798		64,833,229	

* The carry over includes the funds confirmed late from FCDO and the supplemental W1 to fulfill the 90% guarantee approved budget.

**Total budget for Scaling Fund is USD 1,015,785. It has already been allocated to projects and mapped under specific flagships.

*** Total CRP budget 2021 includes projected carry-over budget 2020.

³ Cluster level annual reports are evaluated by RTB PMU. The award of the fully satisfactory cluster performance is an annual bonus which is kept small recognizing that this mechanism should not affect the overall distribution of funds by cluster.

TABLE 4: 2020 FORECAST AND 2021 BUDGET

The amounts presented in the following tables have been developed in accordance with the 2021 Revised FINPLAN. Table A shows the information by natural classification as presented in the participant center financial reports. RTB regrouped center natural classification categories and aligned with the ones requested by the FINPLAN. Table B presented the allocation in accordance with the FINPLAN.

4.A

Natural Classification	2020 Forecast (W1-2)	2021 Budget (W1-2)
<i>Personnel</i>	8,624,280	11,895,026
<i>Collaborator Costs - CGIAR Centers</i>	28,589	46,950
<i>Collaborator Costs - Others</i>	947,584	1,032,795
<i>Supplies and Services</i>	3,824,341	4,843,302
<i>Training / Workshop</i>	641,603	731,719
<i>Operational Travel</i>	397,955	1,020,095
<i>Depreciation</i>	76,546	52,785
Sub-total Direct Cost	14,540,897	19,622,672
<i>Indirect Costs</i>	2,260,445	3,080,759
CRP Total budget	16,801,342	22,703,431

4.B

Natural Classification	2020 Forecast (W1-2)	2021 Budget (W1-2)*	2020 Forecast (W1-2) %	2021 Budget (W1-2) %
<i>Personnel</i>	8,624,280	11,895,026	51%	52%
<i>Collaborators & Partnerships</i>	976,173	1,079,745	6%	5%
<i>Consultancy & Operational Expenses (incl. Training/Workshop)</i>	4,465,944	5,515,021	27%	24%
<i>Travel</i>	397,955	1,020,095	2%	4%
<i>Capital & Equipment</i>	76,546	52,785	0.5%	0.2%
<i>Closeout cost</i>		60,000	0%	0.3%
<i>Indirect Costs</i>	2,260,445	3,080,759	13%	14%
CRP Total budget	16,801,342	22,703,431	100%	100%

* 2021 Budget includes 2020 carry-over amount of USD 3.74M.

Travel budget percentage increases from 2020 to 2021. This is caused by travel expenses postponed due to COVID-19. It is expected that travel expenses will increase in the second half of 2021. Operational expenses are slightly reduced compared to 2020. The other categories have a similar behavior between the two years.