Advisory Services

CGIAR

CGIAR Research Program 2020 Reviews: Roots Tubers and Bananas (RTB) - Annexes

Contents

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Annex 1: Terms of Reference for the CRP2020 Review, Addendum

Links to CRP 20202 Reviews TOR and Addendum[1].

Annex 1.1: Call for Expressions of Interest

CRP 2020 Independent Reviews of Quality of Science and Effectiveness

Deliverables and consultation for the CRP Review (pag.9-10 of the ToR attached)

The review team is expected to produce the following deliverables:

1. A preliminary findings matrix, for discussion midway through the review process, to check the progress of the review and to provide a basis for early course correction if required. The CAS Secretariat will provide the review team with a template for the preliminary findings matrix.
2. A brief presentation of preliminary findings, for the debrief with the CRP management and the CAS Secretariat for validation, factual corrections, and feedback.
3. A draft report of the CRP review, for review by the CRP management and the CAS Secretariat for final feedback. The CAS Secretariat will provide a template for the draft and final reports.
4. A final report of the CRP review, following the report template with a maximum of 20 pages, a 2-3 page executive summary, and a set of annexes with additional information apart from the main body of the report.
5. A PowerPoint presentation covering the main points of the review, including purpose, methods, findings, conclusions, recommendations, and additional notes relevant to the review. The CAS Secretariat will provide a template for this presentation.

Templates for the preliminary findings matrix, draft, and final report, and the presentations will be provided to the review team in the first week of the review.

The review team will engage with the CAS Secretariat and the CRP under review at the following key points:

1. Initial discussion with the CAS Secretariat to start the review and clarify questions from the review team;
2. Briefing at the start of the review between the review team and CRP management, facilitated by the CAS Secretariat;
3. Interview with the CRP Leader and a focus group discussion (FGD) with other members of the CRP management during data collection;
4. Debrief presentation of the preliminary findings led by the review team, for validation, clarifications, and feedback by the CRP management and the CAS Secretariat;
5. The draft report will be shared with the CRP Leader and staff for factual correction and final feedback.

Additional discussions between the review team, the CRP management, and the CAS Secretariat may be scheduled based as needed during the course of the review.

Annex 1.2: Addendum to the Terms of Reference & Call for Expressions of Interest, June 2020

The CAS Secretariat has made the following modifications to the Terms of Reference (TOR) and Call for Expressions of Interest, for the CRP 2020 Reviews of Quality of Science (QoS) and Effectiveness.

Please note: (i) the independent reviewers for CRP reviews that will begin in August (see Annex I for the working schedule) will be selected by the first week of July, and (ii) the overall deadline is 15 July 2020 for submission of expressions of interest for the CRP 2020 Review.

Methods. The proposed surveys of CRP researchers, partners, and donors have been removed from the CRP 2020 Reviews. The sample frame of respondents for these surveys was considered to be smaller

[1] Accessed September 25, 2020

than anticipated, thereby limiting the value of quantitative data collected from the surveys. Given the extensive qualitative methods (primarily key informant interviews) already applied to the same pool of respondents, the value of the surveys was determined to be questionable. Further, the burden on respondents was considered excessive, and a higher value is placed on the in-depth qualitative interviews. Considering the limited value addition of the proposed surveys and the burden on respondents, CAS has removed the surveys as a method for the reviews.

Establishing contributions to Intermediate Development Outcomes (IDOs). Links between the outcomes (documented as milestones) from the CRPs and the CGIAR Strategic Results Framework will be examined at the sub-IDO level, not the IDOs themselves.

Data sources. CRP performance data will be drawn from the Plans of Work and Budget (POWBs) and Annual Reports for the period under review, with supplementary information from the CGIAR result dashboard. The CAS Secretariat supports the reviews by integrating data from the dashboard, the CRP internal monitoring, and the POWB and annual reports, to allow the review team to make quantitative assessments of performance. The dashboard data will also be used in conducting a 'deep dive' of selected CRP outcomes (OICRs).

Knowledge management. The review team will be responsible for uploading and storing its original data, analysis, and drafts on the secure online content site (SharePoint) provided by the CAS Secretariat, as a basic step in knowledge management for the review.

Analytics support. The team will also need to adhere to timelines for accessing technical consultants made available by the CAS Secretariat, e.g., for quantitative analysis of performance data.

Distribution of effort within team. The two members of each review team (subject matter expert and senior evaluator) are each allocated 39 days for execution of the work, over the 11-week period. An additional two days are allocated to the team member who takes on the team leadership role. The team leader will also commit to responding to any questions or need for clarifications that arise from copy editing of the final report.

Further notes to interested consultants:

Consultants who have already submitted their expressions of interest have been logged in the CAS consultant database and do not need to re-submit their documents. Short-listed candidates will be contacted as preparations for the CRP reviews are made.

Consultants who wish to apply should indicate their expertise and availability in relation to the nine CRPs that are scheduled to be reviewed between August and December 2020. The reviews of three CRPs (A4NH, GLDC, and Wheat) have already started.

Table 1. Working schedule of CRP 2020 reviews

CGIAR Research Program (CRP)	Type	Review period
Grain, Legumes and Dryland Cereals (GLDC)	Agri-Food System	Apr-Jun
Wheat	Agri-Food System	Apr-Jun
Agriculture for Nutrition and Health (A4NH)	Global Integrated Program	Apr-Jun
Forests, Trees and Agroforestry (FTA)	Agri-Food System	Aug-Oct
Livestock	Agri-Food System	Aug-Oct
Climate Change, Agriculture and Food Security	Global Integrated Program	Aug-Oct
Fish	Agri-Food System	Sep-Nov
Maize	Agri-Food System	Sep-Nov
Water, Land and Ecosystems (WLE)	Global Integrated Program	Sep-Nov
Rice	Agri-Food System	Sep-Dec
Roots, Tubers and Bananas (RTB)	Agri-Food System	Sep-Dec
Policies, Institutions and Markets (PIM)	Global Integrated Program	Sep-Dec

Note: this working schedule may be modified. When submitting an Expression of Interest, consultants are advised to indicate a range of dates for which they are available for conducting the reviews. The schedule for all 12 reviews spans April to December 2020, with an anticipated duration of 11 weeks for each review. The final three reviews will begin in late September, to conclude by mid-December.

Annex 2: CRP-Specific Methodology

Note from section 2.1.3.2 Research outputs:

In order to assess the quality of selected research publications (highlighted in CRP Annual Reports). The following question is included with a ratings scale:

Criterion	Ratings
Do the results (knowledge) presented in the paper represent broadly applicable knowledge (International Public Goods) relevant to the objectives of the specific CRP?	0= results not relevant to agriculture and climate change 1=no broader applicability (local relevance only) 2= potentially broader applicability, but not spelled out 3= broader applicability is presented 4= significant international applicability

Source: CAS evaluation guidelines (1 Sept 2020) Table 3

Annex 3: List of Documents Reviewed

Project documents and data:

RTB Minutes of meetings of the Independent Steering Committee (2017-2019)

RTB Minutes of meetings of the Research Management Committee (2017-2019)

RTB (2016) CRP Roots, Tubers and Bananas Proposal 2017-2022. Vol. I.

RTB (2016) CRP Roots, Tubers and Bananas Proposal 2017-2022. Vol. II.

RTB (2016) CRP Roots, Tubers and Bananas Proposal 2017-2022. Vol. III.

RTB (2017) Annual Report

RTB (2018) Annual Report

RTB (2019) Annual Report

RTB (2017) Plan of Work and Budget

RTB (2018) Plan of Work and Budget

RTB (2019) Plan of Work and Budget

RTB Bibliometric data – pre-analyzed by CAS

RTB Database of Results – through Dashboard data pre-analyzed by CAS

RTB OICR reports

Background Documents:

Alston, J., Pardey, P. D. and Rao, X. (2020) The pay-off to investing in CGIAR research. SoAR Foundation.

CGIAR (2016) Strategy and Results Framework 2016-2030.

Douthwaite, B. (2020) Mainstreaming of biofortification in the African Union: Evaluation of CGIAR contributions to a policy outcome trajectory. CGIAR Research Programs on Roots, Tubers and Bananas & Agriculture for Nutrition and Health: Lima, Peru.

Holland, G., Castillo, G. E., van Hemelrijck, A. and Newman, D. (2019) CGIAR 2030 Plan – Review of CGIAR Research Program and Platform Modalities. Collaborative Impact and Matter.

EiB (2020) Key actions taken in response to Crops to End Hunger: EiB Special Report to the CGIAR System Management Board, May 2020.

IEA (2016) Evaluation of CGIAR Research Program on Roots, Tubers and Bananas (RTB) Volumes I, II, III. Rome, Italy: Independent Evaluation Arrangement (IEA) of the CGIAR

IEA (2017) Workshop on Development, Use and Assessment Of ToC In CGIAR, Research Report Rome 12-13 January 2017

ISPC (2016) Assessment of the Roots, Tubers and Bananas (RTB) CRP-II revised proposal (2017-2022)

ISDC (2020) Quality of research for development (Qo4RD) in the CGIAR context

Journal Articles General:

Netsayi N. Mudege, Norita Mdege, Putri E. Abidin & Sandra Bhatasara (2017) The role of gender norms in access to agricultural training in Chikwawa and Phalombe, Malawi. *Gender, Place & Culture,* 24, 1689-1710

Price, E.J., Drapal, M., Perez-Fons, L. *et al. (*2020*)* Metabolite database for root, tuber, and banana crops to facilitate modern breeding in understudied crops*. Plant Journal* 101*,* 1258–1268*.*

Ramcharan A, Baranowski K, McCloskey P, Ahmed B, Legg J and Hughes DP (2017) Deep Learning for Image-Based Cassava Disease Detection. Front. Plant Sci. 8:1852.

Journal Articles from OICR Analysis:

Blomme, G. Ocimati, W. Sivirihauma, C. Vutseme, L. Mariamu B. Kamira, M. van Schagen, B. Ekboir, J. and Ntamwira, J. (2017). A control package revolving around the removal of single diseased banana stems is effective for the restoration of Xanthomonas wilt infected fields. *European Journal of Plant Pathology,* 149(2). https://dx.doi.org/10.1007/s10658-017-1189-6

Blomme, G., Ocimati, W., Sivirihauma, C., Vutseme, L., Mariamu, B. and J. Ntamwira. (2018). Controlling Xanthomonas wilt of banana: Influence of collective application, frequency of application, and social factors on the effectiveness of the Single Diseased Stem Removal technique in eastern Democratic Republic of Congo. *Crop Protection* 118, 79-88.

Kikulwe, E., Okurut, S., Ajambo, S., Gotor, E., Ssali, R., Kubiriba, J. and E. Karamura. (2018). Does gender matter in effective management of plant disease epidemics? Insights from a survey among rural banana farming households in Uganda. Journal of Development and Agricultural Economics, 10(3), pp. 87-98. https://dx.doi.org/10.5897/JDAE2017.0877

Iradukunda, F., Bullock, R., Rietveld, A. and B. van Schagen. (2019). Understanding gender roles and practices in the household and on the farm: Implications for banana disease management innovation processes in Burundi. *Outlook on Agriculture*, 48(1), pp. 37-47. https://dx.doi.org/10.1177/0030727019831704.

Tinzaara, W., Ssekiwoko, F., Kikulwe, E. and E. Karamura. (2019). Effectiveness of learning and experimentation approaches for farmers as a community-based strategy for banana Xanthomonas wilt management. *Journal of Agricultural Extension and Rural Development*, 11(7), pp. 128-138. https://dx.doi.org/10.5897/JAERD2018.1000

Kikulwe, E., Kyanjo, J., Kato, E., Ssali, R., Erima, R., Mpiira, S., Ocimati, W. et al. (2019). Management of Banana Xanthomonas Wilt: Evidence from Impact of Adoption of Cultural Control Practices in Uganda. Sustainability, 11(9), pp. 1-18. [https://dx.doi.org/10.3390/su11092610

Ntamwira, J., Blomme, G., Bahati, L. and W. Ocimati. 2019). Effect of timing of diseased plant cutting, altitude and banana cultivar on efficacy of singly removing Xanthomonas wilt infected banana plants. *European Journal of Plant Pathology*, 154(1), pp. 477-489. https://dx.doi.org/10.1007/s10658-019-01671-9

Ocimati, W., Nakato, G.V., Fiaboe, K.M., Beed, F. and G. Blomme. (2015) Incomplete systemic movement of *Xanthomonas campestris* pv. musacearum and the occurrence of latent infections in xanthomonas wilt-infected banana mat. Plant Pathology 64(1) p. 81-90 ISSN: 1365-3059 https://doi.org/10.1111/ppa.12233F

Kawarazuka, N., Damtew, E., Mayanja, S., Okonya, J. S., Rietveld, A., Slavchevska, V. and B. Teeken. (2020) A Gender Perspective on Pest and Disease Management from the Cases of Roots, Tubers and Bananas in Asia and Sub-Saharan Africa. *Frontiers in Agronomy* 2: 7 doi: 10.3389/fagro.2020.00007

Dung Phuong Le et al (2019) Characterization of Cassava Production Systems in Vietnam. CIAT Publication No. 480, August 2019

Labarta, R., Wossen, T., Phuong Le, D. (2017) The Adoption of Improved Cassava Varieties in South and South East Asia, The 9th ASAF International Conference in Agriculture and food economy in Asia, 11-13 January 2017, Bangkok, Thailand (SPIA supported study)

Phuong Le, D., Labarta, R., and Meridia, M.K. (2017) Analysis of cassava varietal adoption in Vietnam using DNA fingerprinting approach, Vietnam Economist Annual Meeting, 2017

*Does not include publications, technical reports, or communication documents listed in Annex 6.

Annex 4: List of Persons Interviewed

Person	Affiliation	Role in RTB	Sex
1. Conny Almekinders	WUR, Netherlands	FP2 CC2.1 Co-leader	F
2. Maria Andrade	CIP, Mozambique	FP2 Leader	F
3. Jorge Andrade	CIP, Peru	FP2 CC2.1 Co-leader	M
4. Luis Agusto Beccera	CIAT, Colombia	FP1 Leader; CFP, CIAT	M
5. Guy Blomme	Bioversity Alliance, Ethiopia	FP3 BA3.3 Leader, BXW OICR	M
6. Erick Boy	IFPRI, USA	HarvestPlus, A4NH	M
7. Dominique Dufour	CIRAD, France	CFP, CIRAD	M
8. Chiedozie Egesie	National Root Crops Research Institute and IITA, Nigeria	Cassava research - Nigeria	M
9. Karen Garret	University of Florida, USA	ARI Partner	F
10. Michael Friedmann	CIP, Peru	Science Officer	M
11. Michael Hauser	IITA, Switzerland	FP3 CC3.2 Leader	M
12. Simon Heck	CIP, Uganda	Former FP4 Leader and Program leader	M
13. Irene Kernot	ACIAR, Australia	Funder	F
14. Bettina Heider	CIP, Peru	CFP, CIP	F
15. Enoch Kikulwe	Bioversity International, Uganda	BXW OICR	M
16. Dung Phuong Le	CIAT, Vietnam	Cassava research - Vietnam	F
17. Jerome Kubiriba	NARO, Uganda	NARs partner; Banana program leader	M
18. James Legg	IITA, Tanzania	FP3 Leader; CFP, IITA	M
19. Hannele Linqvist-Kreuse	CIP, Peru	FP1 D1.1 Leader	F
20. Jim Lorenzen	BMGF, USA	Funder	M
21. George Mahuku	IITA, Tanzania	BXW OICR	M
22. Tawanda Muzhingi	CIP, Kenya	FP4 Leader	M
23. Valentine Nakato	IITA, Uganda	BXW OICR	F
24. Pham Thi Nhan	Hung Loc Agricultural Research and Development Center, Vietnam	Cassava research - Vietnam	F
25. Walter Ocimati	Bioversity International, Uganda	BXW OICR	M
26. Acho Okike	IITA, Nigeria	Project Leader (cassava peels)	M
27. Claudio Proietti	RTB, CIP, Peru	Former Senior Program Manager	M
28. Vivian Polar	RTB, CIP, Peru	Gender Focal Point	F
29. Pieter Pypers	IITA, Tanzania	Project Leader (ACAI)	M
30. Anne Rietveld	Bioversity International, Italy	BXW OICR	F
31. Nicolas Roux	Bioversity Alliance,	CFP, Bioversity Alliance	M
32. David Spielman	IFPRI/ PIM, USA	PIM Cluster co-leader	M

Person	Affiliation	Role in RTB	Sex
33. Marc Schut	IITA, Kenya & WUR, Netherlands	FP5 Leader	M
34. Eugene Terry	TransFarm Africa, USA	ISC Chair	M
35. Graham Thiele	RTB, CIP, Peru	Program Director	M
36. Philip Thornton	ILRI, UK	CCAFS	M
37. Mark Tokula	National Root Crops Research Institute, Nigeria	Cassava research - Nigeria	M
38. Hanna Weberhofer	RTB PMU, Peru	Finance	F
39. Alan Tollervey	DFID, UK	Funder	M
40. Barbara Wells	CIP, Peru	Director General, ISC member	F
Total			F=13 M=27

Annex 5: OICR Study Templates

OICR Banana BXW – Uganda

Ugandan farmers adopting techniques to control *Xanthomonas* wilt of banana (BXW) have restored the productivity of their fields and incomes

CRP, OICR Number & Title: RTB MEL 197 - Ugandan farmers adopting techniques to control *Xanthomonas* wilt of banana (BXW) have restored the productivity of their fields and incomes		
CRP Lead: RTB (FP3 BA 3.3)		
Phases of report: New outcome		
Year reported: 2019	Maturity level: 3	# Years of programmatic work: Basic research – 9 years; research and scaling on management package – 6 years
Geographic location(s): East Africa/Great Lakes: Uganda, DR Congo, Rwanda, Burundi		
Populations covered: Uganda – 600,000; additional scaling activities reached another 64,865 in Uganda, DR Congo, and Burundi; subsistence farmers, commercial farmers, and women		
Key contributors to the outcome		
CGIAR: Bioversity International, IITA		
External main partners: Catholic University of Graben, Belgium; Uganda: CIRAD, NARO; DR Congo: INERA; Burundi: ISABO; Rwanda: RAB; extension services; NGOs; others included CRS, USAID, FAO, BPEAE, IPAPEL, PABU, UBCU		
Links to the CGIAR Strategic Results Framework: sub-IDOs: 3.3.1 Increased resilience of agro-ecosystems and communities, especially those including smallholders; 1.4.2 Closed yield gaps through improved agronomic and animal husbandry practices		
RTB contributions to the outcome		
Innovations: 1. Lessons learned from successful management packages developed for Moko disease in Latin America and Blood disease in SE Asia were successfully applied to BXW in Uganda and DR Congo 2. Further studies on systematic infection of banana found that it was incomplete which rendered complete mat removal (CMR) unnecessary 3. Development of single diseased stem removal (SDSR) and incorporation into the management package including male bud removal and tool sterilization 4. Scaling package with NARs, extension, and NGOs associated with significant capacity development 5. Comprehensive gender research on understanding the role of women in banana production systems and the implications for adoption of the BXW management package		
Policies: 1. Uganda Government law: non-removal of diseased bananas made illegal; fines imposed for non-compliance 2. Rwandan Government: advanced policy dialogue on replacing CMR with SDSR in BXW management package but interrupted by Covid-19. 3. Burundi Government: initial policy dialogue on replacing CMR with SDSR in BXW management package but further experimentation required		
Key CRP publications supporting the OICR: 1. Blomme, G. Ocimati, W. Sivirihauma, C. Vutseme, L. Mariamu B. Kamira, M. van Schagen, B. Ekboir, J. and Ntamwira, J. (2017). A control package revolving around the removal of single diseased banana stems is effective for the restoration of Xanthomonas wilt infected fields. *European Journal of Plant Pathology,* 149(2). https://dx.doi.org/10.1007/s10658-017-1189-6 2. Blomme, G., Ocimati, W., Sivirihauma, C., Vutseme, L., Mariamu, B. and J. Ntamwira. (2018). Controlling Xanthomonas wilt of banana: Influence of collective application, frequency of application, and social factors on the effectiveness of the Single Diseased Stem Removal technique in eastern Democratic Republic of Congo. *Crop Protection* 118, 79-88. 3. Kikulwe, E., Okurut, S., Ajambo, S., Gotor, E., Ssali, R., Kubiriba, J. and E. Karamura. (2018). Does gender matter in effective management of plant disease epidemics? Insights from a survey among rural banana farming households in Uganda. Journal of Development and Agricultural Economics, 10(3), pp. 87-98. https://dx.doi.org/10.5897/JDAE2017.0877 4. Iradukunda, F., Bullock, R., Rietveld, A. and B. van Schagen. (2019). Understanding gender roles and practices in the household and on the farm: Implications for banana disease management		

innovation processes in Burundi. *Outlook on Agriculture*, 48(1), pp. 37-47. https://dx.doi.org/10.1177/0030727019831704.
5. Tinzaara, W., Ssekiwoko, F., Kikulwe, E. and E. Karamura. (2019). Effectiveness of learning and experimentation approaches for farmers as a community-based strategy for banana Xanthomonas wilt management. *Journal of Agricultural Extension and Rural Development*, 11(7), pp. 128-138. https://dx.doi.org/10.5897/JAERD2018.1000
6. Kikulwe, E., Kyanjo, J., Kato, E., Ssali, R., Erima, R., Mpiira, S., Ocimati, W. et al. (2019). Management of Banana Xanthomonas Wilt: Evidence from Impact of Adoption of Cultural Control Practices in Uganda. Sustainability, 11(9), pp. 1-18. [https://dx.doi.org/10.3390/su11092610
7. Ntamwira, J., Blomme, G., Bahati, L. and W. Ocimati. 2019). Effect of timing of diseased plant cutting, altitude and banana cultivar on efficacy of singly removing Xanthomonas wilt infected banana plants. *European Journal of Plant Pathology*, 154(1), pp. 477-489. https://dx.doi.org/10.1007/s10658-019-01671-9
8. Ocimati, W., Nakato, G.V., Fiaboe, K.M., Beed, F. and G. Blomme. (2015) Incomplete systemic movement of Xanthomonas campestris pv. musacearum and the occurrence of latent infections in xanthomonas wilt-infected banana mat. Plant Pathology 64(1) p. 81-90 ISSN: 1365-3059 https://doi.org/10.1111/ppa.12233
9. Kawarazuka, N., Damtew, E., Mayanja, S., Okonya, J. S., Rietveld, A., Slavchevska, V. and B. Teeken. (2020) A Gender Perspective on Pest and Disease Management from the Cases of Roots, Tubers and Bananas in Asia and Sub-Saharan Africa. *Frontiers in Agronomy* 2: 7 doi: 10.3389/fagro.2020.00007

OICR relationship with CGIAR cross-cutting issues: YES

Capacity development

There was significant capacity development of extension agencies and NGOs in the BXW management package; for example, the scaling component reached 450 extension staff in Uganda, Burundi, and DR Congo. This enabled capacity development of hundreds of thousands of farmers, both men, and women. A solid understanding of the technologies helps farmers to benefit more. Farmer Learning Groups were used in some countries. Other training aids were
Factsheets in 3 different languages; two radio messages (theatrical) and a song which were broadcasted on 2 popular local radio stations and a video. In Uganda, on average, farmers received two trainings on BXW in five years, but BXW control package adopters received significantly more trainings compared to partial adopters. A significantly larger percentage of households adopted three practices when a woman was trained in BXW control. Farmers trained in BXW management obtain on average 176% more value of matoke production when they adopt all three practices compared to 113% for those who were not trained but adopted the three practices. There were large positive and significant benefits (216%) for trained farmers in terms of value of all banana production when they moved from non-adoption to adoption of all three practices compared to that (101%) for non-trained farmers. The positive effect of training women can be attributed to the fact that they are more engaged in day-to-day management of banana plantations, and therefore, their participation in training increases the probability of adoption. Hence trainings should be more women inclusive. Capacity building in parts of Eastern DR Congo was less effective due to violence and Ebola.

Climate change

Although climate change was not looked at directly, various aspects of the problem and the research relate to climate change. Altitude can be used as a proxy for climate change. Control methods at lower altitude need to be modified due to higher insect activity. Insect vectors spread the bacteria from infected plants – higher transmission levels. Hence male bud removal becomes more important at lower altitudes. This may also be the case at higher altitudes with climate change. The issue is also complicated by banana variety – cultivars with persistent male bracts have less insect load hence less trouble with transmission of virus. Additionally, removal of infected plants affects the environment and ecosystem services. Removal reduces carbon sequestration and can also result in erosion which affects watercourses etc.

Gender

In order to assess the role of women in managing BXW, it is necessary to understand the role of women in banana production systems. As women (except widows) do not usually own land, their role in management of BXW is often subsidiary to the role of men. In Uganda, Kikulwe et al (2018) found that men rated cutting down of infected plants to be more effective than women, but tissue culture, removal of male buds, and disinfecting of farm tools were perceived to be equally effective by both men and women. More importantly, the study found both gender and farmer perceptions on BXW control to significantly affect adoption of BXW control practices and household food security. For better and sustainable management of plant epidemics in Uganda, it is therefore critical that existing gender-

based and underlying perception constraints are addressed. In Burundi, Iradukunda et al (2019) found that men gain higher levels of access to information in Farmer Learning Groups than women and men are also primarily responsible for implementing SDSR, reflecting gender-differentiated norms, roles, and practices that are common in the household and in banana-based farming systems. Although women's participation in FLGs was lower, at least the learning increased the potential of women to implement parts/all of the SDSR package. Iradukunda et al found that gender norms, roles, and practices significantly influence uptake of SDSR practices and warrant further investigation across the region, where smallholder uptake remains a pressing challenge to establish household food security. Overall, the role of gender in banana production can influence the uptake and application of BXW control measures. There are limitations in applying control measures due to male and female issues.

Youth
As youth do not normally own land, they do not farm bananas.

Key implementing organization: Bioversity International

External partners related: Partners are mentioned above

Partnerships:
RTB's engagement with most key partners was in capacity building for implementation of the management package for BXW
NARs and Extension services: capacity building of NARs and Extension services in four focus countries involved familiarization with the three-part control package and methods of dissemination. The success of this exercise is borne out by the uptake of the management package by farmers as noted above. This also reinforces the view that the expectations of these key partners were met. Methods of dissemination included Farmer Learning Groups, Fact sheets, radio broadcasts, songs, and videos. A partner project ICT4BXW developed an app to support decision-making on BXW control for Rwanda. It has been tested with extension officers in the project sites and is available in the android/apple play-stores.
Additional engagement was with policymakers in Uganda and Rwanda. In Rwanda, trials for testing different BXW control packages (Single diseased Stem Removal (SDSR) and Complete Mat Uprooting (CMU)) were conducted in order to generate evidence in favor of SDSR for presentation to RAB and Ministry of Agriculture Rwanda. Control packages were assessed on basis of effectiveness and labor time/costs associated with the control. Policy approval has been delayed by Covid-19.

Brief reviewer's description of the outcome (based on OICR report, documents cited, original data collected/interviews, and other references)
A quantitative survey of 1,224 farmers in Uganda was conducted to estimate the adoption of control methods for banana *Xanthomonas* wilt (BXW)(Kikulwe et al., 2019: doi.org/10.3390/su11092610) The study found that farmers are widely adopting technologies that came from RTB research. The study estimated adoption for three BXW control methods: a) removing the male flower bud that attracts insect vectors; b) cutting down diseased plants and mats, and c) disinfecting metal tools with fire or a sodium hypochlorite solution. This first nationally relevant study on the adoption of BXW control practices in Uganda found that 600,000 out of 800,000 banana farmers have adopted at least some of the BXW control practices. 70% of adopters adopted cutting of single diseased stems, either alone or in combination. Adopting all three control practices was more profitable than using just one or two. Adoption of the whole control package increased the value of surveyed farmers' banana production by $462 per ha, while adopting just two practices improved the value of banana production by $343 per ha. Adoption was higher on subsistence farms vs commercial farms while productivity and economic benefits were higher on larger farms.

Analysis
The BXW management study is mapped to FP 3 BA 3.3 which aims to develop approaches, detection tools, and holistic and cost-effective practices for managing and containing BXW (and other diseases), one of the damaging threats to banana production in East Africa and the Great Lakes region where banana is a staple food crop. During the course of development of the three-part management package, progress was mapped to the impact pathway. In this respect, it contributes to sub-IDO 3.3.1 Increased resilience of agro-ecosystems and communities, especially those including smallholders. The scientific basis of the management package is founded on proven control packages developed for two other similar bacterial diseases of banana: Moko in Latin America and Blood in SE Asia. The innovative modification for BXW was based on further research to show that the bacteria was not systemic in the whole banana mat which enabled SDSR with on-going monitoring to replace CMR hence less loss of production but effective control. Scientific credibility is well-demonstrated by the approach – apply proven methodology and modify it to fit the specific circumstances in East Africa and the Great Lakes region. Scientific legitimacy is demonstrated by the extensive and strong partnerships established during the dissemination phase and recognition of these partners in outputs from the projects.

Furthermore, on-going monitoring of uptake of the package by farmers revealed some concerns about the tool sterilization component of the package – specifically, that heat sterilization damaged cutting tools. Additional research is underway to address this issue before there is a level of disadoption which would negatively affect the full management package.
Conclusions The BXW OIRC clearly shows how an effective management package for a serious banana disease can contribute to increasing smallholder farmers' incomes for poverty reduction and sustainability of banana production systems. To date, an adoption study has only been carried out in Uganda. It would be useful to do further studies in DR Congo, Rwanda, and Burundi where a scaling study has been successful in reaching almost 65,000 additional farmers. Furthermore, opportunities are being sought to spillover the modified management package back to Latin America (Colombia) and SE Asia (Philippines) where SDSR could replace CMR to address the issue of reductions in banana production through complete removal of banana plants. Two main assumptions were made: NARs and extension services would have adequate resources to effectively support the dissemination and sustainable management of the disease would results in higher profitability for smallholder farmers. With respect to the first assumption: significant capacity development was necessary to enable NARs and extension services to effectively support dissemination – these resources were provided by RTB. With respect to the second assumption: the adoption study in Uganda showed measurable increases in the profitability of banana production through adoption of the management package. Lessons learned: 1. Improved understanding of the role of women in banana production systems was necessary to improve the inclusion of women's needs in the management strategies for BXW. 2. Heat sterilization of tools can cause damage. Improved methods are needed. 3. Support of national governments and policy change is necessary to support NARs and extension services to disseminate the management package 4. Community-based management had value beyond increased production as it gave recognition to women and built cohesion within the community.

OICR Cassava - Nigeria

OICR Number & Title MEL ID 78 Adoption of improved cassava varieties in Nigeria gives 64% productivity gain as a result of adoption of improved cassava varieties		
CRP Lead: Tesfamicheal Wossen		
Phases of report (new/updated same level/updated new level of maturity): New		
If for Innovations at Level 4 or Policies at Levels 2 and 3		
Year reported: 2017	Maturity level: not assigned in 2017	# Years of programmatic work: 1 in phase II
Geographic location(s): Nigeria		
Populations covered, Estimated 3.1 million male and female subsistence and small farmers. Geographical overage: 16 states that contribute at least 80% of the total production of cassava		
Key contributors to the outcome		
RTB/IITA with links to Nextgen and Basics programmes		
External partners: Agricultural Research Council of Nigeria, National Root Crops Research Institute - ARCN-NRCRI, Federal Ministry of Agriculture and Rural Development - FMARD, Nigeria		
Links to the CGIAR Strategic Results Framework: (IDOs and sub-IDOs) 1.4.3 - Enhanced genetic gain; 1.4.2 - Closed yield gaps through improved agronomic and animal husbandry practices		
[CRP] contributions to the outcome *(list any of the following)*		
Innovations – no		
Policies - not documented		
• Wossen, T., G. Girma, T. Abdoulaye, I. Rabbi, A. Olanrewaju, J. Bentley, A. Alene, S. Feleke, P. Kulakow, G. Asumugha, A. Abass, M. Tokula, and V. Manyong. 2017. The cassava monitoring survey in Nigeria final report. IITA, Ibadan, Nigeria. • Wossen, T., T. Abdoulaye, A. Alene, S. Feleke, I. Rabbi, G. Asumugha, P. Kulakow, and V. Manyong. 2017. Impact of improved cassava varieties in Nigeria final report. RTB / IITA, Ibadan, Nigeria		

- ISPC. (2018). What is the True Impact of Improved Cassava Varieties in Nigeria?, Brief N. 64. Rome: Independent Science and Partnership Council.

OICR relationship with CGIAR cross-cutting issues

Capacity development YES

Climate change NO

Gender YES

Youth NO

Organization responsible for OICR (CGIAR/not CGIAR),
CGIAR: RTB, IITA, PIM

External partners related
National Root Crops Research Institute

Partnerships
Key partners ([CRP]'s engagement with each partner, and extent to which partner expectations/needs were met or not)
National Root Crops Research Institute (NRCRI) – Jointly designed and implemented the survey, IITA has supplied the technical knowledge and resources for the DNA study and has also assisted with the mass production of plantlets, development of new tissue culture methods, and provided knowledge on cassava crop production and breeding.

Brief reviewer's description of the outcome (based on OICR report, documents cited, original data collected/interviews, and other references)
The survey using DNA fingerprinting was designed to show the rate of adoption of improved varieties across 80% of the production areas of Nigeria. At the same time, a large-scale socio-economic survey was carried out with 2,500 households to understand farmers' perceptions of their varieties, gender-differentiated crop trait preferences, market imperfections (labor, credit, and information), and heterogeneity in plot management. The results showed that 60% of farm households have adopted improved cassava varieties (higher for men; 62% - and lower for women; 49%). The self-reported classification between improved and traditional varieties is widely inaccurate and the use of inputs to maximize crop performance of improved varieties is therefore frequently used on the wrong type of crop. Trait preferences varied widely by region and by gender – asking for trait preference from only the household head does not cover the traits that are most important to women.

Analysis
Mapping of the outcome to the CRP/Flagship ToC.
The work with IITA and RTB contributes to the outcome "national agencies and seed firms release and promote end user demanded varieties".
The work is part of FP2; CC2.1: Access to quality seed/varieties and CA2.3: Added-value cassava varieties.
How does it fit into the narrative of the ToC?
Within the FP2 ToC, the work primarily contributes to the research outcome – "NARS and private sector breeders are developing, selecting and releasing RTB hybrids and varieties with high potential meeting end user needs." This has contributed in turn to several development outcomes, "increased opportunities to generate income", "farmers have access to seed", "farmers sustainably engaged in integrated production systems" and "expanded market opportunities". Higher-level links are noted above.
According to the RTB AR 2017, DNA-fingerprinted adoption data revealed that about 66% of cassava growers adopted improved cassava varieties. Adoption of improved varieties is associated with an 82% increase in yield (http://hdl.handle.net/10568/80706). Using a poverty line of USD 1.9 per person per day at purchasing power parity, adoption has led to a 4.6% poverty reduction implying that 7.5% of the rural poor cassava producers escaped poverty due to adoption of improved varieties, representing about 2 million individuals (RTB report under publication).
Analysis of the reported outcome/impact, using the evaluation criteria of quality of science and effectiveness (also using findings from document review and/or interviews with key informants).
The widespread misclassification by farmers of their planting material raises many important issues that are being addressed by the RTB/IITA, the NRCRI, and government at the policy level. These issues and solutions include:
How to ensure that planting material in the market is correctly classified
- Education of farmers about the differences between varieties
- Developing nationwide common names for varieties to avoid duplication and confusion
- Tracking seed from producer to grower (through the seed tracker tool)

How to ensure the development of a sustainable market for high-quality seed
- Ensuring the quality of early generation planting material at the level of the research institute

• Revising seed regulations to recognize the different technical and market requirements of clonal crops from cereal crops such as maize. • Assisting the development of commercial seed producers (entrepreneurs) at village level. • Raising awareness of the value of improves seed in terms of yield and profitability for the grower. • Ensuring that varieties that reach the market carry the traits needed by all actors in the value chain.
Conclusions The survey shows a 66% adoption of new varieties with a 64% increase in yield when treated optimally. It showed that 3.1 million male and female subsistence and small farmers had benefitted from improved varieties and that adoption has led to a 4.6% poverty reduction implying that 7.5% of the rural poor cassava producers escaped poverty due to adoption of improved varieties, representing about 2 million individuals. Although apparently quite a straightforward survey, it revealed and highlighted many aspects of cassava production in Nigeria that needed attention: • Farmers are unaware of what varieties they are growing and widely misclassify traditional varieties as improved and vice versa. • The seed supply chain is weak and does not provide good quality seed • The seed regulations did not operate in the interests of a thriving seed market • Farmers were wasting money on inputs for traditional varieties with low yield potential and, conversely, not applying inputs on improved varieties that would increase profitability • The best varieties (as defined by testing AND the market) must be multiplied in sufficient quantities to meet the demand. RTB/ IITA together with national organizations and international programmes (including Basics and Nextgen) are working together to improve the provision of clean seed of improved varieties. Example questions: To what extent does the OICR represent the application of the CRPs research to developmental outcomes?

5.3 OICR Cassava - Vietnam

The report covers the overall program covering the Adoption of improved CIAT-related cassava varieties in South and Southeast Asia.

The specific work covered in the OICR is a DNA fingerprinting approach for the analysis of varietal adoption in a national representative survey of cassava crops growing in Vietnam.

OICR Number & Title MEL ID 127 Adoption estimates of improved cassava varieties in nine countries in South and Southeast Asia indicate that 2.7 million hectares are grown using CIAT-related varieties		
CRP Lead: Dung Phuong Le		
Phases of report (new/updated same level/updated new level of maturity): *New*		
If for Innovations at Level 4 or Policies at Levels 2 and 3		
Year reported: *2018*	Maturity level: *3*	# Years of programmatic work: DNA survey 2 years – 2015-2016. Adoption work from 1993 to present.
Geographic location(s): South and Southeast Asia		
Populations covered, estimated size and socio-demographic categories: subsistence and small farmers 2.7 million hectares of cassava production in South and SEA. In Vietnam: 1 million employed on crop (2014, FAOSTAT) of 532,000 ha., (2017, Vietnam General Statistics Office)		
Key contributors to the outcome		
CGIAR: RTB Flagship 5, SPIA, CIAT		
External partners: Michigan State University		
Links to the CGIAR Strategic Results Framework: (IDOs and sub-IDOs) Major contribution to SLO 1: Reduced Poverty through: IDO 1.3 Increased income and employment (Sub IDO 1.3.1 Diversified enterprise opportunities) IDO 1.4 Increased productivity (Sub IDO 1.4.3 Enhanced genetic gain) IDO C.1 Enabling environment improved (Sub IDO C.1.3 Conducive agricultural policy environment)		
[CRP] contributions to the outcome *(list any of the following)*		

Innovations No
Policies No formal policies are connected to this OICR under RTB phase II
Key CRP publications supporting the OICR: Characterization of Cassava Production Systems in Vietnam Dung Phuong Le et al, CIAT Publication No. 480, August 2019 The Adoption of Improved Cassava Varieties in South and Southeast Asia, Labarta, R., Wossen, T., Phuong Le, D., The 9th ASAF International Conference in Agriculture and food economy in Asia, 11-13 January 2017, Bangkok, Thailand (SPIA supported study) Phuong Le, D., Labarta, R., and Meridia, M.K., Analysis of cassava varietal adoption in Vietnam using DNA fingerprinting approach, Vietnam Economist Annual Meeting, 2017
OICR relationship with CGIAR cross-cutting issues (YES/NO)
Capacity development YES
Climate change YES (as part of the socio-economic study – but minor)
Gender YES (as part of the socio-economic study)
Youth YES (as part of the socio-economic study)
Organization responsible for OICR RTB, CIAT SPIA
External partners related: Michigan State University
Partnerships Key partner: Hung Loc Agricultural Research and Development Center (HLARDC), Dong Nai, Vietnam All expectations were met: • Joint planning and implementation of the survey with HLARDC and other Vietnam government organizations. • Results showed for the first time the true distribution of cassava varieties in Vietnam • Better understanding of the spread of varieties through formal and informal seed distribution • Socio-economic data collection at the same time as the variety survey. Key results of survey: • Adoption of new improved varieties is very high and spread is very fast • Results showed that previous estimates of variety areas were substantially wrong • Average yields were 21 tonnes/ha • Socio-economic data revealed that 260man days labor is required for 1 ha
Description of the outcome Adoption estimates of improved cassava varieties indicate that out of 4.1 million of hectares of cassava production targeted in nine countries of South and SE Asia, 2.7 million (68%) are grown using CIAT-related varieties. However, the level of adoption of varieties varies from country to country implying different levels of success of different cassava genetic improvement programs in the region. By integrating DNA fingerprinting approach in a national representative survey in Vietnam, it was reported that most cassava grown in Vietnam has a CIAT pedigree. (http://www.rtb.cgiar.org/2016-annual-report/assessment-reveals-that-most-cassava-grown-in-vietnam-has-a-ciat-pedigree/)
Analysis *Mapping of the outcome to the CRP/Flagship ToC*: The work with CIAT and RTB contributes to the outcome "national agencies and seed firms release and promote end user demanded varieties". The work is part of FP2; CC2.1: Access to quality seed/varieties and CA2.3: Added-value cassava varieties. *How does it fit into the narrative of the ToC:* Within the FP2 ToC the work primarily contributes to the research outcome – "NARS and private sector breeders are developing, selecting and releasing RTB hybrids and varieties with high potential meeting end user needs." This has contributed in turn to several development outcomes, "increased opportunities to generate income", "farmers have access to seed", "farmers sustainably engaged in integrated production systems" and "expanded market opportunities". Higher-level links are noted above. *Analysis of the reported outcome/impact, using the evaluation criteria of quality of science and effectiveness (also using findings from document review and/or interviews with key informants).* The DNA fingerprinting study was carried out combining the skills of RTB socio-economists in partnership with the national technical experts from HLARDC. The results were published in Vietnam and CIAT publications. The results have been accepted by the Vietnamese government authorities and contribute

to policy-making. The wider adoption survey has also been the subject of a SPIA impact study. The wider benefits of the DNA study include:

- They reveal that DNA fingerprinting is an accurate and practical method for identifying crop varieties where this is not known from certification and seed sales records
- They confirm the RTB germplasm as one of the major sources of increased productivity and income.
- The socio-economic data will be used as a baseline to measure the impact of new varieties in the future.

The long-standing relationship with RTB/CIAT has enabled RTB to respond quickly to the spread of cassava mosaic disease (CMD) in South and SE Asia through the provision of policy advice to National governments regarding mitigation mechanisms and launching a rapid program to identify resistant germplasm from the region and the collections of CIAT and IITA. This germplasm is already being incorporated into RTB crossing programs and national breeding programs.

Conclusions

- The OCIR provides strong evidence of RTB research for impact in Asia. The breeding programs and dissemination efforts have resulted in an enormous adoption of CIAT related cassava varieties in the region.
- The long-term presence of CIAT and close relations with local partners in the region has enabled a rapid response by RTB/CIAT and national authorities to CMD
- It is not clear why CMD has spread to South and SE Asia during the last 5-10 years. It is possible that this is linked in some way to the susceptibility of CIAT germplasm. Lessons could be learned if this question could be answered including to ensure that the principle of "do no harm" is not compromised by the introduction and rapid uptake of germplasm.
- Several SE Asian countries have developed major starch industries based on cassava production as a result of the introduction of RTB/CIAT germplasm. This has major socio-economic effects on the rural population and introduces many issues for trade policy in the region. The introduction of CMD adds many complications to these relationships

Annex 6: Bibliometrics and Altmetrics

Annex 6a. Number of RTB Peer-reviewed Publications 2017-2019

Year	Peer-reviewed	Open access	ISI
2017	132	103 (78%)	110 (83%)
2018	152	118 (78%)	132 (87%)
2019	150	128 (85%)	144 (96%)

Source: RTB Annual Reports 2017-2019

Note: Number and % of peer-reviewed publications in ISI journals and Open access on a steady upward trend – improving year on year

Annex 6b. Analysis of RTB Peer-reviewed Articles in ISI Journals, 2017-2019

All 2017-2018 articles with 5 or more citations; all 2019 articles with 2 or more citations; all articles with more than Altmetrics of >10

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Karp, D. S., Univ. California, Davis, USA	Proceedings of National Academy of Sciences 2018	Crop pests and predators in the landscape	9.4	25	122/188	>100 authors from ARIs, Univ. and CIAT	4
Wylie S. J., Murdoch University, WA, Australia	Journal of General Virology 2017	ICTV Virus taxonomy profile: Potyviridae	3.4	20	264/4	12 authors from ARIs, Univ., NARs and CIP	4
Jones, S. D., Univ. Michigan, USA	Journal of Nutrition 2018	On-farm crop species richness and dietary diversity and quality	4.3	(1680 cits)	80/34	1 author from Univ.	3
Hickey, J. M., Roslin Institute, UK	Nature Genetics 2017	Genomic prediction platforms for biological discovery	28.0	33	72/93	>20 authors from ARIs, Univ. and Bioversity, CIMMYT, ICRISAT, ICRAF, ICARDA, ILRI, World Agroforestry, and World Fish	3
Krupovic, M. J., Institut Pasteur, France	Archives of Virology 2018	Viruses of Archaea	2.3	52	79/28	5 authors from Institut Pasteur and NCBI, USA	3
Zheng, Y., Boyce Thompson Institute, USA	Virology 2017	VirusDetect: an automated pipeline for virus discovery	2.8	37	56/63	8 authors from ARIs, Univ. and CIP	3
Low, J. W., CIP, Kenya	Global Food Security 2017	Tackling Vitamin A deficiency with biofortified sweet potato	6.0	10**	59/45	4 authors from CIP; 1 from IFPRI	4
Fleisher, D., USDA-ARS, USA	Global Change Biology 2017	Potato model across climates and productivity levels	8.9	22	45/10	>20 authors from ARIs, Univ. and CIP	3
Ramcharan, A., Penn State University, USA	Frontiers in Plant Science 2017	Image-based cassava disease detection	4.4	(250 cits)	126/99	6 authors from ARIs and IITA	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Rojas, M. R., Univ. California, Davis, USA	Annual Review of Phytopathology 2018	World Management of Geminiviruses	10.4	(3241 cits)	52	>20 authors from ARIs, Univ., NARs and IITA	4
Lachat, C., Ghent Univ., Belgium	Proceedings of National Academy of Sciences 2018	Dietary species richness and nutrition	9.4	42	45/91	16 authors from ARIs, Univ. and Bioversity	2
Prentice, K., Ghent Univ., Belgium	Pest Management Science 2017	RNA-based gene silencing against sweet potato weevil	3.8	5	50	8 authors from ARIs, Univ. and CIP	3
Mostert, D., Univ Stellenbosch, South Africa	PLoS One 2017	Distribution and host range Fusarium wilt fungus in Asia	2.7	7	56	14 authors from ARIs, Univ., NARs, private sector, and Bioversity	3
Tripathi, J. N. IITA, Kenya	Communications Biology 2019	Endogenous BSV in Musa spp. genome	12.1	19	28/197	6 authors from IITA and Univ. California, Davis	2
Raymundo, R., Kansas State Univ., USA	European Journal of Agronomy 2018	Impact climate change on potato	3.4	11	29/39	8 authors from ARIs, Univ. and CIP	4
Coyne, D., IITA, Kenya	Annual Review of Phytopathology 2018	Plant parasitic nematodes and food security in SSA	10.4	23	43	7 authors from ARIs, Univ. and IITA	3
Rolando, J. L., CIP, Peru	Agricultural Ecosystems & Environment 2017	Ecosystem services, ecological intensification and climate change in the Andes	4.2	6	46	6 authors from ARIs, Univ. and CIP	3
Tamiru, M., Iwate BRC, Japan	BMC Biology 2017	Genome sequencing of white Guinea yam	1.6	16	22/150	>30 authors from ARIs, Univ. and IITA	3
Gitari, H., Univ. Nairobi, Kenya	Field Crops Research 2018	Nitrogen and phosphorus uptake by potato	4.3	7	29	6 authors from Univ. Nairobi and CIP	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Blomme, G., Bioversity, Ethiopia	Frontiers in Plant Science 2017	Bacterial diseases of banana and ensete	4.4	24	49/18	8 authors from ARIs, Univ., Bioversity and CIRAD	3
Cenci, A., Bioversity, France	Frontiers in Plant Science 2017	Evolutionary analyses in angiosperms	4.4	26	29/2	2 authors from Bioversity	2
Massart, S., Univ. Liege, Belgium	Phytopathology 2019	Virus detection through HTP sequencing of RNA	3.0	21	25/20	>20 authors from ARIs, Univ. and CIP	3
Kayondo, S. I., IITA, and NaCRRI, Uganda	Scientific Reports 2018	Genome mapping for CBSD resistance in cassava	4.0	7	19/14	11 authors from NaCRRI, ARIs, and IITA	3
Koeberl, M., Graz Univ. Tech., Austria	Scientific Reports 2017	Indicator species of healthy bananas in Fusarium wilt affected fields	4.0	13	22/11	5 authors from Univ. and Bioversity	2
Raymundo, R., Univ. Florida, USA	Field Crops Research 2017	Performance of SUBSTOR potato model	4.3	11	26	18 authors from ARIs, Univ., NARs and CIP	3
Nzuki, I., Univ. Pretoria, South Africa	Frontiers in Plant Science 2017	QTL mapping for disease and pest resistance in cassava	4.4	8	28/2	13 authors from ARIs, Univ., NARs and IITA	3
Mugdege, N. N., CIP, Kenya	Gender, Place and Culture 2017	Role of gender norms in agricultural training	1.2	13	13/13	4 authors from Univ. and CIP	3
Wosula, E. N., IITA, Tanzania	Genome Biology and Evolution 2017	Genetic diversity among cassava white flies	3.5	?	16/26	4 authors from ARIs, Univ. and IITA	2
Delgado, A., Texas A&M, USA	Plant Methods 2017	Ground-penetrating radar for roots in cassava	3.4	17	20/12	7 authors from Texas A&M, ARI and CIAT	2
Rabbi, I. Y., IITA, Nigeria	The Plant Genome 2017	Genome-wide association mapping of cassava	4.3	20	23/3	10 authors from Cornell Univ. and IITA	3
Schut, M., IITA, Burundi	Experimental Agriculture 2019	Innovation platforms: institutional embedding for agricultural R&D	1.3	25	72/20	7 authors from ARIs, Univ. and IITA	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Wossen, T., IITA	American Journal of Agricultural Economics 2019	Estimating productivity impacts of technology adoption	2.5	14	16/12	8 authors from Univ., ARIs and IITA	3
Neve, P., Rothamstead, UK	Weed Research 2018	Reviewing research priorities in ecology, evolution, and management	2.0	31	20/17	>30 authors from ARIs, Univ. and IITA	3
Maruthi, M. N., NRI, UK	Journal of Phytopathology 2017	Whitefly, farmer practices, and spread of CBSV	1.2	31	12/1	4 authors from IITA and NARs	3
Thornton, P. K., ILRI, Kenya	Agricultural Systems 2018	Framework for priority setting in climate-smart agricultural research	4.2	83	14/30	18 authors from ARIs, Univ. and CGIAR centers	3
Mc Campbell, M., WUR, Netherlands	NJAS WUR J. Life Sciences 2018	BXW: opportunities, challenges, and ICT-control strategies	1.8	?	14/32	4 authors from Univ., ARI, IITA, and Bioversity	3
Groot, J. C. J., WUR, Netherlands	Landscape and Urban Planning 2018	Exploring ecosystems services trade-offs	1.7	31	14	4 authors from WUR	2
Ghislain, M., CIP, Kenya	Plant Biotechnology Journal 2019	Late blight resistance genes from wild species to potatoes	6.3	5	12/480	12 authors from NARs and CIP	3
Pais, M., Sainsbury Lab., UK	BMC Evolutionary Biology 2018	Gene expression for host immunity late blight in potato	3.0	(647 cits)	14/10	10 authors from Univ., ARI and CIP	3
Silva, G., NRI, UK	Analytical Biochemistry 2018	Rapid detection of potyviruses	2.2	6	17/10	7 authors from ARI, NAR, and IITA	3
Price, E. J., Royal Holloway, UK	Metabolomics 2018	Metabolite profiling of yam	3.2	5	12/22	4 authors from ARI and IITA	3
Krueze, J. F., CIP, Peru	Current Opinion in Virology 2017	Utilization of engineered resistance to viruses	5.4	33	15	2 authors from Univ. and CIP	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Thomas-Sharma, S., Kansas State Univ., USA	Phytopathology 2017	Risk assessment framework for seed degenerations	3.2	6	17/22	11 authors from Univ., CIP and IITA	3
Buddenhagen, C. E., Univ. Florida, USA	Phytopathology 2017	Epidemic network analysis for mitigation of invasive pathogens in seed systems	3.2	15	27/15	9 authors from Univ. and CIP	3
Abduraham, A., WUR, Netherlands	Plant Pathology 2017	Molecular characterization of Ralstonia solanacearum in potato	2.2	-	18/16	7 authors from Univ., ARIs and CIP	3
Bubici, G., CNR-IPSP, Italy	Frontiers in Microbiology 2017	Biological control agents against Fusarium wilt of banana	4.2	13	27/14	5 authors from Univ. and IITA	2
Nyine, M., Palacky Univ., Czech Republic	The Plant Genome 2018	Genomic prediction in multiploid banana	4.3	-	19/21	11 authors from Univ. and IITA	
Kubow, S., McGill Univ., Canada	Nutrients 2017	Effects of simulated human digestion of purple-fleshed potato on cancerous cells	4.2	34	17	9 authors from Univ. and CIP	2
Amagloh, F. K., Univ. Develop. Studies, Ghana	Foods 2017	Nutrient and polyphenol contents of sweet potato leaves	3.0	12	23	5 authors from Univ. and CIP	3
Selby, P., Cornell Univ., USA	Bioinformatics 2019	BrAPI – programming interface for plant breeding applications	5.6	45	23/52	>50 authors from ARIs, UNiv., Bioversity, CIP, ICRISAT, IRRI and CIMMYT	3
Alwang, J., Bioversity International, Italy	Agricultural Systems 2019	Pathways from crop research to poverty reduction	4.2	33	17/11	6 authors from ARI, Bioversity, CIP and CIMMYT	3
Sartas, M., WUR, Netherlands	PLoS One 2018	Multi-stakeholder platforms and networks: implications for scaling	2.7	8	13/10	5 authors from Univ. and IITA	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Okeke, U. G., Cornell Univ., USA	Genetics Selection Evolution 2017	Accuracies in genomic prediction models in African cassava	4.0	7	12/3	5 authors from Univ. and IITA	3
Baurens, F. C., CIARD, France	Molecular Biology and Evolution 2019	Recombination in interspecific edible banana genomes	11.1	24	12/11	11 authors from ARI, NAR, and CIRAD	2
Blomme, G., Bioversity, Ethiopia	European J. Plant Pathology 2017	A control package for X wilt of banana	1.8	24	11/18	10 authors from ARI and Bioversity	4
Floro, V. O., Georgetown Univ., USA	Journal of Agricultural Economics 2018	Household determinants of adoption of improved cassava varieties using DNA fingerprinting in Colombia	1.3	?	19/21	5 authors from Univ. and CIAT	3
Quiroz, R., CIP, Peru	European J. of Agronomy 2017	Linking potato models with light reflectance data	3.4	22	10	6 authors from Univ. and CIP	2
Garrett, K. A., Univ. Florida, USA	Phytopathology 2017	Resistance genes in global crop breeding networks	3.2	40	24/37	7 authors from Univ., CIP, IITA and IRRI	3
Kosmowski, F., SPIA, CGIAR, Italy	Experimental Agriculture 2018	Household surveys, DNA fingerprinting in Ethiopia	1.3	6	8/1	6 authors from CGIAR, ARI, NAR, and CIP	3
Siamak, S. B., Isfahan University, Iran	Horticultural Plant Journal 2018	Banana Fusarium wilt control and resistance in banana	1.5	12	21	2 authors from Univ. and Bioversity	2
Price, E. J., Royal Holloway, UK	Food Chemistry 2018	Carotenoid profiling of yams	5.7	5	10	2 authors from Univ., ARI and IITA	2
Okonya, J. S., CIP, Uganda	Int. J. Environ. Res. & Public Health 2019	Pesticide use practices in RTB crops by smallholders	2.9	9	9/52	8 authors from NAR, CIP, and IITA	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Adegonwa, M. O., Federal Uni. Agriculture, Nigeria	Analytical Chemistry 2017	Nutritional and functional properties of plantain flour	6.8	-	9/1	5 authors from Univ. and IITA	2
Masumba, M. A., IITA, Kenya	Theoretical & Applied Genetics 2017	QTL associated with CBSD	3.9	-	9/31	14 authors from Univ., ARIs and IITA	3
Amuge, T., NaCRRI, Uganda	Scientific Reports 2017	Transcriptome analysis of cassava challenged with CBSV	4.0	-	12/22	6 authors from Univ., ARI and IITA	3
Jenkins, M., Montana State, USA	Food Security 2018	Adoption of Vitamin A rich sweetpot. In Mozambique	3.3	-	11/10	4 authors from Univ. and CIP	3
Andrade, M. I., CIP, Mozambique	J. of Agricultural Science 2017	Release of orange flesh sweet potato in Mozambique	0.8	14	10	6 authors from NAR, Univ., CIP	3
Ruas, M., Bioversity, France	Database 2017	MGIS: managing banana genetic resources with high throughput genotyping	2.2	-	10/14	>30 authors from Univ., ARIs and Bioversity	3
Nyine, M., Palacky Univ., Czech Republic	PLoS One 2017	Trait variation and genetic diversity in banana	2.7	-	9/17	9 authors from ARI and IITA	2
Carvajal-Yepes, M., CIAT, Colombia	Science 2019	A global surveillance system for crop diseases	41.8	(298 cits)	21/304	19 authors from ARIs, Univ., CIAT and IITA	4
Girard, A. W., Emory University, USA	The Journal of Nutrition 2017	Promotion of OFSP increased Vitamin A in women	1.2	-	20/16	8 authors from Univ. and CIP	3
Nayawade, S. O., CIP, Kenya	Applied Soil Ecology 2019	Dynamics of soil organic matter fractions and microbial activity in smallholder potato-legume systems	3.6	7	10	5 authors from Univ. and CIP	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Gomez Selvaraj, M., CIAT, Colombia	Plant Methods 2019	A1 powered banana disease and pest detection	3.2	22	10/256	7 authors from Univ., CIAT and Bioversity	3
Wossen, T., IITA	Journal of Agricultural Economics 2019	Poverty reduction from technology adoption: cassava in Nigeria	1.3	14	9/12	6 authors from IITA	3
Cormier, F., CIRAD, France	Theoretical & Applied Genetics 2019	Reference high-density genetic map of yam	3.9	7	9/4	9 authors from CIRAD	3
Aregbesola, O. Z., Univ. Catania, Italy	Journal of Pest Science 2019	Potential impact of climate change on whiteflies	4.6	-	9	5 authors from Univ. and IITA	3
Baurena, F-C., CIRAD, France	Molecular Biology and Evolution 2019	Recombination and interspecific edible banana genomes	11.1	24	8/11	11 authors from CIRAD, ARI and Bioversity	2
Drapel, M., Royal Holloway, UK	Horticultural Research 2019	Metabolic diversity in sweet potato	3.9	-	13	4 authors from Univ. and CIP	2
Gitari, H., Univ. Nairobi, Kenya	Agricultural Water Management 2018	Optimizing yield and economic returns from water conservation in potato systems	4.0	7	13	7 authors from Univ. and CIP	3
Diaz Tatis, P. A., Univ. Narino, Colombia	Planta 2018	Overexpression of a cassava gene confers resistance to wilt	3.1	3	10/3	8 authors from Univ., CIAT and CIRAD	3
Legg, J., IITA, Tanzania	Virus Research 2017	Community phytosanitation to manage CBSD	2.7	39	9/23	7 authors from NARs, ARI, and IITA	3
Duitama, J., CIAT, Colombia	Comp. Struct. Biotechn. J. 2017	Genomic diversity in cassava for herbicide tolerance and starch	6.0	16	9/14	10 authors from ARI, Univ. and CIAT	3
Shirima, I. R., IITA, Tanzania	J. of Virological Methods 2017	Absolute quantification of CBSV mRNA	1.7	-	7	6 authors from Univ., NAR and IITA	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Tripathi, L., IITA, Kenya	Food and Energy Security 2017	Genetically engineered bananas resistant to wilt and nematodes	4.8	30	12/78	5 authors from AI, NAR, and IITA	2
Chittarath, K., Dept. Agriculture, Lao	Plant Disease 2018	First report of banana wilt tropical race 4	3.0	-	9/8	7 authors from NAR., Univ., ARI, private sector, and Bioversity	2
Girma, G., IITA, Nigeria	Plant Genetic Resources 2018	Redefining the yam core collection with morphological markers	0.9	-	8/10	7 authors from Univ. and IITA	2
Gutarra, L., CIP, Peru	Frontiers in Plant Science 2017	Diversity, pathogenicity and occurrence of bacterial wilt pathogen of potato in Peru	4.4	-	7/6	5 authors from CIP	3
Gitari, H., Univ. Nairobi, Kenya	Plant Soil 2019	Potato-legume inter-cropping on a sloping terrain	3.0	7	7	6 authors from Univ. and CIP	2
Alakonya, A. A., IITA, Nigeria	Plant Pathology 2019	Progress in understanding banana pathogens	2.2	-	7/6	7 authors from Univ., IITA and Bioversity	3
Garrett, K. A., Univ. Florida, USA	Annual Review of Phytopathology 2018	Network analysis: framework to assess grand challenges in plant pathology	10.4	40	7/10	9 authors from Univ., ARI and NAR	3
Wyckhuys, K. A, G, CIAT, Vietnam	PLoS 2017	Phytoplasm infection of cassava and insect interactions	2.7	33	8/27	4 authors from Univ. and CIAT	3
Wyckhuys, K. A. G., CIAT, Vietnam	Communications Biology 2017	Biological control of agricultural pests protects tropical forest	12.1	33	6/75	8 authors from Univ., CIAT, IITA and CIRAD	3
Mujica, N., CIP, Peru	J. Economic Entomology 2017	Temperature-dependent phenology model for Liriomyza	1.8	-	7/1	5 authors from CIP	2
Ramcharan, A., Penn. State, USA	Frontiers in Plant Science 2019	Mobile-based deep learning model for cassava diseases	4.4	(250 cits)	7/24	8 authors from Univ. and IITA	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Okonga, J. S., CIP, Uganda	Int. J. Environmental Res. & Public Health 2019	Pesticide use in RTB crops by smallholders in Rwanda and Burundi	2.2	9	7/2	8 authors from CIP, NAR, Bioversity and IITA	2
Costa, C., Centre for Agricultural Research, Italy	Frontiers in Plant Science 2019	Plant phenotyping research trends	4.4	52	8/10	4 authors from ARI, Univ. and Bioversity	2
Delaquis, E., CIAT, Vietnam	Frontiers in Sustainable Food Systems 2019	Cassava seed networks in Cambodia and Vietnam	NJ****	6	8/33	17 authors from Univ., NAR and CIAT	2
Nemeckova, A., IEB, Czechia	Frontiers in Plant Science 2019	Molecular and cytogenetic study of East African Highland banana	4.4	-	8/11	8 authors from Univ., IITA and Bioversity	2
Nyawade, S. O., CIP, Kenya	Nutrient Cycling in Agroecosystems 2019	Optimizing soil nitrogen balance in a potato cropping system	3.0	7	6/1	6 authors from Univ. and CIP	3
Almekinders, C., WUR, Netherlands	Food Security 2019	Why interventions in seed systems of RTB crops do not reach their full potential	2.3	30	9/48	8 authors from Univ., CIP, CIAT, IITA and Bioversity	2
Rouard, M. Bioversity, France	Genome Biology and Evolution 2018	Three new genome assemblies in wild banana	3.5	19	6/27	15 authors from Univ., Bioversity and CIRAD	2
Sosa, P., CIP, Peru	J. Food Composition & Analysis 2018	Potential application of X-ray FS for Fe and Zn contents of potatoes	2.0	-	6/17	5 authors from Univ. and CIP	2
Van Vugt, D., WUR, Netherlands	Field Crops Research 2018	Exploring the yield gap for OFSP in smallholders in Malawi	4.3	-	10/1	2 authors from Univ.	2
Tocko-Marabena, B. K., CIRAD, La Reunion, France	PLoS One 2017	Genetic diversity of whiteflies on cassava in Central African Rep.	2.7	-	8/14	7 authors from CIRAD, Univ. and IITA	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Cieslik, K. J., WUR, Netherlands	NJAS WUR J. Life Sciences 2018	Addressing socio-ecological challenges in the digital age	1.8	6	8/1	8 authors from WUR	3
Castaneda-Mendez, O., CIAT and Univ. Bogota, Colombia	In vitro Cellular and Development Biology – Plant 2017	Methodology for in vitro cassava production	1.8	-	6/3	5 authors from Univ. and CIAT	2
Rajendran, S., CIP, Kenya	Open Agriculture 2017	Strategies for development of sweetpotato EG seed sector in SSA	0.4	9	6/7	3 authors from CIP	3
Wyckhuys, K. A. G., CIAT, Vietnam	PeerJ 2017	Continental-scale suppression of a pest by a parasitoid	2.4	33	7/28	>20 authors from Univ., ARI, IITA, ICRAF and FAO	4
Nkere, C. J., IITA and Univ. Ibadan, Nigeria	Archives of Virology 2017	Chromogenic detection of yam virus by LAMP	2.3	-	5/7	9 authors from Univ., NAR, ARI and IITA	2
Bertschinger, L., IPPS, Switzerland	Frontiers in Plant Science 2017	Incomplete infection of secondarily infected potato plants	4.4	12	6/1	9 auhtors from ARI, NAR, Univ. and CIP	3
Munoz-Rodriguez, P., Univ. Oxford, UK	Nature Plants 2019	Taxonomic monograph of Ipomoea	10.3	6	5/114	15 authors from ARIs, Univ. and CIP	3
Ditzler, L., WUR, Netherlands	Agricultural Systems 2019	A model to examine farm household trade-offs and synergies in Vietnam	4.2	-	7/14	10 authors from Univ., IFPRI and Bioversity	3
Van de Vossenberg, B. T., WUR, Netherlands	BMC Evolutionary Biology 2019	Mitochondrial genome of Synchytrium endobioticum	3.0	-	11	12 authors from ARIs, Univ. and CIP	2
Teeken, B., IITA, Nigeria	Economic Botany 2019	Cassava trait preferences of men and women farmers in Nigeria	1.9	-	7/24	11 NARs, Univ. and IITA	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Ainembabazi, J. H., IITA, Uganda and AGRA, Kenya	Agricultural Economics 2017	Improving the adoption of agricultural technologies and farm performance in the Great Lakes region	2.3	-	9/1	10 authors from IITA, CIAT and Bioversity	2
Wongprayoon, S., Kasetsart Univ., Thailand	Starch 2018	Pulullanase branching of starches	2.2	-	5/1	6 authors from Univ., ARI, CIAT and CIRAD	2
Pacilly, F. C. A., WUR, Netherlands	Ecological Modelling 2018	Simulating crop-disease interactions in agricultural landscapes – late blight of potato	2.8	-	4/7	5 authors from WUR	3
Le, T. T. N., PPRI, Vietnam	Biological Control 2018	Landscape context does not constrain biocontrol of cassava mealybug in Vietnam	2.7	-	7/1	6 authors from NAR, Univ., ARI and CIAT	3
Karangwa, P., University Stellenbosch, South Africa	Plant Disease 2018	Genetic diversity of Fusarium oxysporum f.sp. cubense in East and Central Africa	3.0	-	10	11 authors from Univ., ARI and Bioversity	2
Van Wesemael, J., KU Leuven, Belgium	Scientific Reports 2018	Homeolog expression analysis in an allotriploid non-model crop - banana	4.0	-	6/14	6 authors from Univ., Bioversity and IITA	2
Bentley, J. W., Agro-Insight, Bolivia	J. Crop Improvement 2018	RTB seed systems: multi-stakeholder framework	0.9	-	6/14	17 authors from NGOs, Univ., CIP, IITA and Bioversity	3
Andersen, K. O., Univ. Florida, USA	Phytopathology 2019	Modelling epidemics in seed systems: Sweetpot. In Uganda	3.2	7	5/88	7 authors from Univ., NAR and ARI	3
Mudege, N. N., CIP, Kenya	Food Security 2017	Women and men farmer perceptions of OFSP	2.3	14	5/27	3 authors from CIP, Kenya and Uganda	3
Harahagazwe, D., CIP, Kenya	Open Agriculture 2018	How big is the potato yield gap…?	0.4	-	5/27	19 authors from ARIs, Univ., NARs and CIP, Kenya, Peru,	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Lozano, I., CIAT, Colombia	Virus Research 2017	Molecular and biological characterization of a novel group of cassava potexviruses	2.7	-	5/6	7 authors from Univ., NAR and CIAT	2
Lau, K. H., Michigan State, USA	Plant Direct	Transcriptomic analysis sweetpot for drought tolerance	1.7	5	5/14	8 authors from Univ. and CIP	2
Kromann, P., CIP, Peru	Plant Soil 2018	Can Andean potatoes be biofortified with Fe and Zn?	3.0	-	8/8	10 authors from NARs and CIP	2
Yada, B., NaCRRI, Uganda	Breeding Science 2018	Genetic analysis of yield. starch, dry matter, and B carotene in OFSP	1.7	-	5/5	8 authors from Univ., NAR and CIP	3
Ayetigbo, O., Univ. Hohenheim, Germany	Sustainability 2018	Characteristics of root, flour, and starch of biofortified cassava	2.6	-	5/6	4 authors from Univ. and IITA	3
Ravelomanantsoa, S., CIRAD, France	Frontiers in Plant Science 2018	Molecular epidemiology of bacterial wilt in the Madagascar highlands	4.4	4	5/5	12 authors from Univ., ARI and CIRAD	2
Price, E., Royal Holloway, UK	Plant Journal 2020	Metabolite database in RTB crops to facilitate breeding	6.1	5	5/8	11 authors from Univ., IITA, CIAT and Bioversity	3
Gutaker, R. M., Max Planck Institute, Germany	Nature Ecology & Environment 2019	Origins and adaptation of European potatoes from historical genomes	12.5	10	5/292	8 authors from Univ., ARIs and CIP	3
Petsakos, A., CIP, Peru	Global Food Security 2019	Understanding the consequences of production changes in production frontiers in RTB crops	6.0	-	6/79	6 authors from CIP, IITA, CIAT, IFPRI and Bioversity	3
Zanini, A. A., INTA, Argentina	Plant Pathology 2018	Distinct strains of CMD virus in Argentina	2.2	3	5/12	7 authors from NARs and CIAT	

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Steinke, J., Bioversity, Costa Rica	PLoS 2019	Prioritizing options for multi-objective agricultural development	2.7	6	5/10	6 authors from Univ., NAR, Bioversity and ILRI	2
Drapal, M. Royal Holloway, UK	J. Agric. & Food Chemistry 2019	Capturing biochemical diversity in cassava	1.1	-	4/4	6 authors from Univ. and CIAT	2
Bomer, M., NRI, UK	Physiological & Molecular Plant Pathology 2019	Tissue culture and next-generation sequencing of yam viruses	1.7	7	4/29	8 authors from ARI and IITA	3
Simonikova, D., IEB, Czechia	Frontiers in Plant Science 2019	Chromosome painting anchors reference genome sequence to chromosomes in banana	4.4	-	4/4	7 authors from ARI, Univ., IITA and Bioversity	2
Kauschal, M., IITA, Tanzania	Int, J. Molecular Sciences 2019	MIST to hit jackpot of agricultural productivity under drought	4.2	9	4	1 author from IITA	2
Yami, M., Consultant, Ethiopia	Sustainability 2019	African rural youth engagement in rural business	2.6	9	4/5	6 authors from Ethiopia and IITA	3
Tripathi, L., IITA, Kenya	Food, Energy and Security 2019	Application of genetic modification and genome editing in banana	4.8	30	4/20	3 authors from IITA	2
Fuentes, S., CIP, Peru	Virus Evolution 2019	Potato virus Y: Andean connection	5.6	21	4/15	6 authors from ARIs, Univ. and CIP, Peru	1
Dupouy, M., CIRAD, France	Annals of Botany 2019	Large translocations characterized in disease resistance-rich banana	4.0	-	4/14	17 authors from CIRAD, Univ. and Bioversity	2
Rinza, J., CIP, Peru	Potato Research 2019	Early water deficit in potato	1.3	-	5/2	9 authors from Univ. and CIP	2
Ocimati, W., Bioversity, Uganda	PLoS One 2019	Risk posed by X wilt disease of banana	2.7	11	4/22	6 authors from ARI, Univ. and Bioversity	3

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Drapal, M., Royal Holloway, UK	Scientific Reports 2019	Metabolite profiling characterizes banana diploids and triploids	4.0	-	5/14	10 authors from Univ., Bioversity and IITA	2
Almekinders, C. J. M., WUR, Netherlands	Outlook on Agriculture 2019	Understanding farmers' seed demand and research methods	1.1	30	4/8	7 authors from Univ., CIAT, IITA and CIMMYT	2
Taleon, V., IFPRI (Harvest Plus), USA	J. Science Food & Agriculture 2019	Carotenoids retention in biofortified cassava	0.7	-	3/10	4 authors from IFPRI and CIP	2
Eyinla, T. E., IITA and Univ. Ibadan, Nigeria	Foods 2019	Retention of Pro-Vit A in products from biofortified cassava	3.0	2	5	4 authors from Univ. and IITA	3
Batte, M., IITA, Uganda	Frontiers in Plant Science 2019	Cross-breeding East African banana: lessons learnt	4.4	-	6/4	9 authors from Univ., NAR, IITA and Bioversity	3
Ntui, V. O., IITA, Kenya	Current Plant Biology 2019	Mediated genome editing tool for Musa spp.	7.8	18	3/27	4 authors from IITA	2
Wolfe, M., Cornell Univ., USA	Genetics 2019	Historical introgressions from wild relative of cassava – important traits but unbalanced selection	3.6	8	4/14	10 authors from Univ., NAR and IITA	3
Sempere, G., CIRAD, France	GigaScience 2019	Gigwa V2: genotype investigator	6.0	-	4/13	7 authors from CIRAD, INRA and Bioversity	3
Mudege, N. N., CIP, Kenya	Gender, Place Culture 2017	Gender norms in access to agricultural training in Malawi	1.7	14	4/13	4 authors from Univ. and CIP	
Amah, D., University of Free State, South Africa	Critical Reviews in Food Science and Nutrition 2019	Recent advances in banana biofortification to alleviate Vit A deficiency	6.1	-	6/1	6 authors from Univ. and IITA	3
Matheka, J., IITA, Kenya	Plant Methods 2019	A simple and effective protocol for genetic transformation of ensete	3.4	6	2/1	5 authors from NAR and IITA	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Abdurahman, A., CIP, Kenya	Phytopathology 2019	Epidemiology of Ralstonia causing wilt of potato in Uganda	3.2	-	2/1	8 authors from Univ., ARI, NAR and CIP	1
Schiller, K., WUR, Netherlands and CIAT, Nicaragua	Agroecology and Sustainable Food Systems 2019	Nicaragua's agroecological transition	1.7	2	3	4 authors from Univ. and CIAT	1
Merga, I. F., IITA, Kenya	Frontiers in Plant Science 2019	Genetic engineering for bacterial wilt	4.4	-	3/15	4 authors from Univ., NAR and IITA, Kenya	3
Anderson, K. F., Univ. Florida, USA	Phytopathology 2019	Modelling epidemics in seed systems: sweet potato in Uganda	3.2	7	7/87	7 authors from Univ. and ARI	3
Wossen, T., IITA, Kenya	Food Policy 2019	Agricultural technology adoption and household welfare	2.2	14	3	5 authors from IITA	3
Killwinger, F., WUR, Netherlands	Outlook on Agriculture 2019	Not only the seed matters: Farmer perceptions of banana planting materials in Uganda	1.1	-	3	4 authors from Univ. and Bioversity	3
Amah, D., University of Free State, South Africa	Food Chemistry X 2019	Variability of carotenoids in Musa germplasm	NJ****	-	2/10	7 authors from Univ. and IITA	2
Chilungo, S., Chitedze Res. Station, Malawi	Int. J. Food Science & Technology 2019	Effect of carotene on carotenoid bioaccessibility in flour and puree of OFSP	2.8	-	3	5 authors from Univ., NAR and CIP	3
Okiro, L. A., Egerton Univ., Kenya	Plant Disease 2019	Comparative evaluation of several molecular techniques to detect Ralstonia in Kenyan potato fields	3.0	-	4/12	6 authors from Univ., ARI and CIP	2
Njoroge, A. R., CIP, Kenya	Phytopathology 2019	Genotyping Phytophthora infestans in Eastern Africa	3.2	8	2/35	7 authors from Univ., ARI and CIP	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Okello, J. J., CIP, Kenya	European J. Develop. Research 2019	Models associated with adoption of technology by smallholders	1.9	29	2/12	4 authors from ARIs and CIP	2
Benham, B., Yokohama City Univ., Japan	FEBS Open Bio 2019	An optimized isolation protocol for isolating RNA from cassava	2.0	-	2/4	6 authors from Univ. and CIAT	2
De Haan, S., CIP, Peru and CIAT, Vietnam	Am. J. Potato Research 2019	Nutritional contribution of potato nutritional diversity in Andean systems	1.1	(592 cits)	5/42	6 authors from NAR, CIP, and CIAT	2
Iradukunda, F., Bioversity, Burundi	Outlook on Agriculture 2019	Understanding gender roles and practices for banana disease management innovation processes	1.1	-	3	4 authors from Bioversity and ILRI	2
Ortiz, O., CIP, Peru	J. Integ. Pest Management 2019	Human and technical dimensions of IPM using FFS for potato late blight management	1.1	-	2/1	11 authors from Univ., NAR, USDA-ARS, and CIP	2
Alamu, E. O., IITA, Zambia	Food Security 2019	Evaluation of cassava processing and utilization in Zambia	3.3	-	3/2	5 authors from NAR and IITA	2
Alamu, E. O., IITA, Zambia	Cogent Chemistry 2019	Nutritional quality of fritters made from cassava roots and flour	0.4	-	2/1	6 authors from Univ., NAR and IITA	2
Gitari, H. I., Kenyatta Univ., Kenya	Open Agriculture 2019	Increasing potato equivalent yield increases returns to investment in potato-legume intercropping	0.4	7	3	7 authors from Univ. and CIP	3
Pradel, W., CIP, Peru	Climate Risk Management 2019	Adoption of potato varieties and their role in climate risk adaptation in India	4.9	(264 cits)	2/26	5 authors from NARs and CIP	2

Author/Institute	Journal	Publication	IF 2019	H-index*	Citations/ Altmetrics	Partnerships	IPG value***
Flores, C., CIRAD, France	Physiol & Molecular Plant Pathology 2019	Development of duplex-PCR for differential diagnosis of Xanthom. in cassava	0.6	-	2	11 authors from Univ. and CIRAD	3
Maruthi, M. N., NRI, UK	Physiol & Molecular Plant Pathology 2019	A method for generating virus-free cassava plants	0.6	31	2/52	11 authors from ARI, NARs, IITA, and private sector	3
Okonya, J. S., CIP, Uganda	Sustainability 2019	Role of women in production and management of RTB crops	2.6	9	2/40	10 authors from NAR, Univ., CIP, IITA and Bioversity	3
Nakato, G. V., IITA Uganda	Plant Pathology 2019	Sources of resistance in Musa to Xanthomonas wilt	2.2	11	2/34	9 authors from Univ. and IITA	2

*H-index from Google Scholar Citations. The h-indices of 62 authors were not found, marked "-", possibly as they are still to meet the h-index citation threshold; **H-index from Web of Science; ***IPG value from Guidelines Annex; ****NJ = new journal.

Notes: 171 publications of 371 attracted 5 or more (2017-2018) and 2 or more (2019 citations); 159 attracted 4 or fewer citations (2017-2018) and 1 or less (2019).

Of 434 peer-reviewed publications from 2017-2019, 386 were in ISI indexed journals. Of these, 349 were open access

Annex 6c. Twenty-five Most Productive Authors 2017-2019 in RTB: Number of Publications, h-indices, Institute and FP Membership

Author	Institute	No. publications	h-index*	RTB FP
Blomme, G.	Bioversity	21	13 (24)	FP3
Swennen, R	IITA	18	29	FP2
Legg, J. P.	IITA	15	26 (39)	FP3
Lava Kumar, P.	IITA	13	20	FP3
Rouard, M.	Bioversity	12	14 (19)	FP1
Schulte-Geldermann, E.	CIP	12	8	FP3
Ocimati, W.	Bioversity	11	7 (11)	FP3
Quiroz, R.	CIP	11	22	FP3
Tripathi, L.	IITA	10	19 (30)	FP1
Kulakow, P.	IITA	9	18 (24)	FP2
Low, J. W.	CIP	9	10	FP4
Forbes, G. A.	CIP	8	26	FP3
Kruese, J.	CIP	8	26 (33)	FP1
Okello, J. J.	CIP	8	11 (29)	FP5
Schut, M.	IITA	8	17 (25)	FP5
Uwimana, B.	IITA	8	9	FP2
Brown, A.	IITA	7	11 (18)	FP2
Dolezel, J.	IEB, Czech Republic	7	60 (77)	FP2
Garrett, K. A.	Univ. Florida, USA	7	30 (40)	FP3
Kroschel, J.	CIP	7	22	FP3
Leeuwis, C.	WUR, Netherlands	7	13 (56)	FP5
Ramirez, D. A	CIP	7	21	FP3
Struik, P. C.	WUR, Netherlands	7	46 (60)	FP3
Thiele, G.	CIP	7	16 (33)	PD
Tripathi, J. N.	IITA	7	15 (19)	FP1

*From Web of Science; in parenthesis h-index from Google Scholar

Annex 6d. Assessment of the Quality of Randomly Selected RTB Research Publications

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
RNA-based gene silencing against sweet potato weevil Pest Management Science 2017: 44-52 DOI: 10.1002/ps.4337	1	3	3.8	Appropriate - high IF in group; Open Access	Appropriate – 8 authors from Univ., ARI, CIP, and private biotech. company	One author from CIP – contributing author	RNA interference (RNAi) technology can potentially serve as a suitable strategy to control the African sweet potato weevil, which is a critical pest in sub-Saharan Africa. The data confirmed that oral delivery can elicit a significant toxicity, albeit lower compared with injection. For future application in crop protection, it is necessary constantly to provide new dsRNA and/or protect it against possible degradation in order to obtain a higher RNAi efficacy. Promising technology for a difficult and important pest. **50
Genome sequencing of white Guinea yam BMC Biology 2017: 86. DOI: 10.1186/s12915-017-0419-x	1	3	1.6	Other articles on crop genome sequencing usually target higher impact journals; low priority given to an African crop?; Open Access	Appropriate >30 authors from Univ., ARIs and IITA	Seven authors from IITA – contributing authors	Guinea yam is a staple food crop in West and Central Africa. The lack of genetic and genomic tools has impeded the improvement of this staple crop. Yam belongs to a unique and highly differentiated clade of monocotyledons. The genome analyses and sex-linked marker development performed in this study should greatly accelerate marker-assisted breeding to improve food security and the sustainability of tropical agriculture.**22/150

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Metabolite database in RTB crops to facilitate breeding. Plant Journal 2020: 1258-1268. doi.org/10.1111/tpj.14649	1	3	6.1	Appropriate - high IF in group; Open Access	Appropriate - 11 authors from Univ., IITA, CIAT, CIP and Bioversity	Six authors from IITA (3), CIP (1), Bioversity (1), and CIAT (1) – contributing authors	A compound database and concentration range for metabolites detected in the major RTB crops is presented: banana, cassava, potato, sweet potato, and yam, following metabolomics-based diversity screening of global collections held within the CGIAR institutes. Integration of metabolomics with the on-going genomic and phenotypic studies will enhance 'omics-wide associations of molecular signatures with agronomic and consumer traits via easily quantifiable biochemical markers to aid gene discovery and functional characterization.**5/8
Application of genetic modification and genome editing in banana. Food, Energy and Security 2019: e10068 doi.org/10.1002/fes3.168	1	2	4.8	Appropriate - moderate IF in group; Open Access	Lacks recognition of partners – 3 authors from IITA	Three authors from IITA – first and contributing authors	There is a need to develop climate-smart varieties of banana with multiple and durable resistance to combat abiotic stresses such as extreme temperature and drought, and biotic stresses such as pathogens and pests. CRISPR/Cas9-based genome editing has been lately established for banana, paving the way for functional genomics allowing identification of genes associated with stress-tolerant traits, which could be used for the improvement of banana for adaptation to a changing climate. This article presents an overview of recent advancements and prospects. **9/20

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Genomic prediction platforms for biological discovery Nature Genetics 2017: 1297-1303. doi.org/10.1038/ng.3920	1	3	28	Appropriate - among highest IF in group; Open Access	Appropriate >20 authors from ARIs, Univ. and Bioversity, CIMMYT, ICRISAT, ICRAF, ICARDA, ILRI, World Agroforestry, and World Fish	Eleven authors from CGIAR centers as members of the Implementing genomic selection in CGIAR breeding programs workshop – contributing authors	The rate of annual yield increases for major staple crops must more than double relative to current levels in order to feed a predicted global population of 9 billion by 2050. However, achieving higher, sustainable rates of improvement in yields in various species will require renewed genetic interventions and dramatic improvement of agricultural practices. Genomic prediction of breeding values has the potential to improve selection, reduce costs, and provide a platform that unifies breeding approaches, biological discovery, and tools and methods. A strategy for the use of genomic selection as a unifying approach to deliver innovative 'step changes' in the rate of genetic gain at scale is proposed. **72/93
Release of orange flesh sweet potato in Mozambique J. of Agricultural Science 2017: 919-929. DOI: 10.1017/S002185961600099X	2	3	0.8	Low IF journal for the release of a significant technology (recipient of World Food Prize) for reducing Vitamin A deficiency; Open Access	Appropriate - 6 authors from NAR, Univ., CIP	Four authors from CIP – first and contributing authors	Breeding clones with storage root yields above 10 t/ha were advanced to preliminary and advanced yield trials across four sites and for 3 years. As a result, 64 high-yielding OFSP breeding clones were selected and evaluated in four mega-environments following a randomized complete block design with three replicates. Storage root yield and DM content for 15 OFSP breeding clones ranged from 14·9 to 27·1 t/ha and from 24·8 to 32·8%, respectively. BC content, iron, and zinc ranged from 5·9 to 38·4, 1·6 to 2·1 and 1·1 to 1·5 mg/100 g dry weight, respectively. The OFSP breeding clones also met the culinary tastes required by local consumers in Mozambique. **10

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Poverty reduction from technology adoption: cassava in Nigeria Journal of Agricultural Economics 2019: 392-407 doi.org/10.1111/1477-9552.12296	2	3	1.3	Appropriate - moderate IF journal in group; not Open Access	Lacks recognition of partners - 6 authors from IITA	Six authors from IITA – first and contributing authors	DNA-fingerprinting used to estimate the poverty reduction effect of adoption of improved cassava varieties in Nigeria. Results suggest that adoption of improved cassava varieties has led to a 4.6 percentage point reduction in poverty. Accurate measurement of adoption is crucial for a more credible estimate of the poverty reduction effect of adoption. Addressing structural barriers that make improved technologies less profitable for the poor would be important to increase the poverty reduction effect of improved cassava varieties.**9/12
Why interventions in seed systems of RTB crops do not reach their full potential. Food Security 2019: 23-42. doi.org/10.1007/s12571-018-0874-4	2	2	2.3	Appropriate - moderate IF but seed systems papers do not have specific journals; Open Access	Appropriate - 8 authors from Univ., CIP, CIAT, IITA and Bioversity	Five authors from CIP, CIAT, IITA and Bioversity – contributing authors	Critical thinking for understanding problems with establishing sustainable seed systems in developing countries. Experiences, literature, and 13 case studies of RTB seed system interventions were analyzed to identify gaps in knowledge on farmer practices in sourcing and multiplying seed, and processes affecting seed quality. Currently, most approaches to developing RTB seed systems favor decentralized multiplication models to make quality seed available to smallholder farmers. In many situations, the economic sustainability of these models cannot be guaranteed, among others because the effective demand of farmers for seed from vegetatively propagated crops is unclear. Few interventions are designed with a rigorous understanding of these issues; in particular, what types of interventions work for which actors, where, and why, although this is a necessary condition for prioritizing investments to increase the use of improved seed by smallholder farmers.**9/48

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Strategies for development of sweetpotato EG seed sector in SSA. Open Agriculture 2017: 236-243 DOI: 10.1515/opag-2017-0025	2	3	0.4	Higher quality journal should have been sought; poor IF but seed systems papers do not have specific journals; Open Access	Lacks recognition of partners – 3 authors from independent consultant and CIP	Two authors from CIP – first and contributing authors	Formal plant breeding efforts need to be linked to a sustainable seed supply system by means of identifying business opportunities for sweetpotato Early Generation Seed (EGS) producers. This study analyzed the overall business opportunities for public institutions using Strengths, Weaknesses Opportunities, and Threats (SWOT) tool and then a Threats, Opportunities, Weaknesses, and Strengths (TOWS) approach was used to transform the SWOT results into strategies for further development of the early generation seed sector. NARIs and policymakers need to take up the recommendations from the TOWS analysis to refine strategies for exploiting opportunities in the business environment and for mitigating weaknesses to reduce vulnerability to any identified threats to the potential business in EGS. **6/7
RTB seed systems: multi-stakeholder framework. J. of Crop Improvement 2018: 599-624 DOI: 10.1080/15427528.2018.1476998	2	3	0.9	Higher quality journal should have been sought; poor IF but seed systems papers do not have specific journals; Open Access	Appropriate - 17 authors from NGOs, Univ., CIP, IITA and Bioversity	Eleven authors from CIP (6), IITA (3), CIAT (1), and Bioversity (1) – contributing authors	A framework was used with 13 case studies to understand VPC seed systems for roots, tubers, and bananas, including differing roles and sometimes conflicting goals of stakeholders, and to identify potential coordination breakdowns when actors fail to develop a shared understanding and vision. The framework is a critical tool to (a) document VPC seed systems and build evidence; (b) diagnose and treat coordination breakdown and (c) guide decision-makers and donors on the design of more sustainable seed system interventions for VPCs. The framework can be used to analyze past interventions and will be useful for planning future VPC seed programs. **6/14

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Crop pests and predators in the landscape. Proceedings of National Academy of Sciences 2018: E7863-E7870 doi.org/10.1073/pnas.1800042115	3	4	9.4	Appropriate – high IF journal in group; Open Access	Appropriate - >100 authors from ARIs, Univ. and CIAT	One from CIAT and one from ICRAF – contributing authors	Key paper to debunk the dogma that increased biodiversity is always best. Decades of research have fostered the now-prevalent assumption that non-crop habitat facilitates better pest suppression by providing shelter and food resources to the predators and parasitoids of crop pests. Non-crop habitat surrounding farm fields does affect multiple dimensions of pest control, but the actual responses of pests and enemies are highly variable across geographies and cropping systems. Because non-crop habitat often does not enhance biological control, more information about local farming contexts is needed before habitat conservation can be recommended as a viable pest-suppression strategy. Consequently, when pest control does not benefit from non-crop vegetation, farms will need to be carefully co-managed for competing conservation and production objectives.**129/188
Plant parasitic nematodes and food security in SSA. Annual Review of Phytopathology 2018: 381-403 doi.org/10.1146/annurev-phyto-080417-045833	3	3	10.4	Appropriate – high IF journal in group; Open Access	Appropriate - 7 authors from ARIs, Univ. and IITA	Two from IITA – first and contributing authors	A holistic systems approach to pest management recognizes disciplinary integration. However, a critical under-representation of nematology expertise is a pivotal shortcoming, especially given the magnitude of the threat nematodes pose under more intensified systems. With more volatile climates, efficient use of water by healthy root systems is especially crucial. Within SSA, smallholder farming systems dominate the agricultural landscape, where a limited understanding of nematode problems prevails. This review provides a synopsis of current nematode challenges facing SSA and presents the opportunities to overcome current shortcomings, including a means to increase nematology capacity.**43

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
BXW: opportunities, challenges, and ICT-control strategies. NJAS WUR J. Life Sciences 2018: 89-100. https://doi.org/10.1016/j.njas.2018.03.002	3	3	1.8	Higher quality journal should have been sought considering the significance and proven success of the strategy; Open Access	Appropriate – 8 authors from Univ., ARI, IITA and Bioversity	Three authors from Bioversity and likewise from IITA – contributing authors	Xanthomonas Wilt of Banana (BXW) is a complex problem in the African Great Lakes Region that is affecting the livelihoods of millions of smallholder farmers. This paper provides an in-depth analysis of the broader BXW problem using a systems perspective, with the aim to add to the understanding about reasons for poor uptake of appropriate disease management practices, and limited ability to prevent rather than control BXW in the region. Entry-points for the use of Information and Communication Technologies (ICT) and citizen science tools to better address BXW in banana production systems are discussed.**14/32
Risk assessment framework for seed degenerations. Phytopathology 2017: 1123-1135. doi.org/10.1094/PHYTO-09-16-0340-R	3 (2)	3	3.2	Appropriate – high IF journal in group; Open Access	Appropriate - 11 authors from Univ., CIP and IITA	Two from CIP and one each from IITA and CIAT – contributing authors	Pathogen build-up in vegetative planting material, termed seed degeneration, is a major problem in many low-income countries. (1) On-farm seed selection can perform as well as certified seed if the rate of success in selecting healthy plants for seed production is high; (2) when choosing among within-season management strategies, external inoculum can determine the relative usefulness of 'incidence-altering management' (affecting the proportion of diseased plants/seeds) and 'rate-altering management' (affecting the rate of disease transmission in the field); (3) under severe disease scenarios, where it is difficult to implement management components at high levels of effectiveness, combining management components can be synergistic and keep seed degeneration below a threshold;(4) combining management components can also close the yield gap between average and worst-case scenarios. **17/22

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
A control package for X wilt of banana European J. Plant Pathology 2017 DOI 10.1007/s10658-017-1189-6	3	4	1.8	Higher quality journal should have been sought considering the significance and proven success of the strategy; Open Access	Appropriate - 10 authors from ARI and Bioversity	Eight authors from Bioversity – first and contributing	The SDSR technique, as an alternative or complementary practice, to complete mat uprooting (CMU) for XW control. SDSR is more appealing to subsistence-oriented production, such as in eastern DR Congo, Burundi, or central Uganda, whose target is more oriented towards management/control. SDSR can be suggested where access to clean planting material is difficult, thus could be recommended to a very large percentage of small-scale farmers in the currently affected banana-based production systems in east and central Africa. **11/18
A global surveillance system for crop diseases. Science 2019: 1237-1239 https://doi.org/10.1126/science.aaw1572	3	4	41.8	Appropriate – highest quality journal in group; Open Access	Appropriate - 19 authors from ARIs, Univ., CIAT and IITA	Two authors from CIAT and one from IITA – first and contributing authors	The GSS would detect threats and risks to global food supplies and support timely response. Countries and regions will benefit by increasing their capacity to predict, detect, communicate, and effectively respond to emerging crop disease outbreaks. This will be possible by leveraging different lessons learned from existing national and regional plant protection systems, such as NPDN established in 2003or EPPO created in 1951. **21/304
Network analysis: framework to assess grand challenges in plant pathology. Annual Review of Phytopathology 2018: 559-580. doi.org/10.1146/annurev-phyto-080516-035326	3	3	10.4	Appropriate – high IF journal in group; Open Access	Appropriate - 9 authors from Univ., ARI and NAR	No authors from CGIAR but linked to RTB through collaboration with Uni. Florida	Linking epidemic network analysis with social network analysis will support strategies for sustainable agricultural development and for scaling up solutions for disease management. Statistical tools for evaluating networks, such as Bayesian network analysis and exponential random graph models, have been underused in plant pathology and are promising for informing strategies. Research priorities for network analysis applications in plant pathology.**7/10

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Tackling Vitamin A deficiency with biofortified sweet potato. Global Food Security 2017: 23-30. https://doi.org/10.1016/j.gfs.2017.01.004	4	4	6.0	Appropriate – high IF journal in group; Open Access	Lacking recognition of non-CGIAR partners - 4 authors from CIP; 1 from IFPRI	Four authors from CIP and one from IFPRI (link between RTB and A4NH) – first and contributing authors	100 g of orange-fleshed sweet potato (OFSP) can meet the daily vitamin A needs of a young child. Breeding in Africa was requisite to obtain OFSP varieties competitive with local varieties. Integrating nutrition education is essential for impact on young child vitamin A status. The policy environment drastically changed in 2007, facilitating enhanced investment in OFSP. A multi-partner, multi-donor initiative, launched in 2009, has already reached 2.8 million households. **59/45
Potential application of X-ray FS for Fe and Zn contents of potatoes. J. Food Composition & Analysis 2018: 22-27 10.1016/j.jfca.2018.03.004	4	2	2.0	Appropriate – moderate IF journal in group; Open Access	Appropriate - 5 authors from Univ. and CIP	One author from CIP – first author	Iron and zinc can be estimated by X-ray fluorescence spectrometry with high precision. Twenty clones showing high iron concentration (above 32 mg/kg DW) and 13 clones with high concentration of zinc (above 25 mg/kg DW) were identified. X-ray fluorescence spectrometry provides a rapid, low cost and suitable tool for potato breeders, compared to inductively coupled plasma optical emission spectrometry for screening iron and zinc concentrations, especially when a high number of potato clones must be evaluated in a short time frame. **6/17

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Characteristics of root, flour, and starch of biofortified cassava. Sustainability 2018: 3089. doi.org/10.3390/su10093089	4	4	2.6	Appropriate – moderate IF journal; Open Access	Appropriate - 4 authors from Univ. and IITA	One author from IITA – contributing author	The concept of sustainability in adoption of biofortified yellow-flesh cassava and its products cannot be fully grasped without some detailed information on its properties and how these variants compare to those of the white-flesh cassava. Flour and starch are highly profitable food products derived from cassava. This review compares properties of cassava root, flour, and starch from white-flesh and biofortified yellow-flesh variants. It also states the factors affecting the chemical, functional, and physicochemical properties; relationships between the physicochemical and functional properties; effects of processing on the nutritional properties; and practical considerations for sustaining adoption of the biofortified yellow-flesh cassava. **5/6
Recent advances in banana biofortification to alleviate Vit. A deficiency Critical Reviews in Food Science and Nutrition 2019: 3498-3410. https://doi.org/10.1080/10408398.2018.1495175	4	3	6.1	Appropriate – high IF journal in group; Open Access	Appropriate - 6 authors from Univ. and IITA	Two authors from IITA – contributing authors	Some banana genotypes are rich in provitamin A carotenoids (pVACs), providing an opportunity to use bananas as a readily available vehicle for provitamin A delivery. This review summarizes the progress made in carotenoid research in bananas relative to banana diversity and the use of conventional breeding and transgenic approaches aimed at banana biofortification to address vitamin A deficiency showing the importance of bananas in biofortification schemes. **6/1

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Role of gender norms in agricultural training in Malawi. Gender, Place and Culture 2017; 1689-1710. doi.org/10.1080/0966369X.2017.1383363	5	3	1.2	Low impact factor journal – most gender journals have low IFs'; Open Access	Appropriate - 4 authors from Univ. and CIP	Two authors from CIP - first and contributing authors	This article discusses how gender relations shape men and women's access to and participation in agricultural training. It also examines how men and women justify or challenge gender inequalities in relation to access to agricultural information and knowledge. Negative stereotypical perceptions about women by their husbands and extension workers militate against women's access to training and information. Institutional biases within extension systems reproduce gender inequality by reinforcing stereotypical gender norms.**13/13
Innovation platforms: institutional embedding for agricultural R&D. Experimental Agriculture 2019: 575-596 doi.org/10.1017/S0014479718000200	5	3	1.3	Higher quality journal should have been sought as the concepts presented are important for agricultural R&D; Open Access	Appropriate -20 authors from ARIs, Univ. and IITA	First author from IITA; contributing authors CIP, CIAT, and Bioversity; 7 contributing authors from 7 CGIAR centers	Innovation platforms are becoming part of the mantra of agricultural research for development projects and programs. Their basic tenet is that stakeholders depend on one another to achieve agricultural development outcomes to overcome challenges and capture opportunities through a facilitated innovation process. This study provides a decision support tool for research, development, and funding agencies that can enhance more critical thinking about the purposes and conditions under which innovation platforms can contribute to achieving agricultural development outcomes.**72/20

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
Household surveys, DNA fingerprinting in Ethiopia Experimental Agriculture 2019: 371-385. doi.org/10.1017/S0014479718000030	5	3	1.3	Moderate IF journal for novel technique; Open Access	Appropriate - 6 authors from CGIAR, ARI, NAR, and CIP	First author from SPIA; contributing author from CIP	Accurate crop varietal identification is the backbone of any high-quality assessment of outcomes and impacts. Sweetpotato varieties have important nutritional differences, and there is a strong interest to identify nutritionally superior varieties for dissemination. The variety names given by farmers delivered inconsistent and inaccurate varietal identities. Visual-aid protocols were better than farmer ID but greatly underestimated the adoption estimates given by the DNA fingerprinting method. Our results suggest that estimating the adoption of improved varieties with methods based on farmer self-reports is questionable and point towards wider use of DNA fingerprinting in adoption and impact assessments.**8/1
*Science of Scaling: Understanding and guiding the scaling of innovation for societal outcomes. Agricultural Systems 2020: 102908 doi.org/10.1016/j.agsy.2020.102908	5	3	4.2	Appropriate – high IF journal in group; Open Access	Appropriate – 3 authors from Univ., IITA and CIP	First author from IITA; contributing author from CIP	Scaling of innovation is increasingly important in the world of AR4D. Science of Scaling supports understanding of scaling trajectories. Science of Scaling guides the practice of scaling prospectively. Three Research Domains are proposed for the Science of Scaling. Science of Scaling requires more investment to achieve SDGs.
*Scaling Readiness: Science and practice of an approach to enhance impact of research for development. Agricultural Systems 2020: 102874 doi.org/10.1016/j.agsy.2020.102874	5	3	4.2	Appropriate – high IF journal in group; Open Access	Appropriate – 5 authors from Univ., IITA and CIP	Contributing authors from IITA (1) and CIP (2)	Scaling of innovation to achieve impact requires systems approaches. There is a need to translate systems theory into action-oriented decision support. Performance management of innovation and scaling processes is key in R4D. Scaling Readiness offers a stepwise process to develop scaling strategies. Scaling Readiness can monitor a portfolio of innovation and scaling investment. **3

Journal article	FP	IPGs	Journal Impact Factor (IF)	Appropriateness of journal	Co-authorship	Contribution of CRP	Overall quality summary (including metrics – Cit./Alt.)**
*Understanding innovation: The development and scaling of orange-fleshed sweetpotato in major African food systems. Agricultural Systems 2020: 102770 doi: 10.1016/j.agsy.2019.102770	5	4	4.2	Appropriate – high IF journal in group; Open Access	No partners acknowledged; 2 authors from CIP	First author and contributing author from CIP	Vitamin A-rich, orange-fleshed sweetpotato is the lead biofortified crop in Africa. OFSP was a disruptive innovation as non-OFSP types were demanded before. Committed leadership for innovation for over 20 years was critical for scaling. A strong evidence base was requisite for obtaining donor support for scaling. Partner initiative for scaling united diverse organizations with a common vision. **4

Note: Criteria for assessment can be found in the Guidelines Table 3, Pg. 8.

*A Special Issue of Agricultural Systems was published in 2020 although most of the papers featured were based on research done during 2017-2019. Three of these are included as they demonstrate their important contribution to scaling science across the CGIAR by RTB.

**Citations/Altmetrics

Annex 6e. Assessment of Selected Technical Publications* Generated by RTB Flagships

Technical publications	Flagship	Quality	Relevance to next-stage users**	Potential for capacity development
Friedmann, M., Becerra L.A., and Fraser, P.D. 2019. Metabolomics in the CGIAR Research Program on Roots, Tubers and Bananas (RTB). Lima (Peru). CGIAR Research Program on Roots, Tubers and Bananas (RTB). RTB Working Paper. No. 2019-2. *Metabolomics research in RTB has involved metabolite profiling for making significant marker-trait associations, assessment of genetic diversity, and varietal identification with the Royal Holloway University London, UK. Therefore, this has included screening young plantlets as proxies for mature end-product quality (roots, tubers, and banana fruits), identifying potential biomarkers for abiotic stress tolerance, and for product-quality traits.*	1	High	Comprehensive and valuable review for researchers working on metabolomics and for breeders who wish to use the information generated with useful examples of relevance to RTB crops especially for yield and quality traits. Both challenges and opportunities are presented. Six publications generated to date with more in the pipeline.	The RHUL lab has also run several metabolite training schools for early-stage researchers. It is hoped that in the near future the RHUL group will be able to run one of these activities in a target country such as Tanzania.
Sardos, J., Paofa, J., Janssens, S., Vanden Abeele, S., Roux, N., and B. Panis (2017). Report from the "Exploration of wild banana populations in Papua New Guinea" *The aim of the collecting mission was the collection of wild banana samples that would allow performing population genetics studies and further help to design more efficient conservation strategies specific to wild bananas. In Madang province, we collected samples of M. acuminata banksii M. schizocarpa, and M. peekelii ssp. angustigemma while M. acuminata ssp. banksii, M. schizocarpa, M. maclayi spp. maclayi var maclayi and* M. balbisiana *were collected in Morobe Province.*	1	Good – well illustrated	Useful account for banana germplasm and biodiversity scientists and potentially for breeders. Collected material also valuable for the Papua New Guinea banana collection.	Not mentioned

Technical publications	Flagship	Quality	Relevance to next-stage users**	Potential for capacity development
Bonierbale, M., I. Rabbi, N. Mudege, E. Arnaud, M. Friedmann, and C. Hershey. 2017. RTB Breeding Community of Practice and NextGen Breeding Clusters: Founding and Planning Workshop. Lima (Peru). CGIAR Research Program on Roots, Tubers and Bananas (RTB). RTB Workshop Report. *The RTB Breeding Community of Practice is recognized by the System Management Office as an innovative mechanism to enhance communication, coordinate planning, streamline collaboration and overall, support accelerated breeding gains. This workshop supported the launch and the refinement of some of the BCoP's planned activities, and especially with regard to interaction with NextGen Breeding and gender mainstreaming. The BCoP, with support from its members, will enable results and impact that are greater than the sum of its individual components.*	2	High	The workshop enabled the further development and refinement of the vision, objectives, and outputs of RTB Clusters DI 1.1 and DI 1.2 as well as advancing implementing selected deliverables of earmarked funding for DI1.1, DI1.2, and Gender. In this way, it was not only relevant but also useful to all RTB breeders and associated disciplines e.g. pest and disease management and quality research. The focus on next and end user priority traits was an important theme.	The importance of training tools, materials, and methods was an important theme – training the next generation of RTB crop breeders.
RTB (CGIAR Research Program on Roots, Tubers and Bananas). 2016. Multi-stakeholder framework for intervening in RTB seed systems. Lima: RTB Working Paper No. 2016-1. ISSN 2309-6586. *This user's guide presents a tool, called the multi-stakeholder framework for intervening in RTB seed systems. It is designed to help any interested person to understand RTB seed systems or to improve interventions (e.g., projects or programs) in them. The framework can be used to plan a future intervention or to analyze the recent history of one. When used before an intervention, the framework may guide a study of the existing seed system and identify bottlenecks and key actions for the upcoming intervention. The framework will help stakeholders to think about RTB seed systems in a holistic way and to account for differences—even contradictions—in the perspectives of some of the people and organizations who are the stakeholders in these crops.*	2	High	The framework is the foundation for much of the research on seed systems in RTB Phase II. It has therefore been very helpful for next-stage users for all RTB crops. It is being used to analyze 12 case studies in RTB seed systems in various countries. A publication on this analysis is included in the analysis of selected RTB publications (Almekinders et al., 2019).	Training in all aspects of seed systems development is identified throughout the working paper in Tables 2 and 3.

Technical publications	Flagship	Quality	Relevance to next-stage users**	Potential for capacity development
Mudege, N.N. & Torres, S. (2017). Gender mainstreaming in root tuber and banana crops seed systems interventions: identification of lessons learned and gaps. Lima (Peru). CGIAR Research Program on Roots, Tubers and Bananas (RTB). RTB Working Paper. No.2017-2. *RTB has developed a seed systems framework for intervening in root tuber and banana systems, as well as conducted work to understand gender-related opportunities and constraints for men and women's participation in RTB seed systems. Evidence from the literature shows that seed systems are socially embedded; so, to develop equitable RTB seed systems researchers and practitioners need to understand the social context in which they aim to intervene. Understanding male and female farmers' knowledge will promote the development of seed systems that are sustainable and responsive to farmers' needs and capacities.*	2	High	The comprehensive analysis of lessons learned and gaps is useful for next stage users in both future projects and in practice where seed systems have already been established.	The importance of capacity development in many aspects of the recognition of both women's role and increased involvement in seed systems.
Maroya Norbert, Morufat Balogun, Beatrice Aighewi, Jimoh Lasisi, and Robert Asiedu. 2017. Manual for Clean Foundation Seed Yam Production Using Aeroponics System. IITA, Ibadan, Nigeria. 68 pp. *The YIIFSWA Project's single-node vine cuttings findings on aeroponics at IITA-Ibadan were used to develop this manual on foundation seed yam production. It is important for users of this manual to know that these results were obtained only after two years of experimentation with only five varieties of white yam and two varieties of water yam. This manual will be updated as soon as more data are collected.*	2	High – well-illustrated	Invaluable training manual for researchers and private sector companies – clearly presented and very usable.	Invaluable training manual for researchers and private sector companies.
No technical reports etc. were found for FP3. Technical outputs included: publications, leaflets, digital tools, and databases.	3			
CIP. 2019. Sweetpotato vine silage for improved dairy cattle production – Manual. 24 pp. *Dairy cattle production is among the priority sectors to spur poverty eradication under Uganda Vision 2040 development framework. Feed constraints are among the key constraints that small-scale dairy farmers grapple with. Sweet potato residues (vines, peels, and non-commercial roots) are a major feed resource in small-scale dairy cattle production systems in Uganda. The manual demonstrates how to make silage from sweet potato vines and how to store it and how to best use it.*	4	High – well illustrated	Useful and clear training manual for researchers, extension agents, and farmers.	Useful and clear training manual for researchers, extension agents, and farmers.

Technical publications	Flagship	Quality	Relevance to next-stage users**	Potential for capacity development
Kikulwe, E. (2017) Reducing postharvest losses and promoting product differentiation in the cooking banana value chain. Final Workshop Report from RTB Endure project. *The project implementation was based on four approaches: (1) Reduction of postharvest losses through promotion of varieties with intrinsic longer shelf-life and better postharvest handling practices; (2) Increase in market access and transparency in unit pricing through product differentiation and piloting the weight-based pricing system; (3) Promotion of sucker staggering for evening-out banana production across seasons; and (4) Linking the different actors along the value chain to benefit from emerging untapped market opportunities based on product differentiation.*	4	Good	As part of the exit strategy, the workshop was held with next users in mind and covered sharing research findings of the project activities with a wider audience and exhibiting and launching the successful innovations to the market.	Training farmers was mentioned several times
Building nutritious food baskets: Scaling up biofortified crops for nutritional security. Final Project Report, 2019. *The* Building Nutritious Food Baskets: Scaling up Biofortified Crops for Nutrition Security" *project goal is to reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops (vitamin A cassava, vitamin A maize, vitamin A sweetpotato, and iron-rich beans) at scale. The 3-year project is implemented in Nigeria and Tanzania and purposes to demonstrate how multiple biofortified crops can be scaled up together at country level using a "food basket" approach. 2175 million additional households will adopt biofortified crops as a result of BNFB investment over the next 5 years.*	4	High – including 12 well-illustrated reports of events during the project	To share some of the success stories and insights gained during the project's implementation, BNFB compiled a booklet that showcases successful partnerships and human-interest stories, outcomes, and the emerging impacts of these efforts. While most of the success stories were written and disseminated over the course of the project's three-year implementation, some were developed at the end to illustrate best practices for scaling biofortified crops.	Significant training embedded in project

Technical publications	Flagship	Quality	Relevance to next-stage users**	Potential for capacity development
Rene Bullock, Marlene Elias, Nozomi Kawarazuka, Netsayi Mudege, Gordon Prain (managing editor), Anne Rietveld, Lucila Rozas, and Amare Tegbaru. 2018. Women can do it! Stimulating more inclusive innovation in root crop and banana-based agri-food systems. GENNOVATE Report. *GENNOVATE aims to use the understanding of gender norms and agency to engage agricultural researchers and decision-makers. In doing so they strengthen the impact of their work by more systematically incorporating gender equality objectives in agricultural research for development (R4D) interventions. RTB and the former CRP on Humidtropics were leading members of the partnership, undertaking 24 case studies between 2014 and early 2016 in 10 countries: 7 in Sub-Saharan Africa (SSA), 2 in Asia, and 1 in Latin America and Caribbean (LAC). GENNOVATE research has also explicitly sought to understand the way household and community power relations and self-perceptions of personal power also shape innovation decisions. Knowing which practices/technologies or institutional arrangements are best able to empower women through broadening their social and economic options can lead to transformational outcomes.*	5	High – well-illustrated	The study identified four types of interventions, or social conditions, that can help women, men, and communities maximize opportunities for agricultural innovation: need for linkages between informal social networks and formal institutions; importance of diversity and competitiveness; importance of local expectations and demands; and the key aspects of the "domestic domain".	Significant capacity development was part of all case studies
Mudege, N.N., Mbiri, D., and Mdege, N. 2019. Making the agriculture sector work for youth: A tool to promote young men and women's engagement in growing root, tuber, and banana crops. Lima (Peru). International Potato Centre. 8 p. *Young people may be expected to participate in agricultural value chains despite lacking any decision-making powers or influence over what happens to them. They may find this disempowering which could be a factor in driving them away from agriculture and towards other jobs where they may feel more in control. As citizens, young people need to be properly consulted and greater efforts need to be made to understand the barriers and opportunities to engagement and to develop better strategies that more effectively promote and support their engagement.*	5	Good – useful analysis through myth-busting	A checklist to guide projects seeking to engage youth in agriculture was developed.	Importance of training was mentioned throughout the report.

Technical publications	Flagship	Quality	Relevance to next-stage users**	Potential for capacity development
Gatto, M.; Hareau, G.; Pradel, W.; Suárez, V.; Qin, J. 2018. Release and Adoption of Improved Potato Varieties in Southeast and South Asia. International Potato Center (CIP), Lima, Peru. ISBN 978-92-9060-501-0. 45 P. Social Sciences Working Paper 2018-2. 42 p. *In this study, we close the identified gaps in the existing literature and databases by documenting release and adoption of improved potato varieties in seven major potato producing countries in Southeast, South, and East Asia. Methodologically, this study adopts a refined expert elicitation (EE) approach applied in previous projects. EE workshops were used as an inexpensive alternative to the collection of national representative adoption data. An average of 15 experts working in the potato value chain participated in a one-day event to elicit perceived adoption rates and to update release databases. In total, 347 experts attended 23 workshops which were held during 2014-2016.*	5	High	Significant adoption of improved potato varieties was found – highly beneficial to next users. Regarding the ten most important CIP-related varieties, nine out of ten varieties are cultivated in China. Cooperation 88, released in China in 2001, covers about 165,000ha and is the most important CIP-related variety. Kufri Chipsona, released in India in 1998, covers 61,000ha. Compared to 2007, almost all CIP-related varieties are increasing in trend, especially Chipsona 1, which jumped from rank 37 to 7. Further research could analyze the adoption determinants of these varieties to better understand why certain varieties are successful and others not. In terms of beneficiaries, overall CIP directly reached 2.93M farming HHs with CIP-related material. Indirectly, CIP was able to reach about 10.3M individuals.	Not mentioned

*Technical publications (20%) include: working papers, project reports, and manuals selected at random from ARs; Note: Criteria for assessment can be found in the Guidelines Table 3, Pg. 8; **Clarity, simplicity, usability

Annex 6fi. Assessment of Newsletters, Leaflets, and Brochures* Generated by RTB Research

Communication products	Relevance to next-stage users	Potential for capacity development
Small-scale flash dryers for cassava flour *Capacity building on design, construction, and operation of small-scale pneumatic dryers was accomplished using participatory technology development. This required the engagement of local cassava processors, local equipment manufacturers, and local research institutions.*	Enables efficient drying of cassava flour in small quantities to produce a quality product and stimulated SMEs to enter the industry.	Significant capacity development involved in both building the dryers and operating them
RTB Scaling readiness newsletters and web portal *The newsletters capture the major concepts of Scaling Readiness, activities, and information about the RTB test cases. The Scaling Readiness project is an Earmarked Funded project under RTB Cluster 5.4 and is implemented by Wageningen University, IITA, Bioversity International, CIAT, and CIP. Innovations are packages In our Scaling Readiness project we perceive innovations as packages of technological, organizational, and institutional components that can include new crop varieties, processing equipment, fertilizer blend, best crop, pest, soil management practices, and new legislation, collaborations, or market arrangements. Consequently, scaling of innovation requires the scaling of the package of components. Whether an innovation is perceived as useful depends on the spatio-temporal context in which it is supposed to contribute to achieving specific livelihood objectives.*	The approach validates the scaling readiness conceptual and analytical framework; assesses the RTB innovations for their scaling readiness; provides decision-support to the case studies in developing action plans that will accelerate the scaling readiness; supports and monitors the implementation and impact of action plans in selected cases; and provides a basis for generalization of findings that also can serve other projects in the RTB portfolio. The web portal attracts clients who wish to use the scaling readiness approach.	Significant capacity building is embedded in the process.
Farmer Business Schools *Farmer Business School (FBS) is a participatory action learning process that involves farmer groups' participation in agricultural value chains. As part of capacity strengthening, FBS comprises a series of group-based experiential learning activities over a production-marketing cycle while interacting with other chain actors and stakeholders. Several examples are given mostly with women's groups.*	By their nature, FBSs prepare women for greater involvement in agricultural value chains – highly relevant to next stage users.	The approach of FBSs is capacity development through experiential learning processes.

Communication products	Relevance to next-stage users	Potential for capacity development
Inter-sectional gender tool focusing on task groups – RTB Gender & Breeding Initiative *Instead of segregating by sex groups, this tool proposes an identification of task groups: Who does what?* *This task group approach overcomes the intersectionality of local identities by focusing on who does what along the value-chain and allows for closer integration with the practice of participatory trials, post-harvest processing, and breeding as these connect to specific tasks. This makes this tool fit in the 'social targeting and demand analysis' stage but could also be suitable within participatory breeding strategies (generation/identification of new varieties). By studying the preferences of each task group within each social group, we insured that all (vulnerable) groups were included in evaluating for preferences. This can inform breeders on how to make a suitable composite of the preferences to inform their breeding practices.*	Trials with farmers and other participatory methods including in-village food science exercises become tools of action research within a social science investigation for a truly integrated approach to link breeding objectives to gender.	The approach is fully participatory with significant capacity building. The tool will also build the capacity of researchers through collaboration. The mutual cooperation between social science and gender specialists, food scientist, and breeders is crucial to move away from the simplistic upfront disaggregation of data by sex as well as the reliance on mere social science tools.
Insect Life Cycle Modeling software (ILCYM) *ILCYM software supports the development of process-oriented temperature-driven and age-stage structured insect phenology/population models. ILCYM interactively leads the user through the steps for developing insect phenology models, for conducting simulations, and for producing potential population distribution and risk mapping under current or future temperature (climate change) scenarios.*	It was successfully used to develop the Insect Pest Distribution and Risk Atlas for Africa. It has been further enhanced with modules for the prediction of risk for insect-transmitted viruses.	A practical training course was held in Benin in 2017.

Communication products	Relevance to next-stage users	Potential for capacity development
RTB databases (see Pg. 18 – AR 2017) *The program contributes to the systematic and long-term effort for making available genomic and phenotypic data as well as data from experimental trials related to all the RTB crops. The table below lists some of the databases maintained and/or contributed by RTB and its centers.*	BioMart (http://germplasmdb.cip.cgiar.org/) Cassava genome hub (http://www.cassavagenome.org/) CASSAVABASE (https://www.cassavabase.org/) MGIS (http://www.crop-diversity.org/mgis) MUSABASE (https://musabase.org/) ProMusa knowledge base (www.promusa.org) Southgreen (http://www.southgreen.fr/content/rtb-multi-genomes-hub) Potato Gene Identity Kit (https://research.cip.cgiar.org/confluence/display/IPD/SSR+Marker) PotatoGENE (https://research.cip.cgiar.org/confluence/display/potatogene/Home) The Catalogue of CIP Potato Varieties (https://research.cip.cgiar.org/red_varie/pages/home.php)	Not relevant

*Selected from ARs; **Clarity, simplicity, usability

Annex 6fii. Assessment of Digital Innovations* Generated by RTB Research

Communication products	Relevance to next-stage users	Potential for capacity development
Cassava SeedTracker – mobile app *The application provides real-time information on seed variety, quantity, and availability and facilitates timely access to seed markets. It enables producers to register their seed crops, regulatory authorities to do electronic certification of seeds, and those who need quality seed to locate seed suppliers and arrange for purchase.*	SeedTracker supports farmers to access quality certified planting material (seed) from producers. For producers, it allows them to get markets for their produce. The app also allows authorities to certify the seed.	Not mentioned
Sweetpotato Knowledge Portal *This portal provides a venue for sweetpotato scientists, practitioners, and farmers to share, discuss, and generate new knowledge. Information is also available for the general public to learn more about sweetpotato. The goal is to build a vibrant community of practice, providing easy access to technical and scientific information concerning sweetpotato. There are links to breeding, seed systems, crop management, processing and marketing, and nutrition and use. All E-digest newsletters are also linked.*	High relevance to next-users – researchers, practitioners, and farmers. Progress is checked in reaching beneficiaries – now >6 million.	
Toolbox for RTB seed systems *The set of tools are being validated in over 10 projects in Asia, Africa, and South America across five major RTB crops. Tools cover both socio-economic and biophysical dimensions and include the "multi-stakeholder framework for intervening in RTB seed systems" which provided an overview of the major stakeholders, their roles, and critical bottlenecks in Nigeria for cassava, India for potato, Ethiopia for sweetpotato, and Uganda for banana; "impact network analysis" which is now being applied in four PhD theses (potato in Ecuador and Kenya, sweetpotato in Tanzania, and cassava in Vietnam) to understand how seed network dynamics influence the spread of new technologies, new pathogens, or new information; and the "gender constraints analysis tool" which was used to understand the sweetpotato seed value chain in Ethiopia.*	The tools are highly relevant to major next-stage stakeholders.	Four PhD theses; additional capacity building embedded in case studies.

Communication products	Relevance to next-stage users	Potential for capacity development
Insect Life Cycle Modeling software (ILCYM) *ILCYM software supports the development of process-oriented temperature-driven and age-stage structured insect phenology/population models. ILCYM interactively leads the user through the steps for developing insect phenology models, for conducting simulations, and for producing potential population distribution and risk mapping under current or future temperature (climate change) scenarios.*	It was successfully used to develop the Insect Pest Distribution and Risk Atlas for Africa. It has been further enhanced with modules for prediction of risk for insect-transmitted viruses.	A practical training course was held in Benin in 2017.
PlantVillage Nuru app *A smartphone application that helps in accurately diagnosing cassava diseases. The app works both online and offline and is using artificial intelligence to analyze and classify images taken in the field to detect four major cassava diseases. PlantVillage Nuru is a publicly supported and publicly developed application.*	By its nature, it helps next-stage users	Capacity building is embedded in testing its usefulness.

*Selected from ARs; **Clarity, simplicity, usability

Annex 6g. Most Productive Countries for RTB Publications*

Country	Number	Generated by:
1. Kenya	48	CIP
2. USA	37	Partner universities e.g. Uni. Florida, Cornell, Penn. State
3. Peru	28	CIP
4. France	23	CIRAD, Bioversity
5. United Kingdom	23	Partner institutes e.g. Royal Holloway, NRI
6. Uganda	22	IITA, CIP, Bioversity
7. Netherlands	19	WUR
8. Tanzania	17	IITA, Bioversity
9. Ethiopia	15	Bioversity
10. Belgium	14	Bioversity, Univ. Leuven
11. Nigeria	14	IITA
12. Colombia	11	CIAT
13. China	9	CIAT
14. Vietnam	8	CIAT
15. Mozambique	7	CIP
16. Ghana	6	CIP
17. South Africa	6	Partner universities
18. Germany	5	Partner universities
19. Italy	5	Partner universities
20. Cameroon	4	IITA

* Countries are based on the institutional affiliation of the authors

Annex 6h. Assessment of Physical Outputs and Services including Varieties, Digital Innovations, Methodologies, and Tools Generated by RTB for IPG Value

Flagship/Cross-cutting theme objective	Physical product – examples, (IPG assessment*)
FP1 – Discovery research for enhanced utilization of RTB genetic resources Objective: To develop and apply leading-edge science for faster and more precise development of user-demanded varieties, overcome the limitations of conventional breeding for clonal crops, and enhance the long-term conservation and use of genetic diversity.	BCoP fostered communication among breeders from different crops and with the EiB as a foundation for QoS and a model for multi-crop CRPs/FPs (4) Stewardship and regulatory approval of late blight multi-genic resistant GM potato and BXW resistant GM banana (2) Molecular markers for development of biofortified cassava (3) Sequencing of white Guinea yam to improve efficiency of breeding programs (3) Elucidation of banana genome rearrangements improves understanding of triploid cultivars (2) Modernization on breeding programs through BPAT under the multi-donor Crops to End Hunger Initiative in collaboration with EiB for Product Profiles (4) Significant advances in genomics research across RTB crops e.g. sweet potato, cassava, and banana (2) Metabolomic techniques applied to cassava to aid breeding (2) 47 Product profiles for RTB crop breeding targets registered with EiB (3) Databases set up for sweet potato, cassava, yam, and banana accessible from BreeDBase (3) Progress in application of –omic tools to identify candidate genes and molecular markers for breeding (3) Advances in sequencing of water yam and B genome of banana (2) GWAS identified markers for important banana traits (3) Metabolomics identified compounds possibly linked to pest and disease resistance and quality traits (3) Global *in situ* information systems developed – banana and potato (2) On-farm diversity hot spots identified – collection – integration with *ex situ* conservation (3)

Flagship/Cross-cutting theme objective	Physical product – examples, (IPG assessment*)
FP2 – Productive varieties and quality seed Objective: to make available good-quality planting materials of a diverse set of high-yielding RTB varieties that are adapted to the needs and preferences of different stakeholders in the value chain.	87 varieties of sweet potato (60), potato (15), cassava (5), and yam (7) over the past 3 years in 14 different countries (3) Toolbox for designing, implementing, and evaluating RTB seed systems interventions finalized and validated in 10 projects including impact network analysis, gender analysis, and cassava seed tracker (3) Pro-Vitamin A rich banana cultivars acceptable in Burundi and eastern DRC (3) Climate-resilient, virus-resistant potato clones performed well in arid and semi-arid regions of India (3) Net tunnels performed well for multiplication and maintenance of sweet potato clean planting material in Ghana (2) Significant advancement in population improvement and large advances in new hybrids with NARs – e.g. matoke banana with IITA and NARO in Uganda and CBSD tolerant varieties in Tanzania (2) Population hybrid breeding for sweet potato in Uganda, Ghana, and Mozambique (3) Usefulness of the application of the seed systems toolbox assessed e.g. in Uganda for sweet potato (3) Cassava Seed Tracker adopted by NASC in Nigeria for certification of cassava seed production fields (3) RTB-Action Malawi disseminated quality planting material of improved varieties of cassava, potato, and sweet potato to over 90,000 households (2) 5 new potato varieties (Rwanda) and 4 yam varieties (Nigeria) were released/recommended for release (3) GAP package for potato in Kenya almost tripled potato yields (2) 6 orange and 2 yellow sweet potato varieties released in Kenya; 189 banana genotypes screened for pro-Vitamin A; Zn and Fe biofortified potatoes tested widely, and 9 cassava varieties with high B carotene under final evaluation in Colombia (3) Certified cassava producers are making a profit from selling seed in Nigeria; Commercial entities are producing EGS using rapid multiplication technologies for cassava in Nigeria and Tanzania; yam in Nigeria and Ghana; and potato in Rwanda and Kenya and providing seed to commercial growers (3) Cassava Seed Tracker app being used in Nigeria and Tanzania for registering and certifying seed producers (3) Nigeria Seed Act 2019: decentralizing seed certification by authorizing private entities to certify seed and Malawi started using certification standards for cassava seeds (3)

Flagship/Cross-cutting theme objective	Physical product – examples, (IPG assessment*)
FP3 – Resilient crops Objective: 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.	Rapid increase in capacity of FP3 to utilize big data on pest and disease incidence and distribution as well as climate change (BDP) (4) ICT tools and artificial intelligence (CDS) improve diagnosis and monitoring of cassava diseases in SSA (and useful for other RTB crops) (3) ILCYM strengthens capacities to perform risk assessment under climate change and global pest movement (Pest distribution and Risk Atlas for Africa) (3) Development of demand-driven support tools for cassava agronomy in Nigeria and Tanzania (ACAI) (3) Removal of single diseased banana stems (SDSR) recognized as the most effective method for restoring productivity of XW affected banana fields in DR Congo, Burundi, Rwanda, and Uganda (3) In Benin, roguing is being adopted to contain the spread of Banana Bunchy Top Disease (BBTD) (3) Cassava virus disease management was strengthened through scaling out of the PlantVillage Nuru app.; Tumaini - a digital tool developed for banana disease and pest detection; Akilimo is an ICT platform that provides site-specific recommendations to extension officers and farmers on optimal cassava agronomic practices (4) Partnerships with 17 National Plant Protection Organizations (NPPO) allowed for addressing the spread of major diseases in Cambodia, Laos, Thailand, Vietnam, Kenya, Burundi, Rwanda, DR Congo, Mozambique, Tanzania, India, Benin, Cameroon, Nigeria, Togo, Ecuador and Peru supported by ICT tools (3) Advances in the sustainable use of natural resources including water in potato and banana systems (2) Gender norms and roles in crop management assessed in Rwanda and Burundi (3)
FP4 – Nutritious RTB food and added value through post-harvest intervention Objective: to broaden the nutritional potential of RTB crops, expand their utilization, and add value through postharvest innovation.	RTB-ENDURE stimulated marketing, technological and institutional innovations: cooling and marketing of peeled cooking bananas; silage for pig feed; storage for potato; and waxing technology for extended storage of cassava (3) High throughput tools such as NIRS for successfully used to determine quality traits – improved efficiency for breeding programs (FP4 x FP2) (3) Improved energy performance of small-scale dryers for cassava flour in Tanzania and Nigeria – prototype developed (3) Analysis of high-quality cassava flour with B-carotene enrichment (2) Commercialization of storable OFSW puree and shown to be economically viable in Kenya – 100% return annually (3) Progress made in inclusion of biofortification as a national and regional priority in African agriculture (AR 2018 – Table 2) (2) Assessment of bioavailability of micro-nutrients and marketing potential of new and traditional RTB food products e.g. replacement of wheat flour with cassava and banana flours - addition of these local ingredients improved nutritional content (3) 80% increase in Zn and Fe levels and increased Vitamin C in potato to fight malnutrition in the Andes (3) SUSTAIN showed increased adoption and diffusion of OFSP can be achieved through intensive agriculture-nutrition education and extension programs (3) Integration of high-quality cassava peels and sweet potato silage in animal feed in Nigeria and Uganda – in Nigeria, resulted in an enhanced value chain with more than 1,000 small and medium cassava processing centers, about 25 small and medium enterprises processing HQCP, 4 major millers producing animal feed and more than 10,000 fish and livestock producers purchasing HQCP products. (3)

Flagship/Cross-cutting theme objective	Physical product – examples, (IPG assessment*)
FP5 – Improved livelihoods at scale Objective: to improve livelihoods by supporting the scaling of RTB innovations in agri-food systems for all RTB actors and their RTB agroecologies.	Pilot testing of the Scaling readiness approach and the Scaling fund (4) The success of this innovative approach has attracted the attention of other CRPs and the system as a whole (2) Impact of changes in land use on soil carbon in the Peruvian high Andes (3) GENNOVATE – Gender in agricultural change: towards more inclusive innovation in farming communities (3) Social network analysis of multi-stakeholder platforms in agricultural R&D (2) Guidelines for innovation platforms in agricultural R&D (3) Analysis of programmatic research priorities supported by foresight and ex-ante analysis of potential impacts of RTB innovations (2) Partnership management has proven to be a key factor for scaling of innovations esp. in multi-stakeholder platforms (2) Trade-offs between diversification and intensification in areas affected by BXW using whole-farm model FarmDESIGN – effective for decision-makers; more widely applied (3) The ICT4BXW App was further developed as a tool to enable early warning systems and guide options for effective policies and measures to help smallholder farmers combat further spread of banana disease in Rwanda (4) New industry created for cassava peels in Nigeria - Cassava peel tracker helped build linkages between peel sellers, processors and millers – see input above under FP4. (3) The effectiveness of Farmer Field Schools (FFS) was clearly evidenced in Africa and Latin America to enhance innovation (3) PMCA in Latin America and FBS in Asia also showed important contributions to value chain development and potential to enhance gender equality (3)

Flagship/Cross-cutting theme objective	Physical product – examples, (IPG assessment*)
Gender and Youth	Strategy for gender-responsive breeding developed (2) RTB leads the Gender in Breeding Initiative across CGIAR (2) Development of a "Decision checklist and tools for gender-responsive breeding" (3) Input of gender trait preferences to the Crop Ontology Platform (3) Partnership with EiB to internalize the GBI for input to Product profiles (3) Seed systems toolbox gender lens piloted in Uganda (2) Gender-responsive guidelines and protocols to strengthen IPM research and dissemination strategies (3) Gender participation in value chains and women's empowerment (2) Promotion of consumption of OFSP to women and children (3) Development of analytical approaches and tools for gender-responsive innovation (2) 79 publications on gender and youth produced during 2017-2019 including 18 journal articles (3) Understanding youth issues and opportunities in scaling agricultural innovations (2) Young women and men led local development in production of high-quality cassava flour in DR Congo (2) Pilot studies on the interconnections between gender and youth; youth in conflict and post-conflict zones and youth in ethnic minorities with respect to their involvement in agriculture (2) RTB Gender Research Agenda 2019-2021 prioritized gender research on breeding, seed systems, and scaling of innovations (3) Partnership between GREAT and EiB for inclusion of gender-responsive tools in profile development (3) Studies of gender in culturally embedded practices in banana in Uganda (2) Studies of gender-responsive varietal selection of potato in India (2) Rich experience of gender analysis and final outcomes of Farmer Business Schools (FBS) were documented through qualitative research in India (3) Effects of commercialization of sweet potato on gender relations and farmer's wellbeing were assessed and recommendations were formulated to build commercial partnerships for orange-fleshed sweet potato processing and gender-equitable sweet potato value chains (3) Literature review of youth engagement in agri-business (2) Importance of understanding different gendered youth risk situations highlighted for facilitating opportunities for scaling agricultural technologies in Vietnam (2) In Nigeria, the importance of role models engaging in RTB crops as well as access to markets are factors that promote young people's work with RTB crops (2) Tool produced that provides recommendations to foster effective youth participation in agriculture and in RTB crops specifically (2)

Flagship/Cross-cutting theme objective	Physical product – examples, (IPG assessment*)
Climate change	Significant research activities on both adaptation to and mitigation of climate change are embedded in RTB's research agenda; RTB has been tackling the challenges of climate change across disciplines, from genomic approaches, foresight studies to agronomy strategies. (3) Much effort on developing varieties with higher levels of heat and drought tolerance as well as salinity tolerance and emerging diseases and pests (3) Participated in a potato crop multi-model assessment to evaluate responses to climate change (3) Impact network analysis to address the effects of climate change on seed degeneration and seed systems (2) RTB contributed to a cross-CGIAR workshop to identify concrete actions linking foresight modeling, future climate modeling, and breeding, which resulted in an info note calling for innovative holistic breeding strategies for multiple traits that will embrace the full pipeline from trait discovery to varietal deployment and seed system development (3) Studies in India and Kenya showed that adapting smallholder farming to climate change can be achieved by growing varieties that can cope with high temperatures, erratic rainfall patterns, and even drought. (3) Legume intercropping with potato reduced soil temperature, improved soil moisture content, hastened foliage development and canopy cover of the soil which in turn favored tuber initiation (also reported under FP3) (3) Collaboration with CCAFS to develop a framework for priority setting in climate-smart agriculture (3)
Golden eggs – RTB assets	In situ conservation information system (3) Gender+ breeding tools (3) Digital alliance pest and disease management (4) Seed system toolbox (3) TR-4 management strategies (3) Farmer business schools (3) Modeling platform for trade-off analysis (3) Gender-responsive AR4D portal (3) Scaling readiness (3)

*From Guidance notes Pg. 8: IPG rating: 0=not relevant to agriculture; 1=no broader applicability; 2=potentially broader applicability; 3=broader applicability demonstrated; 4=significant international applicability

Annex 7: Data Collection Tools

An interview guide was prepared for each category of interviewee. It is shown below in two sections. The actual questions used were adapted to the interviewee and the information still required for the evaluation.

Main EQ	Secondary EQ	Main information needed from KII and FGDs	CGIAR Management: Steering committee	CRP teams (PMU): CRP director, program head, MEL lead, finance, contracts or communications officers, and others as applicable	Key staff: flagship, cluster, project leaders.
EQ1: QoS To what extent does the CRP deliver Quality of Science, based on its work from 2017 through 2019?	1.1: To what extent does the CRP benefit from sufficient high-quality **inputs**, necessary to deliver planned outputs and outcomes?	research staff, team compositions, availability of adequate research infrastructure, and funding resources. Limitations?	To what extent does the ISC have advisory input to quality of research staff, partnerships, infrastructure, and funding - sphere of influence	To what extent can the PD have input to influencing the quality of staff etc in the CRP accepting that many of the researchers will be from partner centers? What measures have been established to allow this? For management: explore interface between the PMU and how partner centers report MEL, financial issues, etc.	Questions for FP and CC leaders, not project leaders: do you have adequate quality staff, infrastructure, funding for your FP/CC; limitations

Main EQ	Secondary EQ	Main information needed from KII and FGDs	CGIAR Management: Steering committee	CRP teams (PMU): CRP director, program head, MEL lead, finance, contracts or communications officers, and others as applicable	Key staff: flagship, cluster, project leaders.
	1.2: To what extent do the CRP management **processes** ensure the quality of science, including relevance to next stage users, scientific credibility, and legitimacy, of the research and operations?	**Incentives** for achieving and maintaining the high scientific credibility of outputs. L**egitimacy** - how CRP partnerships are effectively built and functioning on the basis of mutual understanding, trust, and commitment, with clear recognition of each one's perspective, needs, role, and contribution. **fairness** and the ethical aspects of research implementation. implementation of **ethics guidelines, management decision processes,** and how representative they are. How **gender, youth, and marginalized groups** are included (or not) in CRPs, in terms of the evidence demonstrating that these groups are considered.	To what extent can the ISC have advisory input to incentive schemes; oversee the legitimacy of partnerships; the ethics of management processes; and recognition and involvement of gender/youth in ensuring that research is relevant to next stage users? Any examples of such actions? Limitations?	From PD: incentives for encouraging achievement of high QoS outputs; influence over legitimacy of partnerships (considering that the sphere of influence is mostly at center level); level of influence over ethical practices; encouragement on gender integration from PMU: role in influencing/controlling management processes that impact directly on CRP from partner centers (reporting, MEL, finance, communication, etc.	To what degree do management processes (at PD and PMU levels) support your abilities to ensure QoS in your sphere of influence: How can this be improved?
	1.3: In what ways are the research **outputs**, such as germplasm, knowledge tools, and publications, of high quality?	**scientific outputs**: published results, germplasm, and other technical outputs. **Quality**	Identify the highest quality technical outputs and publications and why Any outputs which were not up to standard and why	Identify the highest quality technical outputs and publications and why Any outputs which were not up to standard and why	Identify the highest quality technical outputs and publications and why Any outputs which were not up to standard and why

Main EQ	Secondary EQ	Main information needed from KII and FGDs	CGIAR Management: Steering committee	CRP teams (PMU): CRP director, program head, MEL lead, finance, contracts or communications officers, and others as applicable	Key staff: flagship, cluster, project leaders.
EQ2: Effectiveness: What outputs and outcomes have been achieved and what is the importance of those identified results?	2.1: To what extent have planned outputs and outcomes been achieved by 2019?	Progress against **milestones** for outputs and outcomes (POWB) **Quality** of outputs **Factors affecting** performance (positive and negative) **Gender and Capacity development/Partnerships** - reporting, progress, strengths and weaknesses, highlights	Overall progress compared with expectations - highlights Factors affecting from system/ centers etc Major partnerships, capacity building efforts	Check sources of info Highlights factors affecting achievements and quality	Identify most important achievements Reasons for over/underachievement Assessment of quality Identify key gender/ CD/ Partnership achievements challenges with above
	2.2: To what extent achieved outcomes contributed to broader goals, cross-cutting issues (Capacity Development, Climate Change, Gender, Youth and Partnerships), with consideration for predictability of funding and legacy time frame for the CRP?	Contribution to **sub-IDO**s, and higher objectives (IDOs, CGIAR SRF, DDGs) Broader contribution to **Climate Change, Youth, Gender and Capacity development/Partnerships**	What has the CRP contributed to sub-IDOs and higher objectives What have they achieved on XC issues (Climate Change, Youth, Gender and Capacity development/Partnerships)	What has the CRP contributed to sub-IDOs and higher objectives What have they achieved on XC issues (Climate Change, Youth, Gender and Capacity development/Partnerships)	AT the FP/Cluster level: What has the CRP contributed to sub-IDOs and higher objectives What have they achieved on XC issues (Climate Change, Youth, Gender and Capacity development/Partnerships)

Main EQ	Secondary EQ	Main information needed from KII and FGDs	CGIAR Management: Steering committee	CRP teams (PMU): CRP director, program head, MEL lead, finance, contracts or communications officers, and others as applicable	Key staff: flagship, cluster, project leaders.
	2.3: How have the program's management and governance supported the CRP's effectiveness?	**Management and governance structures** - are they **fit for purpose**? **Improvements needed? In practice** what have been the **strengths and weaknesses** of the management structures? **Why? Lessons Learnt?**	**Management and governance structures** - are they **fit for purpose**? **Improvements needed? In practice** what have been the **strengths and weaknesses** of the management structures? **Why? Lessons Learnt?**	**Management and governance structures** - are they **fit for purpose**? **Improvements needed? In practice** what have been the **strengths and weaknesses** of the management structures? **Why? Lessons Learnt?**	**Management and governance structures** - are they **fit for purpose**? **Improvements needed? In practice** what have been the **strengths and weaknesses** of the management structures? **Why? Lessons Learnt?**
	2.4: To what extent have the CRP and its Flagship Programs made progress along their Theories of Change (TOCs)?	**ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**	**ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**	**ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**	**ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**

Main EQ	Secondary EQ	Main information needed from KII and FGDs	CGIAR Management: Steering committee	CRP teams (PMU): CRP director, program head, MEL lead, finance, contracts or communications officers, and others as applicable	Key staff: flagship, cluster, project leaders.
EQ3: Future Orientation: To what extent is the CRP positioned to be effective in the future, seen from the perspectives of scientists and of the end users of agricultural research (such as policy-makers, practitioners, or market actors)?	3.1: What programmatic evidence exists for future effectiveness within the life of the program (through 2021), considering the comparative advantages of the CRP and its Flagship Programs and drawing on their progression according to their corresponding Theories of Change?	Expected progress by the end of the program Limitations	Is the CRP likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?	Is the CRP likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?	Is the CRP/FP/Cluster likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?

Main EQ	Secondary EQ	Main information needed from KII and FGDs	Partners - stakeholders and research managers, from the CRP network of research centers including centers' representatives.	NARS, Sub-regional organizations, Institutes, etc	NGO, farmer organizations, and private sector (e.g. seed) partners	Donors
EQ1: QoS To what extent does the CRP deliver Quality of Science, based on its work from 2017 through 2019?	1.1: To what extent does the CRP benefit from sufficient high-quality **inputs**, necessary to deliver planned outputs and outcomes?	research staff, team compositions, availability of adequate research infrastructure, and funding resources. Limitations?	Similar to FP and CC leaders	Similar to FP and CC leaders	Similar to FP and CC leaders	Are you satisfied with the quality of science available to implement your projects? What steps have you/can you take to ensure improved QoS

Main EQ	Secondary EQ	Main information needed from KII and FGDs	Partners - stakeholders and research managers, from the CRP network of research centers including centers' representatives.	NARS, Sub-regional organizations, Institutes, etc	NGO, farmer organizations, and private sector (e.g. seed) partners	Donors
	1.2: To what extent do the CRP management **processes** ensure the quality of science, including relevance to next stage users, scientific credibility, and legitimacy, of the research and operations?	**Incentives** for achieving and maintaining the high scientific credibility of outputs. L**egitimacy** - how CRP partnerships are effectively built and functioning on the basis of mutual understanding, trust, and commitment, with clear recognition of each one's perspective, needs, role, and contribution. **fairness** and the ethical aspects of research implementation. implementation of **ethics guidelines, management decision processes,** and how representative they are. How **gender, youth, and marginalized groups** are included (or not) in CRPs, in terms of the evidence demonstrating that these groups are considered.	To what degree do management processes (at FP, CC, and project levels) support your abilities to ensure QoS in your activities; limitations; how can this be improved?	Similar to partners	Similar to partners	Do you have any influence on management process at CRP level? To what degree can you influence management processes at your project level? To what degree are the various management processes discussed during project development - are these built into project design? Does the lead center have any influence on your own management doctrine or is it top-down from the donor (tact will be needed here!)?

Main EQ	Secondary EQ	Main information needed from KII and FGDs	Partners - stakeholders and research managers, from the CRP network of research centers including centers' representatives.	NARS, Sub-regional organizations, Institutes, etc	NGO, farmer organizations, and private sector (e.g. seed) partners	Donors
	1.3: In what ways are the research **outputs**, such as germplasm, knowledge tools, and publications, of high quality?	**scientific outputs**: published results, germplasm, and other technical outputs. **Quality**	Identify the highest quality technical outputs and publications and why Any outputs which were not up to standard and why	Identify the highest quality technical outputs and publications and why Any outputs which were not up to standard and why	Identify the highest quality technical outputs and publications and why Any outputs which were not up to standard and why	
EQ2: Effectiveness : What outputs and outcomes have been achieved and what is the importance of those identified results?	2.1: To what extent have planned outputs and outcomes been achieved by 2019?	Progress against **milestones** for outputs and outcomes (POWB) **Quality** of outputs **Factors affecting** performance (positive and negative) **Gender and Capacity development/Partnerships** - reporting, progress, strengths and weaknesses, highlights	Has the CRP done what it said it would do - if not why not? Issues in CRP/Issues in own organization/communication/ allocation of resources Quality of outputs	Value of partnership to country/organization Main achievements Main issues/factors affecting achievement Has it strengthened national organizations? Gender effects	Did the project deliver what it promised - on time? Useful? Good quality? What general impression of the collaboration? Issues/challenges?	Is RTB doing what it said it would do? Have the results so far been acceptable? Issues?

Main EQ	Secondary EQ	Main information needed from KII and FGDs	Partners - stakeholders and research managers, from the CRP network of research centers including centers' representatives.	NARS, Sub-regional organizations, Institutes, etc	NGO, farmer organizations, and private sector (e.g. seed) partners	Donors
	2.2: To what extent achieved outcomes contributed to broader goals, cross-cutting issues (Capacity Development, Climate Change, Gender, Youth and Partnerships), with consideration for predictability of funding and legacy time frame for the CRP?	Contribution to **sub-IDO**s, and higher objectives (IDOs, CGIAR SRF, DDGs) Broader contribution to **Climate Change, Youth, Gender and Capacity development/Partnerships**	What has the CRP contributed to higher objectives (Science, Food security, nutrition, etc) What have they achieved on XC issues (Climate Change, Youth, Gender and Capacity development/Partnerships)	Will the CRP have an effect on food security/nutrition etc? What effect on XC issues-particularly CD in your institution	What overall benefit from the CRP in your country/region etc - FS/Nutrition/poverty relief Indirect benefits to your organization? Does it bring any benefits for women/youth and other XC	Do you expect the program to contribute to higher goals (FS/ rural poverty etc) Also on XC - (gender, youth CC, etc) Any achievements noted from the work since 2017?
	2.3: How have the program's management and governance supported the CRP's effectiveness?	**Management and governance structures** - are they **fit for purpose**? **Improvements needed?** **In practice** what have been the **strengths and weaknesses** of the management structures? **Why? Lessons Learnt?**	Has the CRP management and governance been appropriate In practice what have been the strengths and weaknesses of the management structures? Why? Lessons Learnt?	How well has the partnership worked at the admin level? Communications? Payments? Timely agreements and delivery?	How well has the partnership worked at the admin level? Communications? Payments? Timely agreements and delivery?	Ease of working with the CRP and the host centers, communication? Results reporting? Challenges?

Main EQ	Secondary EQ	Main information needed from KII and FGDs	Partners - stakeholders and research managers, from the CRP network of research centers including centers' representatives.	NARS, Sub-regional organizations, Institutes, etc	NGO, farmer organizations, and private sector (e.g. seed) partners	Donors
	2.4: To what extent have the CRP and its Flagship Programs made progress along their Theories of Change (TOCs)?	**ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**	**Only discuss if aware of ToC or Impact pathway plans of CRP ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**	**Only discuss if aware of ToC or Impact pathway plans of CRP ToC at CRP and FP level - valid assumptions? Learning from experience to date, limitations, usefulness in programming, updated**	Discuss the major obstacles to progress in achieving planned results and the impact. Has the CRP adapted its systems to overcome challenges? If so, has it been successful?	Do you think the CRP takes ToCs/Impact pathways seriously (and use as a tool for planning) or a box that must be ticked? Evidence?

Main EQ	Secondary EQ	Main information needed from KII and FGDs	Partners - stakeholders and research managers, from the CRP network of research centers including centers' representatives.	NARS, Sub-regional organizations, Institutes, etc	NGO, farmer organizations, and private sector (e.g. seed) partners	Donors
EQ3: Future Orientation: To what extent is the CRP positioned to be effective in the future, seen from the perspectives of scientists and of the end users of agricultural research (such as policy-makers, practitioners, or market actors)?	3.1: What programmatic evidence exists for future effectiveness within the life of the program (through 2021), considering the comparative advantages of the CRP and its Flagship Programs and drawing on their progression according to their corresponding Theories of Change?	Expected progress by the end of the program Limitations	Are they likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?	Are they likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?	Are they likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?	Are they likely to achieve their goals? Should the program be continued beyond 2021 - why? how? What other challenges should they address in future?

Annex 8: Conflict of Interest Statements by the Reviewers

1. Main employer and any other organization that provides you with remuneration (which may be named participants in the project/program/proposal you are being asked to review/evaluate)

   Please provide details: NONE

2. Are you aware whether a relative, close friend, close colleague or someone with whom you have financial ties is receiving funding from or giving advice to a project/program/proposal you are being asked to review/evaluate?

   Yes/No NO

   If Yes, please provide brief details:

3. Does any project/program/proposal you are being asked to review/evaluate cite any of your own current research?

   Yes/No NO

   If Yes, please provide brief details:

4. Does any project/program/proposal you are being asked to review/evaluate name researchers with whom you have active collaborations, recently published joint papers or are in regular email correspondence?

   Yes/No NO

   If Yes, please provide brief details:

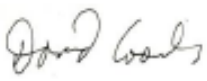
5. Does any project/program/proposal you are being asked to review/evaluate name any of your past PhD students are active participants?

   Yes/No NO

   If Yes, please provide brief details:

Declaration: I declare that the information provided on this statement is true and complete.

Name: David Thomas Coombs

Signed: 

Date: 17/8/20

1. Main employer and any other organization that provides you with remuneration (which may be named participants in the project/program/proposal you are being asked to review/evaluate)

   Please provide details: None

2. Are you aware whether a relative, close friend, close colleague or someone with whom you have financial ties is receiving funding from or giving advice to a project/program/proposal you are being asked to review/evaluate?

   No

   If Yes, please provide brief details:

3. Does any project/program/proposal you are being asked to review/evaluate cite any of your own current research?

   No

   If Yes, please provide brief details:

4. Does any project/program/proposal you are being asked to review/evaluate name researchers with whom you have active collaborations, recently published joint papers or are in regular email correspondence?

   No

   If Yes, please provide brief details:

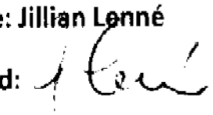
5. Does any project/program/proposal you are being asked to review/evaluate name any of your past PhD students are active participants?

   No

   If Yes, please provide brief details:

Declaration: I declare that the information provided on this statement is true and complete.

Name: Jillian Lenné

Signed: 

Date: 17th August 2020

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