RESEARCH PROGRAM ON Roots, Tubers and Bananas

CGIAR

Addendum from RTB to the

Full proposal for the CRP on Roots, Tubers and Bananas for Phase 2 (2017-2022)

This addendum consists of three sections:

1) Response to the ISPC commentary 1

2) CO comments on IA and OA/OD 19

3) Additional information on changes applied 21

1) Response to the ISPC commentary

The ISCP states in its commentary document (page 2) "[…] that the CRP on Roots, Tubers and Bananas has reached an advanced stage of development and scores well against each of the criteria used by the ISPC to review the full proposals. There is of course always room for improvement and the ISPC requests the CRP proponents to submit an **addendum** which responds to the points made below, alongside the full proposal to be **submitted to the System Office by 31 July 2016.**

1. Propose actions to reduce risks related to science quality, and particularly the high proportion of journal articles published in journals without an impact factor, both in terms of understanding how this came about and what will be done to resolve the problem.
2. Clarify the fate of research on pests and disease management of potato and sweet potato.
3. Respond to suggestions that CC3.2 on crop production systems would be better placed in FP5 and provide further details on the budget for this cluster of activity.
4. Clarify a number of points highlighted in the comments on FP4 to understand the evidence base for expectations of future impact from bio-fortified cassava and sweet potato.
5. Address remaining concerns regarding the content of FP5, particularly clusters of activity 5.2 and 5.4 through a detailed management response in the addendum."

It was agreed during the ISPC plenary feedback in Montpellier in June 2016 that where there is major structural change, this should be included in the Proposal document itself; otherwise it could be covered in the addendum. In the case of RTB for the first four points listed above, we only respond in the addendum. In the case of the issues raised for point 5 on FP5, quite extensive revision was needed, especially of clusters CC5.2 and CC5.4, and we have rewritten the relevant parts of the Proposal.

The responses to ISPC commentary is organized in five subsections; one for each of the ISPC points. Additionally, we grouped under each of these points the linked comments from the ISPC and answered each of these sequentially.

1. *Propose actions to reduce risks related to science quality, and particularly the high proportion of journal articles published in journals without an impact factor, both in terms of understanding how this came about and what will be done to resolve the problem.*

RTB agrees that improving science quality and publishing in higher impact factor (IF) journals is essential and that publication in zero IF journals should generally be avoided. Rigorous research that yields results of fundamental or practical importance can usually find room in IF journals. Publishing serves both as a validation process (to reduce risks related to science quality) and as part of quality management (e.g. to clarify and specify practices and results and to prepare for subsequent monitoring).

A similar request to that of the ISPC was made as recommendation 5 of the Independent Evaluation of RTB (GIAR-IEA 2015). In our management response (RTB, 24 January 2016) we pointed out that work in delivery and outcomes is more challenging to publish in journals with high IF. The diverse nature of science in RTB all the way from basic and biophysical up to value chains, scaling up and science of delivery means that there are different opportunities among scientists to publish in high IF journals. One significant contributory factor to the high % of zero IF in the IEA evaluation was 23 articles published in the IX International Symposium on Banana: ISHS-ProMusa Symposium on “Unravelling the Banana's Genomic Potential”. Acta Hortiuclturae notes that “For several - mainly publishing-technical reasons, Acta Horticulturae, like other series of proceedings is currently not covered by Thomson Reuters in the Science Citation Index (SCI); consequently, the series has no Impact Factor following the standard procedure used by Thomson Reuters (formerly ISI). Nonetheless Acta Horticulturae is a sound scientifically reviewed proceedings series”. Finally, it should be borne in mind that publications even with zero IF may contribute to outcomes particularly when co-published with national programs on topics of local importance, for example article on varietal release in Peru published in Spanish (Arcos et al 2015). We also need to ensure that other dimensions of research quality such as contribution to variety release and technology development are given the correct weighting and attention in performance evaluations if we want to achieve the ambitious outcome targets with partners listed in the RTB Proposal.

In our management response to IEA we highlighted actions to be taken to address the risk related to science quality by better tracking of publications, making clearer in acknowledgements attribution to RTB so that we make sure to pick up IF publications, creating incentives at different levels for publication in IF journals and building a stronger RTB wide culture for science quality. This includes communicating with RTB scientists: (1) that our crops are interesting, original and matter for visible publications; (2) our results, including research for development, must be validated by peers; (3) our data must be stored, capitalized and managed; (4) our impact will best be monitored and our pertinence be demonstrated with an active publication policy; and (5) the credibility of researchers for taking part in our program will openly take account of publication in IF journals. This will be linked to the move to open access which RTB and its participating centers are taking extremely seriously.

There have already been significant changes in RTB to address the stated concern and more is planned. At RTB program level in 2015 we set up an Annual Performance Evaluation by crop teams and RTB granted projects (complementary funded projects). This carefully tracked a range of performance indicators, including numbers of publications in IF journals divided by number of full time equivalents in each team, and rewarded good performance of crop and/or project team with a budget bonus for the following year.

Incentives for publication at the RTB Program level meshes with evaluations of scientists in all centers. Bioversity, CIAT, CIP and IITA have staff performance evaluation systems, which explicitly track the numbers of IF publications amongst other indicators. Since 2015, IITA has circulated on a monthly basis the list of

publications, in IF order. This encourages strong peer pressure to publish in IF journals. In the case of CIP and IITA, this is reflected in salary increases or a bonus payment to the scientist. Bioversity recently had an internal audit on science quality processes and will further strengthen this area by the end of 2016, in line with Board expectations and good practice. Since 2015, CIAT has implemented an intensive twice-yearly performance evaluation based amongst others publications as an obligatory objective and internationally recruited scientists are expected to contribute as author on two publications per year in impact journals. CIRAD also rewards performance by teams, including publications in evaluations of science units every two years.

There is still work to be done in ensuring flow down of performance indicators at the program, crop and cluster level to individual scientists. We are currently putting in place an online system for planning, monitoring, evaluation and learning (PMELP, RTB Proposal March 2016), where all deliverables are listed linked to particular clusters and scientists. Once fully operational, this should help to ensure better tracking of publications and clear articulation between levels and a flow down of incentives from the program to crops (centers) and clusters and then scientists.

No changes were made relating to point 1 in the resubmitted RTB Proposal itself.

2. Clarify the fate of research on pests and disease management of potato and sweet potato

Comment: It is not clear where research on pests and disease management of potato, sweet potato and yams will be carried out, given the focus on cassava and banana in FP3. All of these crops suffer from serious diseases and the presence or absence of this research should be made clear in the addendum.

Research on pests and diseases of potato, sweetpotato and yam is an essential element and central feature of RTB, making up a part of the relevant clusters in FP2. This arrangement reflects a shift in the RTB program structure from Themes, which grouped work in similar disciplines (e.g. pest management), to impact-focused clusters for research and delivery. Each of these clusters was designed around a lead product that is the entry points for the innovation process. A cluster includes and integrates work across multiple disciplines as linked products, to leverage impact. The key point to note is that research on pest and disease management for potato, sweetpotato and yam in FP2 (Productive varieties and quality seed) supports the aim of the cluster and is not an end in itself (as in the previous Thematic structure). This flagship and cluster structure was developed through a participatory process with center scientists, drawing on the RTB priority assessment and in discussion with the Consortium Office.

In cluster PO2.4 (Seed potato for Africa) the lead product focuses on improving quality and availability of planting material to enhance productivity and competitiveness of potato farmers. However, for this to happen, several linked products are needed, such as: robust potato varieties with resistance to key pests (late blight, virus), seed multiplication technologies and protocols (with strong emphasis on disease detection and management of seed-borne diseases), integrated crop management for seed and ware potato (which includes integrated pest management for late blight, and bacterial wilt, potato tuber moth, and leafminer fly), value chain research (including quality parameters for damage thresholds by post-harvest pests, such as potato tuber moth), and scaling-up strategies for seed-related innovations. Hence potato pest management research is an integral part of the cluster, which closely matches one of CIP's potato research programs for Africa.

The cluster PO2.5 (Agile potato for Asia) follows the same logic. The lead product comprises adapted, resilient and precocious potato varieties, but in order to achieve impact with those varieties, linked products are needed, such as: breeding methods and population development (which includes screening for resistance to pests), strategies for ecological intensification of farming systems with potato (also looking at key insect pests and pathogens, including management of seed-borne diseases), together with value chain-related research that takes into account post-harvest pest management (e.g. potato tuber moth). Hence, pest-related research is integrated in the logic of the cluster, which matches almost entirely with one of CIP's potato research program for Asia.

For sweetpotato, the cluster SW2.6 (User preferred sweetpotato varieties), includes as lead product "demand driven OFSP and purple fleshed sweetpotato varieties". This would also incorporate resistance to the sweetpotato virus disease as a key trait for users. Research on the African sweetpotato virome will guide breeding to develop sweetpotato populations adapted to different agroecosystems. The search for resistance to the sweetpotato weevil using biotechnology represents another example of pest-related research. A critical line of research that involves pest management, particularly virus management, is related to improvements in sweetpotato planting material and seed systems. Viruses, transmitted by vectors such as whiteflies, are among the most important causes of degeneration of planting material, so research is included to understand the sweetpotato virome, degeneration processes, and to underpin the development of suitable detection methods, not only for laboratory use, but also for field applications.

Finally, for yam the cluster YA2.7 includes research on pests and diseases linked to developing varieties with enhanced pest and disease resistance, as well as research on therapy procedures to eliminate fungi, bacteria and nematodes from seed and ware yam. And additionally as for potato and sweetpotato there is a considerable pest and disease management component linked to seed systems.

Two cross cutting clusters also involve research on pest management and will link with and support this crop specific research. CC2.1 (Quality seeds & access to improved varieties) includes research to better identify diseases that cause seed degeneration, and to quantitatively describe the factors that drive or mitigate this process. CC3.1 (Management of RTB-critical pests and diseases under changing climates, through risk assessment, surveillance, enhanced modeling, and advanced IPM) will update or develop new integrated pest management strategies (cultural, mechanical, biological, or biorational methods) which cut across RTB crops.

In conclusion, for potato, sweetpotato and yam, pest and disease-related research is well integrated in the crop specific clusters and is an essential element in impact pathways with strong linkages to related research on other RTB crops through the cross cutting clusters.

No changes were made relating to point 2 in the resubmitted RTB Proposal itself.

3. Respond to suggestions that CC3.2 on crop production systems would be better placed in FP5 and provide further details on the budget for this cluster of activity

RTB management and centers reviewed this suggestion and do not agree that CC3.2 (crop production systems) would be better placed in FP5. FP5 has been extensively revised, so that it should be persuasive in its own right, without an injection of content from CC3.2. Therefore, CC3.2 should be retained in FP3.

CC3.2 supports a unified framework for technologies, tools and datasets on crop and soil management in diverse agro-environments. The cluster complements and provides the cross cutting framework for other

clusters in FP2 and FP3, which also contain agronomy work at the product level, e.g. PO2.5, YA2.7 and BA3.3. The products from these clusters feed into an array of decision support tools to enable farmers to make informed decisions on varietal choice and appropriate agronomic practices (site-specific crop managers).

CC3.2 focuses on production technologies, functioning at the plot and field level whereas FP5 focuses on RTB agri-food systems at the household, landscape and value chain levels. No doubt, that there will be a productive area of overlap where insights from FP5 guide work on crop production systems (e.g. demand) and technologies proposed by CC3.2 (e.g. supply) will be evaluated for synergies and trade-offs with other farm enterprises at household, landscape and value chain level. There are two justifications for this differentiation by level of scale and level of systems integration. Both relate to the overall focus on system resilience for FP3:

1) Work on cropping systems in CC3.2 needs to be integrated with the management of pests and diseases, which mostly lies in FP3 under a single FP leader.

2) Crop and soil management technologies need to be adapted to a wide range and variety of local cropping systems before they can be adopted and scaled. But many of these adaptations occur at field level, may be relatively simple (e.g. not having complex system interactions), and can be designed and managed by farmers themselves. For example, a fertilizer or a plant density recommendation has system implications, but typically are not complex in that multiple variables at different scales are involved. These simpler technologies form part of CC3.2. However, larger system-shifts, linked to sustainable intensification, such as moving from monoculture to agroforestry or novel crop-livestock-integration options, will likely need outside support, with a complex series of linked changes which occur at the household, landscape or value chain level of the agri-food system. These higher level changes require complex RTB agri-food system innovations that are part of FP5 and more particularly CC5.2.

With regard to budget, crop management and agronomy were relatively underfunded in Phase I of RTB, as pointed out by IEA. Some of the larger donors have been ambiguous in their support, which has weakened center capacity for agronomy. Evidence of impact from crop management has been less clear-cut than for varietal adoption and there have been fewer scientists with agronomy skills in the CGIAR. Recently, this has changed (with increased potential for impact from research in agronomy given availability of massive data sets linked to crop management and potential for crowd sourcing information and providing decision support through mobile phones) and there is a recent large BMGF grant which supports cassava agronomy in Nigeria and Tanzania. This will make up a considerable part of the budget of CC3.2 although there is optimism that additional funding for cropping systems linked to CC3.2 will be available under large new grants in the pipeline. The budget for this cluster is estimated at $US 3.99m of which $US 0.56m is W1-2 and $US 3.43m is W3 and bilateral.

No changes were made relating to point 3 in the resubmitted RTB Proposal itself.

4. Clarify a number of points highlighted in the comments on FP4 to understand the evidence base for expectations of future impact from bio-fortified cassava and sweet potato.

4.1 Comment: The justification is particularly weak for the target of "10 million people with significantly improved diet quality". A small amount of, for example, orange-fleshed sweet potato would not necessarily constitute a significant improvement in diet quality (page 5, ISPC commentary).

Orange fleshed sweetpotato (OFSP) varieties available in Sub-Saharan Africa (SSA) are excellent sources of bioavailable (Tang, 2010) pro-vitamin A (ranging from 300 to 1200 µg/100 grams Retinol Activity Equivalent (RAE) on fresh weight basis). Solid evidence exists that food-based approaches using OFSP as a key entry point led to significant increases in vitamin A intakes. In Mozambique (Low et al. 2007), vitamin A intakes among children under 5 years of age were eight times higher among intervention than control children (median 426 vs. 56 µg RAE, P< 0.001). Children were only eating OFSP on average two times a week, but over 200 grams of cooked OFSP were consumed on days they ate OFSP. In Uganda (Hotz et al. 2012b), a randomized, controlled effectiveness study compared the impact of the more intensive intervention program (IP) and a reduced intensity intervention program (RP) with a control on orange-fleshed sweetpotato and vitamin A intakes among children 6–35 months of age (n = 265) and 3–5 years (n = 578) of age, and women (n = 573). The prevalence of inadequate vitamin A intake was reduced in the IP and RP groups compared with controls among children 6–35 months of age (>30 percentage points) and women (>25 percentage points) (P < 0.01), with no differences between IP and RP group children (P = 0.75) or women (P = 0.17). The net OFSP intake increased in both the IP and RP groups (P < 0.01), accounting for 44–60% of vitamin A intake at follow-up. While emphasis has been placed on vitamin A, OFSP roots are also a good source of vitamins C, K, E, several B vitamins and minerals such as potassium and leaves are good sources of lutein, vitamin C and other vitamins.

No changes were made relating to point 4.1. in the resubmitted RTB Proposal itself.

4.2. Comment: While the literature has examples of efficacy studies for bio-fortified cassava, it is not clear whether the link between increased consumption of bio-fortified cassava and the incidence of vitamin A deficiency in children is as well-established as it was for OFSP at a similar stage in the "scaling" process.

It is true that at present there is no effectiveness study for vitamin A cassava comparable to that for OFSP before scaling (Low et al 2007 and Hotz et al 2012a; Hotz et al 2012b). However, there is promising evidence, and HarvestPlus is working to gather more as scaling occurs. A larger-scale efficacy trial is underway in Nigeria, and preliminary results are expected by the end of 2016. To date, only a small nutritional efficacy study has been completed in Eastern Kenya with 5–13-year-old children. This trial demonstrated small but significant improvements in vitamin A status, measured both by serum retinol and beta-carotene, in the yellow cassava versus the control group (Talsma et al. 2016). Studies by La Frano et al (2013) found that consumers of yellow cassava had an increase in the levels of β-carotene and vitamin A in their plasma layer indicating that it could be a good food crop for intervention programs. Bechoff et al (2015) reported that consumption of gari made from yellow cassava roots contributed to close to, or more than 50% of a child's estimated average requirement for vitamin A.

HarvestPlus has completed studies, which show that consumers like and will purchase biofortified cassava. In Nigeria, consumer behavior varies by region. A consumer acceptance study conducted in Imo

state and Oyo state tested bio-fortified yellow cassava gari (a popular fermented food) against local gari. The local gari tested was white in Oyo, but yellow (mixed with red palm oil) in Imo, in accordance with regional preferences (Oparinde et al. 2014). In Oyo state, tests revealed that consumers preferred the gari made with light yellow cassava even in the absence of nutrition information. Once consumers received information about the nutritional benefits of yellow cassava varieties, light-colored yellow cassava remained as the most popular variety, but gari made with deeper-colored yellow cassava was preferred over the local variety. In Oyo, the light-colored yellow cassava could become a popular variety even without nutrition campaigns. In Imo, tests revealed that in the absence of nutrition information, local gari was preferred to the gari made with either light- or deeper-colored yellow cassava varieties. Once consumers were told about the nutritional benefits of yellow cassava, however, gari made with the deeper-colored yellow cassava was preferred.

There will be an impact assessment carried out in Nigeria in 2017, which will offer some insight into the effectiveness of various HarvestPlus (FP2 of A4NH) scaling strategies.

No changes were made relating to point 4.2. in the resubmitted RTB Proposal itself.

4.3. Comment: The reader is informed that OFSP has been established as a widely utilized nutritious crop for more 1.3 million households in 10 countries in Africa since 2010. This estimate of 1.3 million households needs to be described in some detail in the addendum.

The evidence of proof of concept for OFSP and the compelling evidence of nutritional impact has been recently recognized in the award of the World Food Prize to three CIP scientists and the Director of HarvestPlus (http://cipotato.org/site/worldfoodprize/). This joint award also illustrates the depth of RTB and A4NH collaboration and interaction on methodologies.

CIP/RTB and partners are monitoring the distribution of OFSP planting material through their programs and projects in Africa and Asia. In Africa, the Sweetpotato for Profit and Health Initiative (SPHI) is a multi-partner, multi-donor initiative launched in 2009 with a goal to improve the lives of 10 million African households by 2020 through access to improved varieties of sweetpotato and their diversified use. The number of households receiving improved sweetpotato planting material is collated annually and reported to donors and partners. Almost all of the varieties being distributed are orange-fleshed. Table 1 provides updated figures as of April 2016, showing an estimated 1.7 million households adopting since 2010, with a projection to 2.4 million for 2016. **This estimated number of 1.7m HH was corrected in the RTB Proposal, to replace the formerly mentioned 1.3m HH (subsection 2.4.1.5, page 121).** Table 1 also provides estimates of future expansion of OFSP to nearly 7 million households in the selected countries, based on estimates of future financial support. However, we also anticipate resource mobilization for other targeted countries as yet not funded, such as Burundi and DR Congo. Under the SPHI, there are 9 organizations represented in the Steering Committee that are committed to reaching this goal, including 4 major donors: HarvestPlus, RTB and organizations, such as Helen Keller International, PATH, and Farm Concern.

CIP/RTB and partners have developed and are implementing standardized monitoring and evaluation tools to capture the names and locations of beneficiary households receiving OFSP planting material with their programs. Through operational research, CIP ascertains the farmer-to-farmer diffusion rate in key program locations. CIP regularly collates these figures at country level and reports a global aggregate

country list and in-country breakdown to donors twice a year (including demographic characteristics of households).

Table 1. Totals to 2015 and projections to 2021 of households receiving OFSP, and programs supporting this work

Country	Households receiving OFSP planting material			Programs supporting OFSP distribution (2015/16)	
	Totals for 2010-2015	*Projections for 2016*	*Projections for 2017-2021*	Project name	Donor
Angola	**29,311**	-	-	[no current activities]	-
Bangladesh	**132,084**	*5,400*	*197,204*	Horticulture, SUSTAIN	USAID, DFID
Burkina Faso	**5,516**	*6,000*	*109,456*	Jumpstarting	BMGF
Ethiopia	**327,335**	*80,000*	*1,228,112*	Better Potato, Nutrition Security	USAID, Irish Aid
Ghana	**14,001**	*10,000*	*216,726*	SASHA, Jumpstarting	BMGF
India	**3,453**	*2,500*	*89,764*	GAINS	Gov. Odisha
Kenya	**47,664**	*46,500*	*447,152*	SUSTAIN, VISTA	DFID, USAID
Madagascar	**1,077**	*1,000*	*87,764*	SASHA	BMGF
Malawi	**251,700**	*110,000*	*1,393,613*	SUSTAIN, VISTA, R&T Crops ACTION, DIVERSIFY	DFID, USAID, Irish Aid, EU
Mozambique	**258,518**	*65,000*	*497,719*	SUSTAIN, VISTA, Niassa, Drought Mitigation, SASHA	DFID, USAID, Irish Aid, OFDA, BMGF
Nigeria	**30,313**	*10,000*	*433,451*	Rainbow, Jumpstarting	Gov. Nigeria, BMGF
Rwanda	**73,590**	*90,000*	*738,633*	SUSTAIN, VISTA, SASHA	DFID, USAID, BMGF
Tanzania	**157,952**	*30,000*	*361,210*	VISTA, SeFaMaCo, Fast-tracking, SUSTAIN	USAID, BMGF, DFID
Uganda	**426,577**	*120,000*	*820,703*	HarvestPlus, Fast-tracking	USAID, BMGF
Zambia	**24,077**	*8,000*	*82,070*	Africa Rising, SUSTAIN	USAID, DFID
TOTAL	**1,783,167**	*584,400*	*6,703,578*		

Source: *CIP compilation*
Note*: In Bangladesh, Kenya, Malawi and Uganda adoption results are co-reported with HarvestPlus reflecting joint attribution of RTB and A4NH*

The following points should be noted concerning Table 1:

- The verified diffusion rates in key countries vary between 1:1.6 and 1:5 depending on a range of agro-ecological, socio-economic, and program design and implementation factors.
- Table 1 uses a default diffusion rate of 1:2.5 in other countries/programs.
- Direct recipient households are counted in the season when they receive planting material, indirect beneficiaries in the next season.
- Secondary and tertiary diffusion in subsequent seasons are not captured.
- Dis-adoption rates are not captured but would likely be offset by the underestimates from secondary and tertiary diffusion.

The only change relating to section 4.3 concerned the number of households adopting OFSP mentioned above.

4.4. Comment: FP4 is also a higher-risk research project, substantially more so than FP2 and FP3 which are at the same applied level. While it is good to see nutritionists and social scientists working in this FP, the idea that researchers can influence consumers to pay a premium for nutritious (bio-fortified) varieties (as described on p. 100), requires several leaps of logic.

FP4 does have a higher potential risk because it requires changes in consumer perceptions. However, the aim of researchers is not to influence consumers to pay a premium per se, but rather to generate interest in biofortified food from RTB crops. The theory of change is to link with existing national programs, platforms and value chain actors, who engage in proactive demand creation and education to influence consumer behaviors to (1) appreciate a healthier product; (2) understand its benefits; and (3) eventually pay a small premium. This is relatively easier for orange varieties because of the high correlation between the visual properties of the food and the vitamin A content – captured in "Eat orange" marketing concept for OFSP. We have seen two situations emerge as knowledge concerning the nutritional value of OFSP grows: (1) OFSP sells at the same price as white-fleshed varieties, but traders report that it sells faster; and (2) the emergence of a price premium. Recent price information from Rwanda, where there is a growing market for OFSP for agro-processing, illustrates the premium for OFSP. In Figure 1, on average (over one year), the OFSP price was 28% higher than the price of white-fleshed sweetpotato and 11% higher than that of yellow-fleshed sweetpotato.

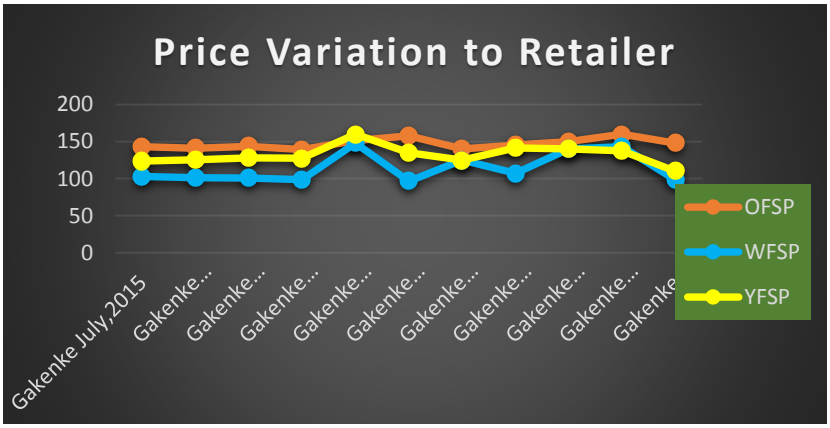

Figure 1. Price series for yellow, white and orange fleshed sweetpotato in Rwanda (Rwfs/kg) from July 2015 through May 2016 in Gakenke market

***Note**: Exchange rate: 770 Rwanda francs/1 USD*

No changes were made relating to point 4.4 in the resubmitted RTB Proposal itself.

4.5. Comment: It is not clear why there is such a rush to get bio- fortified materials out to farm households in 20 African countries when the uptake of OFSP in Uganda and Mozambique – with very good breeding programs, dynamic leadership, and widespread, intensive efforts in technology transfer – have resulted in sustainable acceptance that was as much as 80% below expectations based on nationally representative surveys.

Given the potential and urgent need for impact, it would be a missed opportunity to wait for definitive results in Uganda and Mozambique before scaling elsewhere. And in each country location there will be a different set of opportunities and needs to be addressed for scaling. A recent review of trends in vitamin A deficiency (1991-2013) revealed that vitamin A deficiency remains prevalent in south Asia and SSA. The authors conclude that "improvement of vitamin A status in south Asia and SSA to replicate the reductions in deficiency seen in east and south east Asia and in Latin America and the Caribbean will probably need an improvement in the overall nutrition of the population, including through dietary diversification and improved access to vitamin-rich foods, and improved access to treatment for infectious diseases "(Stevens et al. 2015).

Furthermore, the implication that research has underachieved in these two countries is misleading. While there have been major efforts to distribute OFSP in Uganda and Mozambique, these efforts have not been national in scope nor sustained over time. For example, in Mozambique, since the release of 15 drought tolerant OFSP varieties in 2011, dissemination efforts were only funded for 5 of the Mozambique's 10 provinces through 2014. In 2015, funds were received to expand into the two additional large provinces. In Uganda, HarvestPlus dissemination efforts have focused on 25 of the country's 112 districts. For sustained adoption, an integrated approach is advocated—that is OFSP promotion alongside community-level nutrition education. We also have learned that having an active marketing component accelerates adoption. Due to differences in design and funding, in some countries integrated approaches are being used, in others OFSP dissemination is being used as part of disaster response with limited demand creation and nutrition awareness. Different countries are at different stages and experiences are shared in four different community of practice technical working groups: (1) breeding and genomics; (2) seed systems and crop management; (3) marketing, processing and utilization; and (4) monitoring, learning and evaluation. We will aim for raising funds for a major adoption study in 2019 in several countries, which will permit informal dissemination to complement the formal dissemination efforts. Given that biofortified OFSP is the lead biofortified crop going-to-scale, it is critical that the momentum is sustained. Evidence for improved levels of vitamin A intakes and status mean that its use in integrated approaches does enhance diet quality. Clearly, levels of permanent adoption will vary between and within countries depending on the comparative advantage of different crops and the degree of utilization of an integrated approach to OFSP introduction. To our knowledge, only Mozambique is distinguishing between OFSP and non-OFSP types in its nationally representative survey. To have achieved 22% of area under sweetpotato as orange-fleshed types in 2012 is significant and positive, not a failure given the immense size of the country, the challenges of working with a clonally propagated crop and the underdeveloped seed sector context.

No changes were made relating to point 4.5. in the resubmitted RTB Proposal itself.

4.6 Comment: It is also not evident that the lessons being learned in A4NH about how to scale up are reaching RTB effectively – how does scaling up of OFSP in the CRP on RTB differ from scaling up proposed in A4NH? The possibility of duplication of effort cannot be ruled out without further elaboration by the CRP management. Further clarification on these points is sought in the addendum.

There is on-going collaboration between HarvestPlus (FP2 of A4NH) and RTB FP4 to avoid duplication of effort and leverage synergies. RTB collaborates already with A4NH and further collaboration is planned for Phase II in its FP1 on Food Systems, which will be implemented in Ethiopia, Nigeria, Bangladesh and Vietnam - all important target countries for RTB. In the case of OFSP, CIP and HarvestPlus are sharing methodologies and evidence about scaling biofortified crops. This has resulted in several joint publications, conference panels and policy advocacy campaigns. As one mechanism for sharing lessons learned, HarvestPlus Uganda is a key member of CIP's multi-stakeholder partnership program SPHI and its various Communities of Practice (http://cipotato.org/research/partnerships-and-special-projects/sasha-program/). In other words, a two-way learning process has been established between HarvestPlus (A4NH FP2) and CIP's OFSP program to accelerate learning and widen application of successful approaches to the full range of biofortified crops.

In as much as methodologies are similar and learning is best done together, there is an important difference in the purpose and strategy between HarvestPlus and RTB FP4 (see Annex 6 "Linkages with other CRPs and site integration", Tables 2 and 3, RTB Proposal, March 2016). HarvestPlus is primarily concerned with demonstrating effective and efficient scaling of biofortified crops to contribute to improving nutrition and health in target populations, including several crops in combination ("food basket"). RTB FP4, on the other hand, is scaling several interventions involving both biofortified and non-biofortified crops in an integrated way considering all the complementary technologies around seed systems, postharvest and processing which need to be in place for sustainable adoption. This effort will utilize biofortified RTB crops where available, but as such will not be guided by or limited to the availability of such varieties.

This difference may be illustrated through an example of work in RTB FP4. CIP and Michigan State University, under the DFID-funded SUSTAIN (Scaling Up Sweetpotato through Agriculture and Nutrition) program, are currently implementing a comprehensive 4-year Randomized Controlled Trial (RCT) in 42 villages in eight districts of Rwanda. This research assesses the effectiveness of different combinations of CIP's Integrated Agriculture-Nutrition-Market approach for promoting the adoption and consumption of OFSP at scale. The RCT will generate important evidence on the scalability of a specific set of implementation approaches that include OFSP planting material, nutrition education, healthy foods markets and kitchen gardens. Results will be relevant for HarvestPlus in Rwanda and globally, but equally for the development of nutrition-sensitive agriculture beyond biofortification. In Rwanda, for example, the promotion of highly nutritious foods, both crop and animal source, is an important national policy priority and the RCT will provide evidence on how this may best be achieved in a strongly RTB-based agricultural system.

For the reasons presented above, the scaling of RTB crops for nutrition and incomes is included under RTB FP4, while the collaboration with HarvestPlus for the promotion of multiple biofortified crops is part of A4NH. Certainly, there will be a lively exchange of lessons and methodologies. HarvestPlus is pulling together an online system for documenting and sharing lessons learned from the delivery work and RTB will actively contribute to this. Both HarvestPlus and RTB are supporting adoption and preference studies in cassava (both of white and biofortified cassava) often with scientists shared across different teams).

Hence whilst there is scope for systematizing lessons learned among RTB and A4NH, rather than duplicating efforts this should be considered fruitful cross-fertilization.

No changes were made relating to point 4.6. in the resubmitted RTB Proposal itself.

5. Address remaining concerns regarding the content of FP5, particularly clusters of activity 5.2 and 5.4 through a detailed management response in the addendum.

The FP5 subsection 2.5 of the RTB Proposal was rewritten in the majority of its text – especially concerning paragraphs that refer to CC5.2 and CC5.4. this to take comments from 5.1 – 5.3 into consideration.

> *5.1. Comment: The clusters on Sustainable Intensification and Diversification (CC5.2) and on Institutional Innovation and Scaling (CC5.4) are problematic and likely represent low pay-off investments. The arguments are unpersuasive and not cogently presented, and the outputs are highly speculative and ill-defined.*

We agree that these two clusters need to be substantially revised. Accordingly, we have adjusted the scope and content of FP5, and especially CC5.2 and CC5.4, in the resubmitted RTB Proposal to make it more persuasive. For the revision of FP5, we also considered the ISPC comments, which recognize and highlight the importance of all five RTB FPs, their interlinkedness and interactiveness as well as the strong synergy across FPs that offer more value than the sum of individual CRPs: "There is a cascade of linkages from FP1 (discovery) to FP2 (adaptive varieties/seed) and then FP3 (resilient crops), FP4 (nutritious and value addition) and FP5 (livelihoods at scale). The synergy is clearly articulated in a series of tables." (page 3, ibid). And continuing on page 5: "The CRP aims to increase the income of 4 million households (50% women), help 30,000 SMEs operate profitably, and help to increase the yields of 8 million farm households. These targets would seem to be highly dependent on the strategy for scaling up in FP5 – a strategy that is not particularly clear (see comments on FP5)."

Scaling is central to achieving the ambitious outcome targets of this Proposal. Scaling does not happen spontaneously. FPs and clusters in the Delivery FP2-FP4 have their own scaling strategies, captured in their specific impact pathways via the outcomes with stakeholders and visible for example in sub-IDO targets and the constellation of partners each FP brings to the table. Clear and carefully planned country level impact pathways need to be defined and agreed with stakeholders, with intermediate goals to measure whether scaling is moving in the right direction. Pathways to scaling are a long, stepwise and multi-stakeholder process. Scaling RTB solutions may not only require stepwise improvements, but also support for transformative action to remove deeply embedded beliefs and norms that hamper women/youth employment and their economic opportunities. Scalability has been a central topic for donors for some time and several frameworks already exist (Jonasova and Cooke 2012; IFAD 2015).

FP5, under the adjusted flagship concept presented below, will no longer develop models for sustainable intensification or a "new theory and practice of scaling" but rather focus on adapting and applying existing models and frameworks to improve livelihoods at scale. With this reframing on applying existing frameworks for sustainable intensification and scaling CC5.2 and CC5.4 can become the areas of high pay-off that earlier parts of the ISPC commentary hint at.

Revised strategy and concept for FP5:

Following the RTB conceptual framework, clusters in delivery flagships pass through different stages as the scale of impact increases (RTB Proposal, March 2016, table 8 and page 16f). As this happens, the role of RTB in scaling changes, as the development actors responsible for scaling take on the primary responsibility and consequently the direct RTB role declines.

Table 2. Stages of clusters in delivery flagships (table 8 in RTB Proposal)

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

Note: * = significant, † = important, ‡ = major emphasis.

Different clusters in the delivery flagships are currently at different stages along the scaling process. Over the course of the six years of implementation of Phase II, some clusters in each country will move to the next stage. In the initial stage 1 of assembly and pilot, RTB research focuses on adapting technologies to be scaled. As initial scaling occurs (stage 2), research shifts its focus to the science of delivery - where FP5 has an expanded function. Therefore, FP5 is not about bringing all the products of FP2-FP4 together for scaling under this flagship; as this wouldn't be feasible, particularly given the multi-crop design of RTB. FP5 rather provides a supporting framework that can link FP/cluster specific scaling strategies and their related products through virtuous feedback loops to add value and accelerate scaling. This is done by the learning and outcome support function of FP5, including: (1) targeted research on scaling processes; (2) the development of an evidence base of what works; (3) sharing of lessons learned; and (4) provision of targeted capacity development for scaling. This set of linkages for scaling from FP2-FP4 to FP5 occurs in multiple ways, involving all clusters. Considering the changes proposed in revised clusters CC5.2 and CC5.4, this now plays through as follows:

- CC5.1: foresight and impact assessment helps (1) to understand the big picture changes in consumption and production trends, enabling environment and institutional arrangements, which will likely occur across RTB agri-food systems; and (2) make sure that the optimal technologies are identified for scaling and that the return is commensurate with the investment.
- CC5.2 (revised version): the higher level system interactions required for sustainable intensification consider and support different routes to intensification across the farmer typology (e.g. farmers who are "hanging in" or "stepping up" (see changes in cluster CC5.2 below) in the context of rural transitions and transformation.
- CC5.3: ensures gender equity and a dynamic consideration of youth (especially around employment) as scaling occurs.
- CC5.4 (revised version): provides evidence based guidance across FPs about (1) which scaling strategies are proving most effective and (2) capacity development of key stakeholders for scaling to be more effective.

The reformulated clusters in FP5 are integrally related to RTB's partnership strategy (Annex 1, RTB Proposal, March 2016), CapDev strategy (Annex 2, ibid.), site integration (Annex 6, ibid.) and RBM strategy (Annex 5, ibid.):

(1) The RTB Partnership Strategy recognizes the dependence on linking with and developing capacity among the right set of partners who are ultimately responsible for scaling. It also notes that where technologies can be provided through market mechanisms, then private sector actors may be effective drivers of change; whilst for public goods, not ordinarily provided by a market, then other types of development partners and drivers come to the fore for scaling.

(2) The Capacity Development Strategy considers research on CapDev models and mechanisms that have the highest impact on customizing research outputs and bringing them to scale.

(3) Site integration gives particular attention to cross center/CRP collaboration for sustainable intensification and scaling. Indeed, both elements should form an integral part of CGIAR wide theory of change for site integration and how this leads to enhanced impact.

(4) The RBM strategy tracks and supports progress in developing effective partnerships and the linkages for scaling and more specifically, the monitoring, evaluation, learning and impact assessment approach (MELIA), is an integral part of the scaling efforts within FP5 (e.g. see CC5.1).

With this clarification of the reconceptualization of FP5, its linkages with other FPs and strategies we turn to a more detailed description of the specific changes in CC5.2 and CC5.4.

Changes in cluster CC5.2:

Sustainable intensification of RTB agri-food systems has been reframed to focus on the particular implications for RTB within the broad panorama of agricultural transformation and rural transitions. Livelihood strategies can be broadly classified as (1) "hanging in" for subsistence level farmers; (2) "stepping up" as an option for emergent small-scale commercial farms; and eventually (3) "stepping out" into rural non-farm economy, were marketing and processing of RTB crops may play a key role (DFID 2015, Hazell et al 2010). For each of these contexts there is an array of linked options and needs for sustainable intensification, with a set of sequenced changes in RTB agri-food systems at the community, landscape and value chain level:

- For "hanging in" with weaker market linkages, the support for improving nutrition will play an important role; e.g. incorporation of legumes to enhance diets and cropping system resilience.
- For "stepping up", new value chain opportunities, urban markets for RTB crops and utilization for animal feed play an expanded role, with trade-offs in expanded productivity and sustainability in cropping systems; e.g. bananas in sustaining productivity of perennial crops. In a similar vein to "stepping up", the "Africa RISING Program of USAID's Feed the Future Initiative seeks to create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base" (IITA 2015).
- For "stepping out" larger scale processing will play a greater role and the creation of vertically integrated supply chains opens new opportunities for market driven changes in more sustainable cropping systems e.g. cassava in South East Asia.

Table 3: Changes in cluster CC5.2 set-up

	Old (RTB Proposal March 2016)	NEW (RTB Resubmission July 2016)
Focus	Testing approaches and developing novel research tools	Practical outcomes which can be achieved through sustainable intensification in a systems context considering agricultural transformation and rural transitions.
Aim	"Improve livelihoods at farm and community levels through better income and nutrition while reducing farmers' risks and enhancing equity and ecosystems services"	"Identify system entry points, trade-offs and synergies of RTB innovations to sustainably enhance livelihoods
Rationale	"Develop and apply models and participatory methods to understand diverse RTB crops-based livelihood realities and needs"	"Improve RTB-based livelihoods at farm and community levels through system tailored management of natural resources, higher income and nutrition, while addressing risk and enhancing gender equity and ecosystem services"
Research products	"Whole-diet approaches for improved dietary diversity and intake at the household level"	"Evidence based options for improved dietary diversity and intake at the household level"

The sections on science quality (sub-section 2.5.1.4) and cluster description (sub-section 2.5.1.6) have been extensively edited, following the above points to include more specific RTB content e.g. banana/plantain intercrops which provide ecosystem services for shade and moisture management and accelerate income from newly established cocoa/coffee plots.

Changes in cluster CC5.4:

The reformulated CC5.4 will support the RTB typology of scaling and the changing roles of RTB across it (page 16f RTB Proposal, March 2016). Cluster CC5.4 will, in its adjusted version, no longer aim at developing and applying new theories and practices for scaling but rather adapt strategies and provide support for scaling RTB solutions in agri-food systems. Existing frameworks for scaling, e.g. from IFAD (2015) and Chandy et al (2013) will be adapted to fit scaling of RTB innovations. IFAD (2015) has an analogous set of phases to the RTB stages of scaling, including a critical phase of "leveraging" with mainstreaming into national programs and getting on board critical private sector, development organizations and community partners. Each pathway for scaling needs to develop "spaces" where scaling can take place. Critical spaces that need attention include (1) financial and fiscal arrangements for sustainability; (2) resolution of political and policy constraints; (3) capacity of local institutions and implementing agencies; (4) availability of partnership arrangements that could potentially rally support for a particular program. Partnerships are sought not only to mobilize resources, but also as a means of accessing knowledge and leveraging influence and outreach (IFAD, 2015) and (5) barriers that limit the more equitable participation of women, youth and/or indigenous peoples.

Drivers of scaling will be identified under CC5.4 to guide work in FP2-FP4. Key drivers vary but may include (1) empowered organizations of smallholders, communities or women's and youth groups that are given support to voice their concerns and become stronger participants in dialogue with the public or private sector; (2) private-sector partners that invest in areas that also link up with development needs; (3) government agencies that are committed to moving the scaling agenda forward and politicians who intend to meet the needs of their constituencies; and (4) civil society organizations that pursue a national agenda for change.

Table 4: Some changes in cluster CC5.4 set-up

	Old (RTB Proposal March 2016)	NEW (RTB Proposal July 2016)
TITLE	"Institutional innovation and scaling"	"Scaling RTB agri-food system innovations"
Aim	"Develop and apply a new theory and practice of scaling from a (livelihood) systems perspective, including institutional innovations"	"Provide support for scaling RTB solutions in agri-food systems"
Rationale	"Reconfigure the formal and informal rules and arrangements that shape decisions, practices and interactions across different actors and levels to enhance impact systems"	"Improve RTB-based livelihoods at farm and community levels through system tailored management of natural resources, higher income and nutrition, while addressing risk and enhancing gender equity and ecosystem" services
Research products	• Institutional options and methodologies for institutional experimentation • DST and applications for connective action • Best practices for impactful scaling	• Contextual analysis of enabling environments across priority countries to inform scaling strategies, including role of private sector investment, based on rigorous research on RTB- scaling research and social network analysis • Learning strategies for developing capacity for impact at scale • Big data, decision support and ICT applications for scaling, tracking and investment targeting
Lessons learned	--	Case of linking to IFAD country programs for scaling included

Other key elements that were changed and added in CC5.4 are:

1. CC5.4 will develop a compelling evidence base for the shift from one stage of the scaling process to the next (see table 2), through research on the science of delivery across FPs.
2. Social network mapping, to understand how partners are engaged and innovations are spreading, will be a strong element for the provision of a rigorous comparative basis of scaling approaches.
3. A greater emphasis is given to capacity development for scaling, and this cluster can provide the basis for a community of practice around scaling for the entire CRP.
4. Strong linkages to RBM strategy and the MELIA approach for variables linked to scaling are essential to fill knowledge gaps.

5.2 Comment: The absence of clarity in clusters CC 5.2 and 5.4 is communicated by the proposal for a competitive grants project that could elicit system-wide support to participate in seemingly priority projects related to RTB. Proposing illustrative research projects many years into the CRP's lifespan is an admission of mental fuzziness, at best.

We note that the competitive grants arrangement in RTB Phase I (complementary funding) was very favorably evaluated by the IEA (GIAR-IEA 2015, page ix-xii). At inception, this similarly left open space for more complex collaborative cross-cutting projects. In the new arrangement for Phase II, funding will be semi-competitive, and will be accessed through a call for concept notes from joint RTB flagship teams: (1) FP1–FP4 in collaboration with FP5 to strengthen action research and livelihood system approaches, and (2) FP5 to strengthen collaboration with other CRPs to tackle livelihood systems' challenges and opportunities.

These competitive grants provided opportunities for emerging issues and novel complementarities between research groups and themes, accelerating innovation and impact. We made several adjustments and specifications to the description (sub-section 2.5.1.12) to clarify its scope:

1. New title of the fund: "AFS innovation and scaling fund" instead of "System innovation fund". This title reflects the increased emphasis on scaling
2. The fund will feature:
    - Impact assessment of the scaling process and its results in terms of technology adoption with CC5.1, with 30% of funding set aside.
    - Focus on research for scaling RTB solutions, where smallholders, women and youth are primary beneficiaries (linked to CC5.4 and CC5.3).
    - Delimitation for a specific prioritized set of RTB-relevant countries (especially focused on site integration countries) and to catalyze investments and innovations along the scaling phases.
    - Integration with the site integration process of CGIAR and collaboration with other CRPs.
    - Emphasis on sustainable intensification with support from cluster CC5.2.
    - Significant capacity development for scaling with CC5.4.
    - Research on enhancing uptake of technology and tools, and use of information together with crop specific clusters under FP2-FP4 to ensure a learning and implementation loop.

5.3 Comment: Research on extension and technology transfer has to be carried out in a manner that provides insights that can potentially be generalized to other contexts (i.e. rigorous, experimental examination of alternative mechanisms). It is hard to imagine how OFSP could be scaled more extensively and cost effectively than it has been in Mozambique and cassava varieties tolerant to Cassava Brown Streak Disease (CBSD) have been transferred very cost effectively by NGOs in the same country. FP4 already contains a rich stock of experience in this area.

CC5.4 will conduct rigorous research to enhance uptake of technology and tools, and use of information for scaling. Where possible, and conjointly with CC5.1, we will seek opportunities for experimental examination of scaling mechanisms, e.g. around alternative pricing policies for quality seed and willingness to pay and different combinations of implementation approaches for OFSP in Rwanda (mentioned above). However, for research on scaling which occurs at a district or even higher level, finding an experimental counterfactual is often problematic or too costly; here rigor can be based on a clearly formulated theory of change and evidence that this plays out in practice. CC5.4 will use social network analysis as a rigorous comparative tool to pick up changes in innovation processes, which demonstrate early progress to scaling - prior to significant technology adoption at the farmer or end user level. For this analysis, the cluster can build on a research design and results of a social network analysis undertaken for RTB in 2013 (Ekboir, Canto and Sette 2013).

Cluster CC5.4 and the "AFS innovation and scaling fund" are precisely drafted to (1) learn from such scaling experiences as OFSP in Mozambique; and (2) by building an evidence base of what worked, draw comparative lessons with relevance across the entire RTB portfolio. In many cases this will involve collaboration with other CRPs for example with A4NH to evaluate scaling for nutrition and diet diversity with RTB crops (see also response on point 4 on FP4 above).

References

Arcos, J., Gastelo, M. (CIP), Holguin, V. 2015. [INIA 317 – Altiplano, potato variety with good adaptation to the highland region (altiplano) of Peru]. INIA 317 – Altiplano, variedad de papa con buena adaptación en la region altiplanica del Peru. Revista Latinoamericana de la Papa. (Colombia). ISSN 1019-6609. 19(2):68-75. (AN=79185).

Bechoff A, Chijioke U, Tomlins KI, Govinden P, Ilona P, Westby A, Boy E. 2015. Carotenoid stability during storage of yellow gari made from biofortified cassava or with palm oil. Journal of Food Composition and Analysis, 2015, 44, 36–44.

CGIAR-IEA (2015), Evaluation of CGIAR Research Program on Roots, Tubers and Bananas (RTB). Rome, Italy: Independent Evaluation Arrangement (IEA) of the CGIAR http://iea.cgiar.org/evaluation/crp-evaluation-roots-tubers-and-bananas-rtb

CGIAR Research Program on Roots, Tubers and Bananas (RTB), 2016. RTB Management Response and Action Plan to the CGIAR-IEA (2015), Evaluation of CGIAR Research Program on Roots, Tubers and Bananas (RTB). Rome, Italy: Independent Evaluation Arrangement (IEA) of the CGIAR (Version 24 January 2016)

CGIAR Research Program on Roots, Tubers and Bananas (RTB), 2016. RTB Proposal 2017-2022 Vol. I and Vol. II. March 2016.Chandy, L., A. Hosono, H. Kharas, and J. Linn, eds. 2013. Getting to Scale. Washington, D.C.: Brookings Institution.

DFID 2015. DFID's Conceptual Framework on Agriculture.

Ekboir, J., Canto, G.B. and Sette, C. (2013). Monitoring the composition and evolution of the research networks of the CGIAR Research Program on Roots, Tubers and Bananas. Series on Monitoring Research Networks No. 01. Institutional Learning and Change Initiative, Rome, Italy.

Hazell, P., Poulton, C., Wiggins, S. and Dorward, A. 2010, "The Future of Small Farms: Trajectories and Policy Priorities", World Development Vol. 38, No. 10, pp. 1349–1361).

Hotz, C., Loechl, C., Lubowa, A., Tumwine, J. K., Ndezi, G., Masawi, A. N., Baingana, R., Carriquiry, A., Brauw, A. D., Hotz, Christine, Loechl, Cornelia, Alan de Brauw, Patrick Eozenou; Daniel Gilligan, Mourad Moursi, Bernardino Munhaua, Paul van Jaarsveld, Alicia Carriquiry; J. V. Meenakshi. 2012a. A large-scale intervention to introduce orange sweet potato in rural Mozambique increases vitamin A intakes among children and women. British Journal of Nutrition. Vol 108: 01

Hotz, C., Loechl, C., Lubowa, A., Tumwine, J. K., Ndezi, G., Masawi, A. N., Baingana, R., Carriquiry, A., Brauw, A. D., Meenakshi, J. V. & Gilligan, D. O. 2012b. Introduction of b-Carotene–Rich Orange Sweet Potato in Rural Uganda Results in Increased Vitamin A Intakes among Children and Women and Improved Vitamin A Status among Children. J Nutri, 142, 1871-80.

IFAD. 2015. IFAD's operational framework for scaling up results

IITA. 2015. Sustainable Intensification of Key Farming Systems in East and Southern Africa. Africa RISING Project Document

Jonasova, Marketa and Cooke, Sanjiva. 2012. ABOUT SCALING UP: Developing Guidance for Scaling Up World Bank-supported Agriculture and Rural Development Operations. World Bank and ARD.

La Frano MR, Woodhouse LR, Burnett DJ, Burri BJ. 2013. Biofortified cassava increases β-carotene and vitamin A concentrations in the TAG-rich plasma layer of American women. Br J Nutr 2013, 110, 310-320.

Low, J. W., M. Arimond, N. Osman, B. Cunguara, F. Zano, and D. Tschirley. 2007. A foodbased approach introducing orange-fleshed sweet potatoes increased vitamin A intake and serum retinol concentrations among young children in rural Mozambique. Journal of Nutrition 137 (5): 1320 1327.

Oparinde, A., A. Banerji, E. Birol, and P. Ilona. 2014. Information and Consumer Willingness to Pay for Biofortified Yellow Cassava: Evidence from Experimental Auctions in Nigeria. HarvestPlus Working Paper No. 13. Washington, DC, USA: International Food Policy Research Institute.

Stevens, G. A., Bennett, J. E., Hennocq, Q., Lu, Y., De-Regil, L.M., Rogers, L., Danaei, G., Li, G., White, R. A., Flaxman, S, R., Oehrle, S., Finucane, M. M., Guerrero, R. Bhutta, Z. A., Then-Paulino, A., Fawzi, W., Black, R. E., Ezzati, M. 2015. Trends and mortality effects of vitamin A deficiency in children in 138 low-income and middle-income countries between 1991 and 2013: a pooled analysis of population-based surveys. Lancent Global Health, vol 3: e528-e536.

Talsma EF, Brouwer ID, Verhoef H, Mbera GNK, Mwangi AM, Demir AY, Maziya-Dixon B, Boy E, Zimmermann MB, Melse-Boonstra A. 2016. Biofortified yellow cassava and vitamin A status of Kenyan children: a randomized controlled trial. Am J Clin Nutr 2016: 1–10.

Tang, G. 2010. Bioconversion of dietary provitamin A carotenoids to vitamin A in humans. Am J Clin Nutr 2010;91(suppl):1468S–73S.

2) CO comments on IA and OA/OD

2.1 Response to CO comments on IA in RTB Full Proposal

The RTB team is encouraged by the overall "satisfactory" and "exemplary" findings of the reviewers of the intellectual assets management plan in RTB. The review provides various valid and useful comments to improve the proposal.

Dissemination pathways and critical issues/challenges: The reviewers recognize the Table 1 in Annex 9 as an exemplary approach for mapping IA management and associated delivery strategies at an FP and CoA level. While there is a valid point in questioning the choice of underlying IA management approach for each dissemination strategy per cluster, flexibility in this area is necessary in order to adapt to the diverse range of characteristics in each target geography. This is especially important in the dissemination pathways of tangible IAs as political, cultural, socio-economic sensitivities and attitudes towards private enterprise need to be taken into consideration for each intervention zone and each type of intellectual asset. This is the underlying justification in adopting a probability scale for use of each strategy (*1 most probable, 2 secondary option, and 0 not envisaged*). The identification of challenges to strategic IA management in each FP provides guidance on the magnitude of the challenge, but also provides assurance that FP and CoA leader's awareness of these challenges and their willingness to collaborate with IA practitioners to provide adequate solutions to maximize global accessibility and impact.

Planning and tracking, decision making and capacity: The reviewers highlight RTB's exemplary practices in the first phase of CRPs which will be continued with improvements in Phase II. Valuable comments include the encouragement of CRP level IA management policies, the creation of an IP Management Committee and the detailed mapping of IP/Legal support required for specific IA management issues. These three points had already been considered in the "CRP level policy dealing with IA management", the creation of an "RTB IP Task Force" and "the ToRs of the RTB IP Task Force" (see bullet #1 of ToRs), respectively.

A special comment asked for further information about the responsibility of the Program Management Unit (PMU) in relation to non-standard dissemination pathways that may involve restrictions, and in particular those that require justification/reporting under the CGIAR IA Principles. In this regard, the responsibility for decision making on the appropriate dissemination pathways and compliance with the CGIAR requirements lies with the program participants. The PMU will monitor targeted results via the M&EL platform and will receive compliance self-certifications. The RTB IP Task Force will provide program, level support and coordination for effective IP management at program level and will have an organic connection to the PMU with the RTB Compliance & IA Manager (0.5% FTE).

Resource Allocation: As highlighted by the reviewers, the information given in the Proposal whether budget has been earmarked or not is inconsistent. As Budget Narratives for the CRP and the FPs show, a total of $3.9m (approximately 2% of total budget) has been allocated for IA management. Changes to reflect this earmarked budget are made in the CRP Narrative section on IA (1.0.12, page 33). This allocation will cover expenses including a portion of human resources, legal and operation expenses associated with selected IP management strategies for improved impact and availability, permits, capacity building and awareness raising in IP management.

2.2 Response to CO comments on OA/OD in RTB Full Proposal

The comments provided by the CGIAR Consortium Office on OA/OD in the RTB Full Proposal include valid points.

Governance/accountability: While it was acknowledged that staff roles across CIP and its partners in regard to OA/OD have been well-defined, further assurances of good governance were requested along with an articulation of staff roles and expertise. As a collaborative program, RTB doesn't establish a functional reporting hierarchy between the OA/OD teams of program participants, and thus the work modalities aim to share resources and benefit from each other's expertise so that OA/OD in RTB is bigger than the sum of the capacity of the program participants. However, a coordination function is under the RTB lead center (CIP) responsibility – see next point.

Human and technical infrastructure: This element has been strengthened with the development of a new knowledge and data management coordinator position at the Lead Center (just recruited). This position includes a specific time allocation for coordinating and liaising with counterparts at program participant centers, including developing necessary policies and workflows, and will additionally act as supervisor to CIP's knowledge management and open access manager and research informatics unit. The comments validly highlight a potential concern with existing databases and platforms. One of the tasks of the coordinator position will be to evaluate the compatibility of repositories and platforms already in use by program participants with the requirements of OA/OD, including interoperability.

Achievable OA/OD plan: The commentators correctly highlight the possibility to incentivize OA/OD at RTB level, and RTB will continue advocating for these to be part of the performance evaluation of projects and individuals, while recognizing that this is ultimately the role of the program participants.

Monetary commitment: As highlighted by the reviewers, the statement in the proposal that no budget has been allocated for OA/OD is partially correct in that the information was not consistently provided in the relevant sections of the original RTB Proposal. In the resubmitted Proposal, the CRP Narrative (see 1.0.13, page 34) is corrected to mention the earmarked budget for OA/OD as given in the CRP and FP Budget Narratives. The budget narrative sections show a total of $3.7m allocated in 2017 for OA/OD. This allocation will cover expenses including a portion of human resources, estimated publication costs of between 100 and 200 articles a year, the development of the RTB open access portal and additional costs for making databases open access.

3) Additional information on changes applied

3.1 Budget distribution by Flagship

The proportion of the Flagship Project budgets received by each of the participating centers was adjusted to reflect better the relative contributions of centers to outcomes linked to the Flagships. Specifically, the IITA budget share in FP5 was significantly increased, budget was attributed to Wageningen University for its strong contribution in FP5 and its leadership of cluster CC5.4. In addition, the AFS innovation and scaling fund was assigned proportionally across all FPs as a required procedure of the on line tool (although this might not be the actual distribution after a semi-competitive call).

As a consequence, the following adjustments were made in the resubmitted RTB Proposal:

- Budgets by Center per Flagship
- Total budget amounts per FP
- Uplift budget
- PIM

Changes are made in sections 1.1 and 2.1.2/2.1.3; 2.2.2/2.2.3; 2.3.2/2.3.3; 2.4.2/2.4.3; 2.5.2/2.5.3 and RTB proposal volume II (PIM).

3.2 Management and Support Costs

Following the instructions for specifying the Management and Support budget, we included the respective tables into the RTB Proposal subsection 1.1.4 ("CRP Management and Support Cost"):

1. Explanation of MSC budget components: which shows the budget requested categories A-C. As indicated in the narrative, MSC costs are only covered by W1 and W2 funds.
2. Amount dedicated to M&E and Impact Assessment in the CRP budget: this budget shows M&E and impact assessment funded by all funding sources – as budget, distributed across FPs is based on all funding sources.

Based on these MSC tables the Total amount for Key activities on CRP level was adjusted accordingly and additional comments are added into the budget narrative (subsection 1.1.4, page 39ff).