International Potato Center (CIP)

Development and Delivery of Biofortified Crops at Scale (Sweetpotato Component)

2020 ANNUAL REPORT FOR REVIEW
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A. SUMMARY AND OVERVIEW

Summary supporting narrative

The programme made accelerated progress, adapted quickly to disruptions caused by the COVID-19 pandemic, and met and/or exceeded all its Outcome and Output targets in 2020. Working closely with national COVID-19 responses and through new partnerships with the World Food Programme and other humanitarian agencies, the programme increased its focus on vulnerable populations in fragile environments (more than 60% of programme beneficiaries). The programme succeeded in promoting the production and utilization of biofortified orange-fleshed sweetpotato (OFSP), and biofortified crops more generally, for improving nutrition of low-income and vulnerable consumers during times of declining household food budgets, disrupted markets and restricted mobility, and growing humanitarian need. Major progress was made in establishing OFSP in local food systems in new and fragile environments with high vitamin A deficiency (VAD). OFSP production in these high-impact locations increased by more than 130,000MT, in some cases providing their first sweetpotato harvest, to benefit more than 2.4 million consumers of which more than 50% are children under 5, women of reproductive age, or adolescent girls.

This expansion is underpinned by the increased range of locally adapted OFSP varieties available, and by flexible delivery models that harness existing capacities and strengthen market incentives. In 2020, the programme thus generated production of enough beta-carotene to cover the yearly vitamin A requirements of 2.4 million children – and initiated additional research to assess enabling and inhibiting factors for translating this production into actual nutrition benefits among target beneficiary groups. While the COVID-19 pandemic has slowed down implementation of some programme activities, it has also highlighted high-potential entry points for OFSP Research-for-Development (R4D) to address vulnerability and inequity in the wider food system that will guide and focus programme delivery in 2021.

Major lessons for the year ahead

1. The drive for modernization of breeding in CGIAR and National Agriculture Research Systems (NARS) offers potential risks but also timely opportunities for advancing the biofortification business case. The programme has sought close integration with the Excellence in Breeding (EiB) Platform and Crops to End Hunger Initiative to be able to inform and influence breeding objectives and strategies so that nutrition will continue to be prioritized, and future generations of OFSP varieties (and varieties of other biofortified crops) will be more competitive in the market and will scale more easily.
2. OFSP production continues to expand both through new farmers joining and through area expansion among established producers sourcing new planting material from local markets and communities. The programme should therefore take a two-pronged approach - working with humanitarian partners to establish OFSP production in fragile environments, and secondly linking farmers who have the scope for expansion to new institutional and local markets.
3. Market uptake of OFSP has picked up in locations with increased productivity and more structured market chains supported by demand aggregation and improved market information. Increasing demand is starting to provide incentives for commercial investments in storage and processing and in backward linkages to quality seed supply and contract-based smallholder production. The programme will continue to work closely with small and medium sized food processing enterprises (SMEs) in the formal and informal sector to facilitate their access to advanced technologies and skills.
4. Delivery through humanitarian partnerships can generate high Value-for-Money (VfM); and with formal partnerships in place, the programme can facilitate collaboration across multiple CGIAR centers and programmes to bring a wider set of agricultural technologies and innovations, including biofortified and other nutritious crops and food, to bear on undernutrition in humanitarian contexts.
5. Demand for up-to-date and robust evidence on the scalability of OFSP delivery and nutrition outcomes has further grown in the context of COVID-19. Policy makers and additional delivery partners are keen on guidelines and practical collaboration for incorporating OFSP into a variety of national COVID-19 response and nutrition support programmes. Key questions concern the intensification of production,

marketing strategies and storage and processing options. At the same time, OFSP (and other biofortified crops) are viewed through a comprehensive nutrition lens including nutrient dense vegetables and animal source foods; and the OFSP and biofortification research agenda must, therefore, address questions of delivery models and nutrition outcomes in relation to alternative nutritious food sources that may become more affordable for low-income consumers.

B: THEORY OF CHANGE AND PROGRESS TOWARDS OUTCOMES

Theory of Change: The programme sets out to improve diets of under 5-year-old children, women of reproductive age, and adolescent girls through the increased consumption of nutritious, biofortified OFSP rich in vitamin A. This will be achieved at large scale in selected countries targeting populations with high vitamin A deficiency living in fragile environments. The programme takes an R4D approach combining latest technologies (improved OFSP varieties, supportive technologies for production and utilization, and digital tools for monitoring and knowledge sharing) with cost-effective delivery models based on partnerships in the agri-food, health and humanitarian sectors. The underlying assumption is that by working across these food system domains in a strategic and coordinated manner, the programme can create sustainable supply and demand cycles for OFSP that will improve diets of vulnerable and resource-poor populations. Building on the previous programme phase and harnessing innovations in related R4D initiatives in the CGIAR and beyond, the programme at this time seeks to deliver a shift from a supply-driven approach based largely on a (justified) public health rationale for investing in OFSP as a tool for VAD reduction at household level, to a demand-driven approach that supports OFSP development and delivery by identifying suitable entry points into existing agri-food systems of importance to the poor.

Progress in 2020 has substantiated this approach and evidence is strengthening that OFSP is scaling through the food system driven by demand amongst consumers, producers, processors and other stakeholders. More than 10 years after CIP started to support OFSP, the first nationally representative study of OFSP adoption showed that more than 30% of all farmers in Malawi (or more than 1.2 million households) are growing OFSP varieties and that the majority of these have adopted the crop independently of public sector programmes and have done so for a variety of reasons including income generation and food security in addition to specific nutrition benefits.

OFSP production, therefore, is on a robust growth curve generating increasing supplies of beta-carotene to help achieve the programme's outcome and impact at the envisaged scale, as every 1 ha of OFSP can cover the full yearly vitamin A requirements of 200 5-year-old children. The bigger challenge the programme is addressing is to translate this production into actual consumption by those who need it most, working through strategic food system entry points such as improving access to informal and institutional markets or improving child feeding through the Healthy Baby Toolkit, and, as a longer-term investment, strengthening OFSP processing into nutritious and affordable foods at large scale. Food system impacts of COVID-19 show the continued importance of affordable staple crops, and also point to nutrition gaps emerging from disruptions of formal markets for nutrient dense foods, while informal markets provided a lifeline for the poor[1]. This further highlights the urgency of intensifying and diversifying the utilization of OFSP to reach the majority of low-income consumers who cannot afford a minimum healthy diet that meets national guidelines in target countries[2].

Value-for-Money proposition: Following budget cuts and adapting to COVID-19 restrictions, the programme reduced annual Output targets for 2020 (see Section C for details); reprioritizing those that could contribute most effectively to the Outcome targets under the circumstances. With these adjustments, overall programme VfM has been stable. The programme adapted delivery models and shifted locations and partners to be able to meet beneficiary targets. Secondly, we intensified collaboration with related R4D, commercial, and humanitarian programmes to harness new opportunities for scaling through larger delivery capacities and more robust market development, and for achieving deeper impacts through complementary and reinforcing investments in the health and education sectors.

The programme Outputs capture strategic entry points in the agri-food system where investments in OFSP can trigger large scale change at Outcome level. All 5 Outputs continued to contribute to overall programme

[1] Swinnen, Johan, ed.; and McDermott, John, ed. 2020. COVID-19 and global food security. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10.2499/p15738coll2.133762

[2] Herforth, A., Bai, Y., Venkat, A., Mahrt, K., Ebel, A. & Masters, W.A. 2020. C*ost and affordability of healthy diets across and within countries. Background paper for The State of Food Security and Nutrition in the World 2020.* FAO Agricultural Development Economics Technical Study No. 9. Rome, FAO. https://doi.org/10.4060/cb2431en

VfM though in different ways, reflecting programme learning and changing circumstances during COVID-19: Development of new and improved OFSP varieties further accelerated with NARS adopting improved methodologies through the CGIAR EiB that will make these varieties more competitive and demand-driven. Institutional markets for OFSP planting material and food intensified during COVID-19 with a greater focus on fragile environments, and the programme further reinforced this demand through nutrition awareness and child feeding tools. Formal commercial markets slowed down on the other hand, and the programme will utilize new entry points into informal markets in 2021, combining OFSP with supply chains of other nutritious foods.

CIP and HarvestPlus further developed a harmonized MEL framework and toolset that disaggregates beneficiary data by age, sex, disability, geography, and other relevant variables, and this is now being fully applied to all indicators in the programme logframe. The programme works closely with national and local Governments in all target countries and with implementing partners for poverty-focused targeting of beneficiaries at work planning stage and through regular MEL reviews during implementation.

Progress towards Outcomes and Impacts

The annual Outcome targets have been exceeded and the programme is expected to achieve Outcome and Impact at the scale envisaged, if the original budget can be maintained for the final year. Reaching **more than 300,000 farm households and more than 2.4 million consumers in 2020**, the programme has already progressed more than half-way towards its End-of-Project targets. All Outputs are on track to achieve their targets and the Output-to-Outcome logic has been reviewed and confirmed in 2020 during adjustments and re-focusing in response to COVID-19 and budget cuts. CIP has secured agreements with implementing partners that include co-financing and in-kind support for the duration of the programme, reflecting strong commitment by stakeholders across the participating countries.

The programme has increased its focus on fragile environments and entered into new partnerships with humanitarian programmes to deliver in this context. This new emphasis may require clarification and consolidation of related targets and milestones in the logframe – currently expressed as ‘percentage or number of beneficiaries reached in fragile environments’ (defined geographically) and, separately, as ‘percentage or number of beneficiaries reach through humanitarian programmes’ (defined by implementing partner), when in fact these targets are overlapping. CIP proposes that only one set of targets be used in this regard, using the ‘fragile environment’ definition, and that these be applied to Outcome indicators 0.1 and 0.2, and to Output indicators 2.1, 2.2, 4.1 and 4.2.

A second area for review are indicators 2.3 and 4.1 that track the proportionate growth of biofortified varieties as compared to non-biofortified varieties. In the case of sweetpotato, area expansion of OFSP varieties does not show strongly as % of total sweetpotato area since non-biofortified varieties are also expanding fast (in part with support from CIP), thus masking the actual growth of OFSP in absolute numbers. With respect to the proportion of food distribution that is biofortified, the programme’s entry points with humanitarian agencies are less focused on ‘food distribution’ than on linking OFSP producers to institutional markets (such as schools or cash transfers) and supporting production of OFSP in fragile environments and refugee settlements. In this case, the OFSP proportion of the volume of all sweetpotato or all food distributed through humanitarian programmes becomes less meaningful than tracking the growth of OFSP markets and consumption among these populations.

The programme budget was reduced by 11% in 2020 and logframe targets for the year were adjusted accordingly also factoring in restrictions to programme delivery from COVID-19 regulations in participating countries. Targets were thus reduced by 10-50% across the 5 Outputs and the programme met and/or exceeded these targets, some meeting the original milestones (see section C for details).

Gender considerations are fully integrated at output and activity level and MEL data is fully gender disaggregated. Evidence generated so far does not indicate any changes to business case assumptions on gender equality. CIP has intensified its engagement with the CGIAR Gender Platform and a newly recruited Senior Gender Scientist will provide additional analytical and strategic support to the programme from 2021.

C. DETAILED OUTPUT SCORING

Output Title	At least 57 new biofortified varieties are released or recommended for release; and at least 25 varieties are registered in additional countries		
Output number:	1	Output Score:	A+
Impact weighting (%):	20%	Weighting revised since last AR?	Down from 25%

Indicator(s)	**Milestone(s) for this review**	**Progress**
Number of biofortified varieties released/recommended for release disaggregated by crop and country	8 new OFSP clones recommended for release (including at least 2 hybrid clones)	A total of **9** new OFSP clones have been recommended for release across three countries: Bangladesh (3), Kenya (1), Mozambique (5)
Number of released biofortified varieties exchanged/ shared/ registered in additional countries	12 OFSP varieties exchanged and at least 3 of these recommended for registration	A total of **13** OFSP varieties were exchanged in 2020 among target countries, and **4** exchanged varieties recommended for registration in Kenya (1), Mozambique (2) and Ethiopia (1)

Narrative: This output captures the accelerated development and exchange of new biofortified sweetpotato varieties by National Agricultural Research Systems (NARS) with technical and scientific support from CIP. Working through longstanding partnerships with NARS and backed up by CIP's sub-regional breeding platforms, the programme exceeded all the annual milestones for this output. In 2020, a total of **9** new OFSP clones have been recommended for release in Bangladesh (3), Kenya (1), Mozambique (5). In addition, **13** existing varieties were exchanged among participating countries, and **4** exchanged varieties completed national evaluations and were recommended for release in Kenya (1), Mozambique (2) and Ethiopia (1). In Uganda, 8 additional OFSP varieties have undergone national evaluation trials and are expected to be released in 2021. Beyond the numbers, the quality of new varieties and hence the likelihood of widespread adoption have improved through more rigorous, user-orientated breeding approaches; and adoption of more efficient breeding protocols ('product profiles') developed with the support of the CGIAR Excellence in Breeding (EiB) platform and Crops to End Hunger Initiative. Sweetpotato has been one of the first crops that comprehensively adopted EiB methodologies. At the same time, CIP is pioneering the development and use of molecular tools for sweetpotato breeding. In 2020, the globally first-ever 'hybrid' sweetpotato clones have been produced by CIP showing significant yield jumps and disease resistance; these have been approved for national evaluation trials in Uganda (2021) and Mozambique (2022) and will be reported in future programme updates. Importantly, nutrition benefits continue to be a priority objective in the drive to modernize sweetpotato breeding. Accordingly, market segmentation analyses and breeding product profiles are complemented by evaluations of nutritional value and other societal goods such as gender equity and climate resilience. Biofortified varieties thus remain central to sweetpotato breeding by CGIAR and NARS.

Value-for-Money proposition: The programme has been able to apply improved tools and methodologies to this output and thereby delivered increased VfM: (i) CIP supported NARS to adopt new breeding protocols and data management tools that have reduced the time of developing new biofortified varieties by at least 30%; (ii) the programme worked closely with EiB, Crops to End Hunger, and CIP's BMGF-funded breeding project (SweetGAINS) to help increase the rate of genetic gain in desirable traits; (iii) CIP and NARS have adopted more ambitious performance indicators (genetic gain in farmers' fields; area-weighted average varietal age) that will help track and increase the effectiveness of breeding investments; and (iv) the programme has adopted and promoted with NARS the Gender and Breeding Guidelines developed by the CGIAR Roots, Tubers and Bananas research programme that strengthen gender considerations in setting breeding objectives and adapt evaluation processes to gender and other social inclusion priorities. Similarly, the programme contributed to analyses of market segmentation and product profiles by EiB, advocating that nutrition quality and other socially relevant traits (e.g. labour/input requirements, suitability for marginal environments) are being considered in new CGIAR and NARS breeding strategies.

Changes to this output: Following budget cuts and mindful of COVID-19 disruptions to breeding operations, the programme agreed with FCDO to reduce the annual targets for this output from 11 to 8 new clones recommended for release and from 20 to 12 varieties exchanged; these revised milestones have been exceeded. Reallocation of resources to outputs 2-4 has also been feasible through integration with

related CIP breeding programmes funded by EiB, BMGF and USAID. CIP proposes to maintain this collaborative arrangement as it provides best VfM and ensures that the programme can continue to advocate for biofortification from within the broader CGIAR drive to modernize breeding.

Progress on previous AR recommendations: With respect to Recommendation #1, CIP has further strengthened engagement with EiB and Crops to End Hunger Initiative as evidenced by the pioneering role of sweetpotato and potato in adopting new breeding methodologies and approaches and extending these to NARS. In recognition of this role, CIP's Director of Research has been elected Chair of the EiB Steering Committee. CIP has also deepened the integration with HarvestPlus and the CGIAR's Agriculture for Nutrition and Health (A4NH) programme through harmonization of MEL tools and frameworks, joint publications, and CEO-level institutional dialogue on the future positioning of biofortification in the new One CGIAR.

Lessons learned: The drive for modernization of breeding in CGIAR and its partnerships with NARS offers potential risks but also timely opportunities for advancing the biofortification business case. The programme has sought close integration with EiB to be able to inform and influence breeding objectives and strategies so that nutrition and other societal values continue to be considered as direct economic and demand-based parameters move into the foreground. If this balance can be struck, future generations of OFSP varieties (and varieties of other biofortified crops) will be more competitive in the market and will scale more easily, as they will have been developed through a much more demand-driven process than in the past.

Output Title	Increased production of biofortified crops		
Output number:	2	Output Score:	A+
Impact weighting (%):	25%	Weighting revised since last AR?	Up from 20%

Indicator(s)	**Milestone(s) for this review**	**Progress**
Quantity of biofortified seed acquired by farmers, disaggregated by source	40M vine cuttings over baseline	Farmers acquired more than **62.5M** OFSP vine cuttings in Bangladesh (8.8M), Ethiopia (15.4M), Kenya (12.1M), Nigeria (1.3M), Uganda (17.5M), Malawi (7.1M) and Mozambique (0.13M).
Number of households that acquired seed/planting material annually, of which 15% were reached through humanitarian seed distribution programs, disaggregated by crop, sex of recipient and geographic location.	200,000	At least **231,102** households acquired OFSP vine cuttings in Bangladesh (17,608), Ethiopia (29,480), Kenya (90,640), Nigeria (6,030), Uganda (50,867), Malawi (35,599) and Mozambique (878). Of these, at least **73,056 (31%)** were reached through humanitarian programs in Bangladesh (810), Ethiopia (14,740), Kenya (2,658), Uganda (18,634), Malawi (35,599), and Mozambique (615).
Proportion of crop area that is allocated to biofortified varieties	All crops: 2% over the baseline	The proportion of sweetpotato area allocated to OFSP has increased by at least **3.6%** over the baseline in Bangladesh (11%), Ethiopia (0.9%), Kenya (3%), Uganda (4.5%), Malawi (2.8%) and Mozambique (4%)
Quantity of biofortified crops produced, disaggregated by crop and country	Increase by at least 32,000MT over baseline	Additional **131,139MT** of OFSP have been produced in Bangladesh (1,805), Ethiopia (12,225), Kenya (38,807), Nigeria (435), Uganda (5,602), Malawi (46,821) and Mozambique (25,443)

Narrative: This output captures the growing scale of production of OFSP by increasing numbers of smallholder farmers – a core measure of progress at this stage of establishing OFSP in food systems important to malnourished populations. The programme was able to exceed all its annual milestones. Specifically, at least **231,102 farm households** acquired more than **62.5 million OFSP vine cuttings** (that serve as planting material, functionally equivalent to a botanical seed) and produced an additional **131,139 metric tons** of OFSP. This constitutes a significant increase in the target countries over the previous year, more so since the proportion of farmers and production in fragile environments is much larger than initially

expected (60% vs 20%) – a reflection of changes to the programme's delivery models in response to COVID-19 related demand and a testimony to the adaptability of OFSP varieties available for distribution. It should also be noted that these numbers are based only on new planting material acquisition by farmers and do not include the common practice of replanting sweetpotato vines from the previous season's own fields or production from such replanting (which is estimated at 25% additional production). Through easy vegetative propagation, local sweetpotato planting material is typically widely shared among farmers, though informal specialized multipliers play an important role as a reliable source of quality planting material of preferred varieties. While new biofortified varieties have generally been introduced separately through publicly funded programmes, evidence from 2020 shows that farmers now increasingly source their OFSP vine cuttings from local sources (74%) which further suggests that OFSP varieties have been taken up in informal sweetpotato seed systems.

One of the seed delivery models added in the COVID-19 context of 2020, the collaboration with humanitarian programmes gained fast traction in several countries and reached at least **73,056 farm households** thus more than doubling the annual target of 30,000 with scope for significant expansion in the coming year (see also Output 4). The programme also tracks the proportion of sweetpotato area that is allocated to biofortified (OFSP) varieties as a measure of the changing relative importance of biofortified vs non-biofortified varieties. While there are large differences in the OFSP proportion between countries (lower in countries like Malawi with a large sweetpotato sector; and higher in countries like Bangladesh where sweetpotato is overall a less important crop), the programme estimates that this proportion has increased by a mean **3.6%** over the 2019 baseline across all countries, ahead of the annual milestone.

Value-for-Money proposition: The programme delivered on the original VfM proposition in spite of changing circumstances by adjusting delivery models to COVID-19 restrictions and seizing opportunities for accelerated progress. The main VfM gains and averted losses were: (i) reduced costs of trainings and technical support to seed multipliers and farmers by using digital training modules and mobile-phone based seed marketing tools (see Output 3 IT providers); (ii) increased OFSP productivity per unit planting material through promotion of improved varieties and improved quality control of planting material and their delivery using new CGIAR RTB Seed System Toolbox; (iii) closely embedding OFSP delivery in national COVID-19 responses and humanitarian resilience and nutrition programmes harnessed additional delivery capacities and may garner long-term policy and technical support for seed multipliers and producers; and (iv) selecting new delivery partners with a focus on fragile environments, such as the World Food Programme, resulted in improved targeting of vulnerable communities. Gains made across all four VfM dimensions are being analyzed with respect to possible variance according to gender and socio-economic status of beneficiaries.

Changes to this output: The programme agreed with FCDO to adjust the annual targets of this output in light of COVID-19 disruptions and budget reductions from 65M to 40M OFSP vine cuttings, while keeping the newly defined 'annual' numbers of 200,000 households and 32,000MT OFSP production. The programme reprioritized countries and partners that were able to deliver under prevailing restrictions to movement and transport and in this regard placed greater emphasis on Kenya, Uganda, Malawi and Mozambique as well as on humanitarian partners such as WFP and international NGOs operating in these countries. Delivery models that were deemphasized in 2020 included school-based models as schools remained largely closed, and vertically integrated seed-production-marketing models as the envisaged rural-urban market linkages were susceptible to disruption. CIP proposes to continue with the delivery models initiated in 2020 and extend these with our partners to also include schools and informal markets as institutional platforms for promoting OFSP production and marketing (see also Output 3).

Progress on previous AR recommendations: With respect to Recommendation #2, CIP has accelerated the pace of delivery and as result has been able to exceed annual targets for this output. This was achieved by adjusting delivery models and approaches, engaging new high-capacity delivery partners, and expanding into new locations where it was possible to reach more target beneficiaries in the COVID-19 context. Digital tools have been introduced and will be further expanded and promoted in 2021.

Lessons learned: OFSP production continues to expand both through new farmers joining and through area expansion among established producers sourcing planting material locally. The programme should therefore take a two-pronged approach to this Output in the coming year, working with WFP and other humanitarian partners to establish OFSP production in fragile environments through initially subsidized seed delivery; and secondly linking farmers who have the scope for expansion to new markets such as those supported through WFP cash transfer programmes or to informal market chains that have gained increased recognition as a lifeline for nutrition during COVID-19. Local planting material suppliers respond quickly to new demand among farmers (e.g. as biofortified varieties may become more preferred) and will benefit in their business planning from access to information platforms and additional basic technical training.

Output Title	Increased supply and demand for biofortified foods on the market		
Output number:	3	Output Score:	A+
Impact weighting (%):	20%	Weighting revised since last AR?	N/A

Indicator(s)	**Milestone(s) for this review**	**Progress**
Number of Value Chain Actors that are utilizing harvested biofortified crops, disaggregated by size of enterprise (micro, small, medium, and large) and type of product (fresh, processed)	Aggregators: 10 above baseline Processors: 10 above baseline Retailers: 20 above baseline	A total of **65** aggregators, **47** processors and **162** retailers are utilizing OFSP in target countries; all classified as micro, small or medium sized enterprises.
Quantity of biofortified foods sold, by Value Chain Actors disaggregated by crop, food type (fresh, processed) and country	Increase by at least 18,000 MT over baseline	A total of **27,087MT** OFSP sold over baseline, of which **25,159MT** fresh and **1,928 MT** from processed foods.
Value of sales of biofortified foods, disaggregated by crop, type (fresh, processed) and country	Increase by at least US$4M over baseline	Value of OFSP sales increased by **US$25.1M** (**US$23.3M** fresh and **US$1.8M** processed).

Narrative: This output captures the uptake of OFSP in formal and informal markets of importance to low-income and malnourished rural and urban consumers. The programme exceeded all annual milestones, reflecting the increased role of markets for scaling up the production and utilization of OFSP. Specifically, as a result of the programme, **65** new sweetpotato aggregators, **47** new food processors and **162** new food retailers included OFSP in their businesses in 2020. The quantity of OFSP sold increased by **27,087MT** above the 2019 baseline numbers, comprising of 25,159MT fresh and 1,928MT processed products and translating into a value of approx. **US$25.1M** (US$23.3M for fresh and US$1.8M for processed products). Progress has been strong in Bangladesh, Ethiopia, Kenya, and Uganda, where the programme targeted its effort in demand creation and technical support to producers, traders, vendors and processors. A country-wide assessment in Malawi (2019-2020) suggests that, prior to the COVID-19 pandemic, smallholder producers continued to sell at least 30% of their OFSP harvest three years after FCDO-supported programme interventions – indicating that OFSP has found traction in the regular market system and that CIP's delivery approach via small-scale household-level production and consumption has indeed enabled broad market participation by resource-poor farmers.

COVID-19 significantly disrupted household incomes and food budgets, markets, mobility, and selling and buying behaviour in 2020 and has thus affected the speed of progress. In particular, the pandemic reduced the rate of crop sales among smallholder farmers uncertain of availability and prices of alternative food in the market. It also disrupted marketing and transport, adversely affecting sales volumes of perishable foods such as OFSP. Thirdly, programme delivery of technical assistance to market vendors and food processors and implementation of market assessments were delayed by travel restrictions through most of 2020. The programme responded in part by moving delivery of trainings, awareness campaigns and monitoring online, accelerating the production and roll-out of digital tools that will be used regularly going forward.

While this output has probably been most affected by COVID-19 disruptions this year, the pandemic also highlighted the critical role of markets (including formal, informal and institutional markets) for improving nutrition of low-income consumers. The business case for biofortified crops has been substantiated through large numbers of studies and surveys during the year that consistently showed how low-income consumers in rural and urban settings shifted even more from nutrient-dense but expensive foods to staple crops as their household incomes declined and nutritious foods became less available or more expensive during the pandemic. Engaging markets for delivering both fresh and processed biofortified foods to vulnerable consumers has thus become even more urgent in 2020 and will be a main focus of the programme in the coming year, pursuing three promising market pathways: (i) commercial production of shelf-stable and highly nutritious OFSP puree for use in institutional (school meals) and informal (street food ingredient) markets; (ii) fresh markets for OFSP roots and leaves linked to cash transfer programmes by humanitarian agencies and national COVID-19 responses; and (iii) retailing of fresh OFSP roots and leaves in low-income informal markets with a focus on fast expanding rural towns.

Value-for-Money proposition: Markets are essential for enabling the delivery of OFSP beyond direct programme interventions, and VfM needs to be assessed in light of this. During 2020, when addressing

susceptibility of this output to COVID-19 disruptions, the programme ensured VfM by: (i) reducing costs of technical assistance and market information services through the accelerated use of digital tools, engaging established commercial IT providers such as Arifu and iShamba in Kenya and mPower in Bangladesh for financially sustainable service delivery at low cost to users; (ii) increasing OFSP sales volume and sales value through larger numbers of new market actors reached through new intermediary partners; (iii) stimulating increased co-investment in OFSP processing and marketing by commercial partners even during this difficult year, which indicates a strong prospect of OFSP market growth; and (iv) strengthening equity of participation and benefits by using a smallholder-based approach where possible and linking with institutional markets that target vulnerable consumers.

Changes to this output: The programme adjusted the annual milestones for this output following budget cuts and observed disruptions to OFSP markets from COVID-19 in participating countries. Specifically, we agreed with FCDO to reduce the number of new value chain actors that are utilizing OFSP to 10 aggregators, 10 processors and 20 retailers; and to adjust the quantity and value of additional sales over baseline from 36,000MT to 18,000MT and from US$6M to US$4M. While we expect some COVID-19 related constraints to persist in 2021, implementing partners have adapted their market development tools and methods and should be able to deliver to the original milestones in the coming year. In particular, increased contributions are expected from OFSP puree supply chains and diversified use of puree in informal and institutional markets, and from marketing of fresh roots to institutionally facilitated markets in fragile environments (see Output 4).

Progress on previous AR recommendations: There were no recommendations from the previous AR pertaining to this output.

Lessons learned: Market uptake of OFSP, which seemingly has long lagged behind the widespread adoption of the crop by smallholder farmers, has picked up in locations with increased productivity and more structured market chains supported by demand aggregation and improved market information. Due to the perishability of roots, OFSP markets continue to be more localized, and in many countries more seasonal, than most 'staple crops' markets. Increasing demand is starting to provide incentives for commercial investments in storage and processing and the programme is working closely with food processing enterprises in the formal and informal SME sector to facilitate their access to advanced technologies and skills. This technical support has resulted in commercial investments in supply chains (quality seed supply and contract-based smallholder production) and increased availability of processed OFSP products on the market.

Output Title	Improved utilization of biofortified foods at household and institutional levels		
Output number:	4	Output Score:	A+
Impact weighting (%):	15%	Weighting revised since last AR?	Up from 10%

Indicator(s)	**Milestone(s) for this review**	**Progress**
Proportion of staple foods in institutional food distribution programs that is biofortified disaggregated by crop and country	N/A	N/A; to be reported from 2021 onward
Number of consumers reached through humanitarian programs	50,000	A total of **327,168** consumers were reached through humanitarian programs in Bangladesh (**4,050**), Ethiopia (**58,960**) Kenya (**7,500**), Uganda (**111,804**), Malawi (**142,396**), and Mozambique (**2,458**).
Number of children under 5 years of age in low-income households that are consuming OFSP using the **Healthy Baby Toolkit** (measuring bowl and slotted spoon, counseling card, pre-recorded audio messages)	At least 30,000 children under 5 years of age through humanitarian programs	A total of **43,518** children under 2 years of age in low-income households are consuming OFSP using the Healthy Baby Toolkit in Bangladesh (**6,272**), Ethiopia (**11,200**), Kenya (**234**) and Uganda (**25,812**) as beneficiaries of humanitarian programs.

Narrative: This output captures the growing contributions of OFSP to humanitarian efforts to improve nutrition and livelihoods in communities affected by conflict, displacement and other severe crises. The programme significantly exceeded the annual milestones for this output (by 84% and 78% respectively), reflecting the strong and immediate demand from humanitarian agencies operating in the target countries. CIP entered into a formal Agreement with the World Food Programme (WFP) to guide and support this effort globally. Through WFP and several humanitarian NGOs, the programme reached **327,168** consumers in Bangladesh (4,050), Ethiopia (58,960) Kenya (7,500), Uganda (111,804), Malawi (142,396) and Mozambique (2,458). Amongst these households and through additional nutrition education activities, a total of **43,518** children under 2 years of age now benefit from the Healthy Baby Toolkit for improved complementary feeding in Bangladesh (6,272), Ethiopia (11,200), Kenya (234) and Uganda (25,812). These novel Toolkits, previously piloted by CIP and research partners in India, Malawi and Ethiopia, comprise a measuring bowl and slotted spoon to support the preparation of OFSP based complementary food of the right quantity and viscosity for each age up to 24 months. The Toolkit also includes an individual counselling card and pre-recorded audio nutrition messages for use during nutrition educational sessions such as by mother-to-mother support groups and young child nutrition programs in humanitarian contexts. While the Toolkit is designed for children under 2, it indirectly results in higher OFSP consumption among other children in the same household so that an estimated **60,000** additional children under 5 will have improved their Vitamin A intake as a result of this activity. The Toolkit is a good example for a well-designed and rigorously user-tested auxiliary technology stimulating demand and consumption of a newly introduced nutritious food. In the humanitarian context, it creates new entry points for OFSP to contribute to broader child nutrition programmes as a locally traded and affordable source of vitamin A.

Value-for-Money proposition: Our partnership with the humanitarian sector has turned a corner in 2020 and has developed strongly since. The programme is reaching more beneficiaries, more quickly and more cost-effectively than expected. Demand for OFSP by humanitarian agencies has grown, on account of the nutrition quality and suitability of the crop in marginal environments. Changes in humanitarian programming towards local food procurement (e.g. for school meals) and 'resilience' or 'self-reliance' goals further increase this demand, as do cash transfer and related mechanisms aimed at accelerating local market linkages, including for nutritious food. The programme has been able to exploit this environment and deliver greater VfM by: (i) reducing costs of manufacturing of the Healthy Baby Toolkit (now US$0.57 per kit plus US$0.99 for SBCC material) through a patented central supplier in Kenya, and bulking orders from partners in participating countries; (ii) linking with ongoing humanitarian delivery efforts in highly vulnerable parts of Kenya, Uganda, Bangladesh and Ethiopia for greater efficiency in reaching large numbers of target demographic groups; (iii) increasing the effectiveness of the programme approach on two fronts - reinforcing the nutrition and livelihoods benefits from OFSP through additional educational and financial services delivered by humanitarian agencies, and creating linkages between OFSP producers in high potential production zones, traders, and institutionally facilitated markets (e.g. cash transfers) in high Vitamin A deficiency zones for potentially sustainable new market chains for OFSP and other nutritious food; and (iv) strengthening equity of access to latest agricultural technologies for some of the most marginalized populations affected by multiple crises and displacement, and within these prioritizing nutritionally vulnerable young children, women and adolescent girls.

Changes to this output: The programme adjusted the 2020 annual milestones of this output, adding an indicator for the number of consumers reached through humanitarian programmes (50,000) and reducing the number of under-5 children from 50,000 to 30,000. This reflects the budget reduction for FY 2020/21 as well as the increasing demand for collaboration from humanitarian agencies. The programme has started to promote additional nutritious crops where these are available; in the case of Ethiopia these included iron-rich bean and zinc-rich cowpea varieties released and promoted by the Ethiopian Institute for Agricultural Research, and similar modifications are planned for 2021 in Kenya and Uganda. Collaboration with the World Food Programme is expected to expand in 2021 to include additional countries and diversify from OFSP homestead production into market development activities starting with fresh OFSP/nutritious food markets in and around refugee settlements. Similarly, the programme will move the Healthy Baby Toolkit into these markets to broaden availability and build sustainable supply chains for this auxiliary technology beyond the programme. Since the programme was in fact able to exceed the original milestones with the reduced budget, and given the high VfM from this output, CIP proposes to increase the impact weighting of this output and maintain the original targets for 2021, i.e. 500,000 consumers and 60,000 children under 5, under current budget conditions.

Progress on previous AR recommendations: With respect to Recommendation #4, CIP continued to work closely with HarvestPlus on promoting the use of biofortified crops by the humanitarian sector. In countries like Uganda or Kenya where both CIP and HarvestPlus operate, CIP offered to include HarvestPlus in delivery activities so that all available biofortified crops can be considered in a coordinated

and targeted manner. In other countries like Ethiopia where CIP is working directly with NARS, CIP is now generating evidence on additional biofortified crops and local diets that will be shared with HarvestPlus for a joint assessment of future intervention priorities. At global level, CIP and HarvestPlus have made strong progress in developing a common framework for analysis and programming that will continuously be informed by country level evidence and feedback from delivery.

Lessons learned: A main lesson learned in 2020 is that establishing formal partnerships with large humanitarian agencies such as WFP can generate high VfM. Initial transaction costs of negotiating formal agreements during 2019/20 were a worthy investment. Once in place, these partnerships can facilitate collaboration across multiple CGIAR centers to bring a wider set of agricultural technologies and innovations, including biofortified and other nutritious crops and food, to bear on humanitarian challenges such as undernutrition. Secondly, heightened Government and societal concern for nutrition and health during the COVID-19 pandemic can attract increased public sector investment in OFSP that, if successfully linked with market mechanisms (see lessons under Output 3), can elevate OFSP production and utilization to become a major source of Vitamin A in institutional and humanitarian markets.

Output Title	Strengthening and sharing the evidence on the impact of biofortified crops and the effectiveness of different delivery models		
Output number:	5	Output Score:	A+
Impact weighting (%):	20%	Weighting revised since last AR?	Down from 25%

Indicator(s)	**Milestone(s) for this review**	**Progress**
Number of scientific and technical publications assessing the effectiveness and cost-effectiveness of delivery models.	Peer-reviewed: 3 Technical reports: 4	**4** peer-reviewed journal articles and **6** technical reports on effectiveness and cost-effectiveness of delivery models.
Number of scientific and technical publications on biofortified crops and foods and their nutrition impacts.	Peer-reviewed: 2 Policy briefs: 2 Technical Reports: 2	**4** peer-reviewed journal articles, **2** policy briefs and **2** technical reports on biofortified crops and foods and their nutrition impacts.

Narrative: This output captures the programme's evidence base and publications as a measure of technical and scientific quality and global relevance of the new knowledge generated. In 2020, CIP scientists and research partners exceeded the annual publication targets by authoring and submitting for publication more than 20 articles, reports and briefs in areas of concern to the programme, including: (i) **4** peer-reviewed journal articles and **6** technical reports on effectiveness and cost-effectiveness of delivery models; and (ii) **4** peer-reviewed journal articles, **2** policy briefs and **2** technical reports on the nutrition impacts of biofortified crops and foods. In spite of COVID-19 constraints, the programme also completed new surveys and market assessments in Bangladesh and Ethiopia that will result in further pertinent publications in the coming year. In addition, the programme shared research results and delivery lessons in several virtual international conferences and webinars including the 5th Micronutrient Forum, World Food Prize International Borlaug Dialogue, Tropentag 2020, and the joint HarvestPlus-CIP Biofortification Webinar.
Among the important programme publications in 2020 were:

- Jongstra, R. et al. 2020. Iron absorption from iron-biofortified sweetpotato is higher than regular sweetpotato in Malawian women while iron absorption from regular and iron-biofortified potatoes is high in Peruvian women. The Journal of Nutrition 150(12): 3094-3102.
- Heck, S. et al. 2020. Resilient agri-food systems for nutrition amidst COVID-19: evidence and lessons from food-based approaches to overcome micronutrient deficiency and rebuild livelihoods after crises. Food Security 12: 823-830.
- Mwanga, R. et al. 2020. Development of a food product profile for boiled and steamed sweetpotato in Uganda for effective breeding. Int'l Journal of Food Science and Technology. doi:10.1111/ijfs.14792
- 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.

Value-for-Money proposition: The programme continued to produce high quality publications through this Output in spite of significant budget reallocations, indicating a prolific research and publication pipeline at CIP on issues pertinent to this programme. Among the adjustments made to safeguard VfM of this output were: (i) costs of some data collection and data management processes were reduced through use of improved digital tools and phone surveys and consolidation of staff resources; (ii) additional publications were generated by prioritizing data analysis and writing of manuscripts as part of COVID-19 contingencies plans for research teams restricted from conducting field work; (iii) CIP and HarvestPlus further harmonized their MEL systems to be able to address key research priorities jointly and more effectively by drawing on broader and compatible datasets and lessons; and (iv) in line with CIP's open access policy, all publications and reports are available at CGIAR's CGSpace and all datasets are made publicly available through CIP's *Dataverse* repository.

Changes to this output: In consultation with FCDO, the programme applied proportionately larger budget cuts to this Output to be able to prioritize Outputs 2-4 in particular. Accordingly, annual targets were reduced from 6 to 5 peer-reviewed articles and from 12 to 8 technical papers. Among the publications postponed for this reason are several joint CIP-HarvestPlus review papers on the effectiveness and cost-effectiveness of different delivery models deployed by the two organization over the past years. These strategically important publications are planned for the coming year.

Progress on previous AR recommendations: In response to Recommendation #5, CIP has accelerated work on the biofortification research agenda through analysis of existing datasets and continued data collection within reduced available resources. While some delivery models needed to be deprioritized due to budget cuts and COVID-19 restrictions, CIP and HarvestPlus will jointly review their main delivery models for cost-effectiveness, sustainability and scalability in the coming year. CIP has recruited a Scaling Expert as part of the GIZ-funded CGIAR Scaling Taskforce who will provide additional methodological support for this analysis. Further analyses of the nutrition outcomes of diversified OFSP utilization, including the Healthy Baby Toolkit and processed OFSP products, are already under way and will be published in the coming year.

Lessons learned: Demand for up-to-date and robust evidence on the scalability of OFSP delivery and nutrition outcomes has further grown in the context of COVID-19. Policy makers and additional delivery partners are keen on guidelines and practical collaboration for incorporating OFSP into a variety of national COVID-19 response and nutrition support programmes. Key questions concern the intensification of production, marketing strategies and storage and processing options. At the same time, OFSP (and other biofortified crops) are considered within a comprehensive nutrition concept including nutrient dense vegetables and animal source foods. The OFSP and biofortification research agenda must, therefore, address questions of delivery models and nutrition outcomes also in relation to the overall food system including alternative nutritious food sources that may become more affordable for low-income consumers with additional technical innovations.

D: RISK

The program has worked closely with CIP's crises response team, FCDO, host Governments, international agencies operating at field level and implementing partners to identify potential risks and associated mitigating measures for monitoring and managing the risk. The program risks have been mostly driven by COVID-19 crises, insecurity, and extreme weather events in target counties. Overall, the program has delivered comfortably within risk appetite, however some instances, have impacted on the implementation of field activities such as planting material distribution and field monitoring visits. Access to project areas has been a challenge at times for example in the Eastern and Southern regions of Ethiopia. The programme has adjusted field sites and operations to focus on areas of relative security when and where necessary.

In 2020, a fraud case was reported, investigated, and closed successfully and satisfactorily by CIP and FCDO. To strengthen CIP's internal controls, a refresher fraud prevention training has been provided to all CIP staff. Also this year, CIP's Senior Managers and programme staff underwent a comprehensive set of trainings in safeguarding of children and vulnerable adults, including TOT modules that were implemented with partners in Bangladesh, Nigeria, Ethiopia, Uganda, and Kenya. CIP concurs with FCDO's risk appetite across the five risk categories as summarized in the table below.

Risk Category	Risk appetite	Risk management measures
Reputational Risk	Low	Research agenda broadly owned and transparent. Quality control of research and delivery. Embedded in CGIAR programs.
Fiduciary Risk	Low	Zero-tolerance of fraud and corruption. Internal controls in place to mitigate this risk among implementing partners and staff. Refresher fraud prevention training provided to staff.
Delivery Risk	High	Working in high impact environments that can also be high risk means accepting and managing risks through robust partnerships.
Safeguarding Risk	Low	Comprehensive training on safeguarding of children and vulnerable adults for programme staff and partners. Enhanced Due Diligence assessments on safeguarding.
Operational Risk	Low	High level of professionalism, duty of care, and security policy and procedures. COVID-19 contingency plans at programme and country levels.

E: PROGRAMME MANAGEMENT: DELIVERY, COMMERCIAL & FINANCIAL PERFORMANCE

Overall, the program is on track and has met and/or exceeded its logframe targets for 2020.CIP's current financial performance is healthy and in line with FCDO's requirements and the projected spend trajectory as outlined in the financial narrative attached with this report. CIP has responded swiftly to the changing environment presented by COVID-19 crises and made contingency plans and corresponding adjustments on workplans and budgets including on the 11% budget cut by FCDO in 2020. Contingency plans took into consideration individual country restrictions on movement as well as CIP and partners ability to continue to implement activities. Moreover, contingency plans enabled CIP and partners to apply new delivery models in a restrictive environment, with safety being paramount. Activities went through an internal review and approval process, with safety requirements and training put in place to ensure safety of staff and beneficiaries and continuation of work.

Continuing from 2019, CIP has consistently submitted technical, institutional, and financial documentation to FCDO on request, in a timely manner and at high quality. In 2020, these have included the following:

- IATI reports (Q4 2019 uploaded on Jan. 31, 2020; Q1 2020 on Apr. 30, 2020; Q2 2020 on Jul. 31, 2020; Q3 2020 on Oct. 30, 202
- Six-monthly financial reports (Oct. 2019 – Mar. 2020 and Apr. - Sept. 2020) and forecasts sent on May 4, 2020 and Oct. 30, 2020
- Revised Logical Framework jointly submitted with HarvestPlus (November 2020)

Annexed to this 2020 Annual Review Report are:

- Most recent version of joint Logical Framework with HarvestPlus (Annex 1)
- Forecast vs Expenditure January to December 2020 with a narrative (Annex 2)
- An up-to-date full programme budget by FCDO financial year (Annex 3A)
- Latest CIP Audited Financial Statement (Annex 3B)
- Asset Register (Annex 4)
- Downstream Partner Mapping (Annex 5)

CIP has worked with HarvestPlus to respond to FCDO's queries on previous annual review in early 2020 and to submit regular monthly business case progress updates. CIP regularly updates FCDO on any emerging technical, institutional, or financial issues or risks; and seeks to respond in a timely manner and comprehensively to requests from FCDO. Regular email communication, conference calls and joint meetings between CIP, HarvestPlus and FCDO management team have been very useful in responding to the COVID-19 crisis, managing risks, and ensuring that the programme in on track to contribute to FDCO's priorities. CIP appreciates FCDO's continued support in facilitating and convening these dialogues that promotes collaboration between CIP and HarvestPlus.

In other managerial areas, in 2020 a fraud case was reported, investigated and closed successfully and satisfactorily. Embezzled funds which had been charged to the programme's account have been restituted

and FCDO has also concluded its processes in regard to this case. A refresher fraud prevention training has been provided to CIP staff globally.

In 2020, CIP also carried out a comprehensive Safeguarding training with CIP's Senior Managers, the programme staff and a TOT to key staff for continued training of partners. Safeguarding trainings to partners have taken place in Bangladesh, Nigeria, Uganda and Kenya.

The programme's implementation approach continues to deliver on Value for Money based on lessons from the previous year of implementation (2019). Specifically, CIP has prioritized delivery models that represent VfM under changing circumstances affected by COVID-19. CIP has continued to make use of existing capacities and partnerships in target countries to accelerate implementation of activities and reach target beneficiaries in a cost-effective way. This year, the programme has emphasized its contribution to food and nutrition security in fragile environments by partnering with humanitarian programmes to target high vulnerability populations, so that more than 60% of programme beneficiaries are found in fragile environments.

Economy and efficiency of operations were achieved despite the difficulties presented by COVID-19 that heavily affected logistics. For example, domestic and international travel and freight delivery, such as to and within the African continent, had to depend on very limited and infrequent transport schedules. This constrained securing of bookings, lengthened air freight lead times, and increased costs for delivery of supplies. Working closely with CIP HQ, the regional procurement office in Nairobi implemented a vendor pre-qualification process in line with country public procurement guidelines and CIP policies, that enabled us to continue to procure locally whenever possible ensuring timelines were kept and prices remained stable. In 2020, a major consultancy was negotiated for the development of online training modules for beneficiaries. We procured services of a quality provider with a saving of over GBP 20,000 from the original proposal from the selected supplier and around GBP 30,000 less than the estimated budget for this activity.

Date of last narrative financial report	
Date of last audited annual statement	