Building Nutritious Food Baskets
End-of-Project Report

November 2015–January 2018

(Narrative)

Submitted April 2019

Final narrative

Use this form to provide your final update to your foundation program officer regarding the results achieved for the entire project. In addition, please provide your perspective on key lessons learned or takeaways and input on the foundation's support of your work to ensure that we can capture and share learnings as appropriate both internally and externally.

The Final Narrative must be submitted in Word, as PDFs will not be accepted.

General Information

Investment Title	Building Nutritious Food Baskets: Scaling up Biofortified Crops for Nutrition Security in Nigeria and Tanzania (Reaching Agents of Change Phase 2)		
Grantee/Vendor	International Potato Center		
Primary Contact	Simon Heck	**Investment Start Date**	November 6, 2015
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Program Coordinator	Jaclyn Humphrey	**Reporting Due Date**	April 30, 2019
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Remaining Funds (If applicable)			

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Submission Information

By submitting this report, I declare that I am authorized to certify, on behalf of the grantee or vendor identified on page 1, that I have examined the following statements and related attachments, and that to the best of my knowledge, they are true, correct and complete. I hereby also confirm that the grantee or vendor identified on page 1 has complied with all of the terms and conditions of the Grant Agreement or Contract for Services, as applicable, including but not limited to the clauses contained therein regarding Use of Funds, Anti-Terrorism, Subgrants and Subcontracts, and Regulated Activities.

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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
ASDP II	Agricultural Sector Development Programme Phase II (Tanzania)
BMGF	Bill & Melinda Gates Foundation
BNFB	Building Nutritious Food Baskets project
CAADP	Comprehensive Africa Agriculture Development Programme
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
CORAF	Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles
CRS	Catholic Relief Services
CS-SUNN	Civil Society Scaling-Up Nutrition in Nigeria
DUS	Distinctiveness, uniformity and stability
DVMs	Decentralized vine multipliers
FARA	Forum for Agricultural Research in Africa
FMARD	Federal Ministry of Agriculture and Rural Development (Nigeria)
GAIN	Global Alliance for Improved Nutrition
HH	Household(s)
IITA	International Institute of Tropical Agriculture
IR	Intermediate result
M&E	Monitoring and evaluation
MALF	Ministry of Agriculture, Livestock and Fisheries (Tanzania)
MLE	Monitoring, learning, and evaluation
MoBNP	Ministry of Budget and National Planning (Nigeria)
NARS	National agricultural research systems
NEPAD	New Partnership for Africa's Development
NFFA	National Food Fortification Alliance (Tanzania)
NMNAP	National Multi-Sectoral Nutrition Action Plan (Tanzania)
NPT	National Performance Trial
NRCRI	National Root Crops Research Institute – Umudike
OFSP	Orange-fleshed sweetpotato
PABRA	Pan-African Bean Research Alliance
PANITA	Partnership for Nutrition in Tanzania
PAP	Pan African Parliament
PVA	Pro-vitamin A
RAC	Reaching Agents of Change
RCCG	Redeemed Christian Church of God
RECODA	Research, Community and Organizational Development Associates
SARI	Selian Agricultural Research Institute
SRI	Sugarcane Research Institute–Kibaha
SUGECO	Sokoine University Graduate Entrepreneurs Cooperative
SUN	Scaling up Nutrition
TARI	Tanzania Agricultural Research Institute
TFDA	Tanzania Food and Drug Authority
TFNC	Tanzania Food and Nutrition Centre
TOSCI	Tanzania Official Seed Certification Institute
ToT	Training of trainers
WWK	Wanawake Waumini Wakristo

1. PROGRESS DETAILS

EXECUTIVE SUMMARY

This report covers the period November 2015 to October 2018, the lifetime of the Building Nutritious Food Baskets (BNFB): Scaling up Biofortified Crops for Nutrition Security in Nigeria and Tanzania project. This project was funded by the Bill & Melinda Gates Foundation as phase 2 of the Reaching Agents of Change (RAC) project. BNFB was built on the achievements, success, and scaling-up approaches of RAC and drew on complementary CGIAR expertise for scaling up biofortified crops through a multicrop (food basket) approach. BNFB was led by the International Potato Center (CIP) and implemented by a consortium of partners working on nutritious staple crops. The partners comprised the following: the International Center for Tropical Agriculture (CIAT), focusing on high-iron and -zinc beans; the International Maize and Wheat Improvement Center (CIMMYT), focusing on biofortified pro-vitamin A (PVA) maize; CIP, focusing on orange-fleshed sweetpotato (OFSP) and advocacy and capacity development; the International Institute of Tropical Agriculture (IITA), focusing on yellow cassava and PVA maize; HarvestPlus, focusing on country-level promotion of biofortification; and the Forum for Agricultural Research in Africa (FARA), focusing on policy engagement and advocacy regionally and with national governments and a host of national and community partners. The key focus of BNFB was contributing to the reduction of micronutrient malnutrition, also known as hidden hunger, by catalyzing sustainable investment for the utilization of biofortified crops at scale in Nigeria and Tanzania. The purpose was to demonstrate how the scaling-up of a biofortification intervention can be achieved through a concerted effort of a range of CGIAR centers and programs, along with community, national, regional, and international stakeholder engagement. This report provides the details on the implementation process and highlights the key results for the 3-year project period. Table 1 summarizes the key results against set targets and level of achievement for indicators aligned to the objectives of BNFB.

Table 1: Summary of achievements on key result areas against targets

Key Outcome Indicators	Target	Nigeria	Tanzania	Regional	Overall Result	Achievement Status (%)
Number of policy documents that include/ prioritize biofortification	10	3	4	4	11	110
New programs supporting and/or utilizing biofortification	5	2	2	3	7	140
Amount of resources ($) mobilized in support of biofortification	10m	5,068,330	1,474,900		6,543,230	65.4
Number of documents on key elements of the scaling up model published	5		2	3	5	100
Number of pipeline varieties released	12	3	4		7	58
Number of change agents trained in critical areas along the value chains of the four biofortified crops and on biofortification	10,000	2,633	8,147	53	11,433	114
Number of institutions capacitated to organize and implement gender-sensitive programs and projects on biofortification	20	13	27		40	200
Number of processors of biofortified foods	4	1	8		9	225
Number of households (HH) reached with biofortified crops	1.02m				999,944	97

OBJECTIVE 1: STRENGTHEN THE ENABLING ENVIRONMENT FOR INVESTMENTS IN BIOFORTIFIED CROPS

Capacity for advocates and champions built for continued advocacy for biofortification

- BNFB strengthened the capacity of 101 advocates and champions for biofortification, who were country- and regional-level actors with a strong potential in their organizations, from diverse disciplines and sectors, and with a passionate commitment to achieve better nutrition impact through biofortification innovation. Twenty-seven of them were regional, 32 were from Nigeria, and 42 were from Tanzania. BNFB enhanced their capacity to carry out advocacy by involving them in advocacy retreats and learning events. This critical team was instrumental in supporting policy engagement activities and achievement of the results presented under objective 1.

Number of policy documents, strategies, and plans that prioritize biofortification

- BNFB influenced the inclusion of biofortification in 11 policy documents against a target of 10 (110% achievement). Four of the documents were regional level, four were from Nigeria, and three were from Tanzania. The BNFB team worked with national and regional advocates, champions, and national partners to support the implementation of some of the policies, strategies, and plans.
- **In Nigeria** the documents included:
    - The Nigerian Food and Nutrition Policy (2016–2020)
    - The draft Nigerian Food and Nutrition Strategic Plan of Action
    - The Agricultural Sector Food Security and Nutrition Strategy (2016–2025) of the Federal Ministry of Agriculture and Rural Development (FMARD)
    - A draft national advocacy policy brief prepared by the Ministry of Budget and National Planning (MoBNP)

  Some state governments such as those for Oyo, Rivers, and Kano states also included biofortification in their strategies.
- **In Tanzania** the documents included:
    - The Ministry of Agriculture, Livestock and Fisheries (MALF) food security draft strategic plan
    - The Tanzania Food and Nutrition Centre 5-year strategic plan
    - The National Multi-Sectoral Nutrition Action Plan (NMNAP)

  BNFB also supported the implementation of statements on biofortification in the Agricultural Sector Development Programme Phase II (ASDP II), which had been influenced by the RAC project.
- The four **regional-level** policy documents were:
    - The African Development Bank (AfDB) Multisectoral Nutrition Action Plan (2017–2021)
    - The Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles (CORAF) Nutrition Strategy for Implementation in Promoting West Africa Trade Integration
    - The African Union Business Plan to guide Implementation of the Comprehensive Africa Agriculture Development Programme (CAADP) – Malabo Declaration 2017–2021
    - The Communique of the Pan African Parliament and New Partnership for Africa's Development (NEPAD) nutrition document and the Resolution of the Pan African Parliament (PAP)-NEPAD high-level event on nutrition and food systems

  Biofortification has also been entrenched in several programs and calls for proposals.

Resources mobilized in support of biofortification

- In November 2015–October 2018, BNFB, biofortification advocates, and the national implementing partners raised $6,543,230, against a target of $10m, to support programs and initiatives on biofortification. The funds were mainly from development partners—that is, external governments and development agencies (42%), the private sector (23%), and national and local governments (5.5%). HarvestPlus raised 31% of the funds. The resources mobilized did not include investments in biofortification by Nigerian and Tanzanian governments in their national programs for nutrition because it was difficult to isolate the amount spent on biofortification.
- To support advocacy for policy engagement and raising of investments, BNFB developed a toolkit for biofortification advocates. The toolkit comprised nine flyers, fact sheets, and brochures; one infographic on biofortification; 11 pull-up banners; 13 success stories; 10 blog stories; three videos; one newsletter article; PowerPoint presentations in English and Swahili; and a summary investment guide on biofortification. Media engagement and social media were used as vehicles for awareness creation and nutrition education.
- BNFB built the capacity of 41 journalists, 11 from Nigeria and 30 from Tanzania. The capacity-strengthening events helped to debunk the myths around biofortification and equipped the journalists with technical information and knowledge. Journalists are using this information for accurate reporting, highlighting the problem of hidden hunger and its economic impact, and sensitizing and advocating to the relevant authorities and policymakers to prioritize food-based approaches such as biofortification in addressing hidden hunger.

New programs influenced to support biofortification

- BNFB influenced the inclusion of biofortification in seven new national programs against a target of five.

Policy/technical crop specific platforms promoting evidence-based support for biofortification

- BNFB strengthened the capacity of two national multisectoral policy platforms on biofortified crops: MoBNP in Nigeria and the prime minister's office in Tanzania. The project supported 11 high-level meetings, 8 in Tanzania and 3 in Nigeria. The meetings brought together policymakers from the public and private sectors, civil society organizations, and development partners from diverse disciplines. The workshops raised awareness on biofortification, contributed to prioritization of biofortification in policy documents, and helped raise new investment to support biofortification.
- BNFB helped establish five crop-specific technical platforms (two in Nigeria, three in Tanzania) on OFSP, PVA maize, and high-iron and -zinc beans. Eleven platform meetings were supported, which strengthened the linkages between value chain actors. They also provided a forum for joint planning, thereby fostering collaboration and learning, enhancing joint problem-solving, and helping raise investments for biofortified crops from private and public sectors. The WhatsApp groups created for the policy- and crop-specific platform members were active and facilitated the sharing and exchange of information and knowledge.

BNFB implementation process documented and documents published

- BNFB documented its implementation process and published five documents, including research reports, RAC ex post evaluation report, and booklets on success stories, which contribute to improved global understanding of scaling-up approaches. Several journal articles were drafted and are at different stages of completion. The key findings of the studies include:

- The situation analysis studies revealed baseline information which provided input to the development of advocacy strategies and helped prioritize action areas, key actors, and complementary nutrition-sensitive initiatives to leverage on for increased investment in scaling up biofortified crops.
- The ex post evaluation study on the RAC project (2011–2014) showed that OFSP and biofortification had gained popularity and had been integrated into policy, strategy, and plan documents. The emerging impact indicated that:
  - national governments have continued to allocate resources for biofortification in the annual budgets of key line ministries, national research institutions, and provincial and district councils. For example, the Federal Government of Nigeria provided $819,289 which helped reach over 40,000 households (HH). The Government of Tanzania had committed $115m for the implementation of the NMNAP.
  - RAC and its follow-up projects had distributed more than 24,434,952 vine cuttings to 390,966 farmers directly in the three countries, 20.3% of whom are women.
  - RAC training of trainers (ToT) courses in Tanzania, Nigeria, and Mozambique trained more than 71,602 extension workers, teachers, pupils, nutrition workers at village level, and farmers through the step-down training approach.
  - the RAC scaling up model succeeded in building the capacity of individuals and institutions to promote and scale up OFSP in the target countries through policy engagement for policies and investment in support of biofortification, raising of new investment, and strengthening institutional and individuals to design and implement gender-sensitive courses and ensuring availability of clean planting materials.
- The study on willingness to pay for high-iron and -zinc beans showed that about 95% of bean consumers in both rural and urban areas were willing to pay a 25% higher price than the prevailing bean market price and acceptability of biofortified beans.
- The study by an MSc student at Sokoine University of Agriculture in Tanzania is ongoing and will determine the nutritive value of high-iron and -zinc beans and consumable products. Furthermore, it will recommend adequate quantity per serving in order to meet daily recommended allowance for school children aged 6–15 years.
- Results from the PVA maize seed demand and maize value chain study in Tanzania indicated that although the potential area for maize cultivation was 16,195,384 ha, the current area under maize cultivation in 2017/18 season was only 4,839,842 ha. Approximately 42,000 t of seed and very low quality declared seed was produced in the last 3 years. The estimated seed demand was 105,000 metric tonnes (MT) and there were 37 companies marketing seed. (The production of maize increased from 5.1m t in 2012 to 8m t in 2016, and productivity improved from 0.5 t/ha in 2003 to 2.5 t/ha in 2016.) Approximately 62,000 MT of grain was exported in 2015 but dropped to 45,000 MT in 2017. These findings will guide decisions on PVA maize seed production and multiplication in the country.
- The partnership survey showed that the BNFB partnership had worked well in terms of the partnership engagement process, implementation process, and leadership and management of the partnership, and had added value to work implementing partners were carrying out. Survey findings informed the implementation of BNFB and decision-making by management and pointed out areas that needed improvement. The recommendations will continue to inform future multipartner scaling-up initiatives.
- The survey on the use of the OFSP investment guide toolkit informed the decision to update the guide's summary to include content on the other nutritious food baskets crops.

OBJECTIVE 2: STRENGTHEN INSTITUTIONAL/COMMUNITY CAPABILITIES TO PRODUCE AND CONSUME BIOFORTIFIED CROPS

Strengthened capacities and competencies of investors and executing institutions to design and implement investments that drive uptake of biofortified crops

- BNFB strengthened the capacity of 40 national and community agencies and institutions in government, private sector, and civil society to organize and implement gender-sensitive programs and projects on biofortification (200% level of achievement). Of these institutions, 13 were in Nigeria and 27 were in Tanzania. Examples include the Agricultural and Rural Management Training Institute and FMARD in Nigeria and Sokoine University Graduate Entrepreneurs Cooperative, Tanzania Agricultural Research Institute (TARI)–Kibaha and Wanawake Waumini Wakristo (WWK) in Tanzania, who have designed new programs, raised investment for biofortification and have continued to train more change agents on critical gaps along the value chain of biofortified crops.
- Through the development of primary, secondary, and tertiary trainers (see Fig. 1) and step-down courses, BNFB strengthened the capacity of more than 11,433 trainers: 2,633 from Nigeria, 8,747 from Tanzania, and 53 regional one; women accounted for 5,976 of those trained. The courses focused on advocacy; resource mobilization; project planning, implementation, monitoring and evaluation (M&E); and the critical areas of the value chains of each of the four biofortified crops, the nutritious food basket, and biofortification. This critical mass of change agents continues to step down the training to reach more end-users.
- BNFB strengthened the capacity of future leaders in research through two graduate fellowships in Tanzania.
- To ensure sustainability, BNFB developed and published print and electronic versions of four toolkits: (1) the revised version of *Everything You Ever Wanted to Know about Sweetpotato* ToT manual; (2) Biofortification: a sustainable solution to hidden hunger; (3) High-iron beans: a biofortified solution for iron deficiency; and (4) PVA maize: a biofortified solution for vitamin A deficiency. BNFB also developed a farmer-to-farmer training video on OFSP in Swahili. The learning modules continue to be used for training beyond the two project countries.

Enhanced awareness of and increased organizational action for biofortification among key stakeholder groups

- BNFB successfully increased awareness on biofortified crops through sensitization and awareness-creation events such as cooking demos, farmer field days, open days, exhibitions, and workshops with multiple target audiences. These events provided nutrition education to policymakers, technical experts, street vendors, communities, schools, women and youth, district councils, religious organizations, and the general public. The sensitization and awareness-creation activities resulted in the mainstreaming of biofortification in programs and ongoing initiatives.
- BNFB catalyzed and strengthened the capacity of nine small-scale commercial firms processing food products of OFSP, PVA maize, high-iron and -zinc beans, and yellow cassava against a target of four. Of these firms, eight were in Tanzania and one was in Nigeria. They continue to diversify their product portfolios. The rise in agricultural and community-oriented agriculture-related agripreneur numbers has raised the demand for the production and consumption of biofortified crops and foods.

Biofortification increasingly mainstreamed in national nutrition programs and NARS crop programs, and biofortified varieties of staple crops prioritized in development, release, and utilization

- Seven varieties—the target was 12—of PVA maize, OFSP, and high-iron and -zinc beans were fast-tracked through the development process and were officially released in Nigeria and Tanzania. Several others were at advanced stages of release.
- By October 2018, BNFB and its partners had reached 999,944 HH in the two countries with seed of biofortified crops, against the target of 1.02m.

The results from the 3-year proof-of-concept initiative demonstrate that the BNFB scaling-up model of working through a multisectoral and multi-institutional partnership succeeded in catalyzing investment for the utilization of biofortified crops and foods at scale in Nigeria and Tanzania. The BNFB results confirm the findings from the RAC project that a supportive policy environment and new investment by governments, private sector, and development partners, together with strong institutional capacities at national and community level, and proven biofortified technologies can facilitate the scaling-up of interventions. The resources from governments and private sector appear to be lower than those from development partners. It was noted, however, that there were challenges in apportioning the percentage of resources allocated by governments for nutrition programs that were used to support activities on biofortification. Hence these figures have not been captured under new investments raised. The investments raised from national partners are, however, very important and demonstrate local ownership and sustainability of the processes of scaling up biofortified crops and products. The findings from the BNFB action research have established the critical importance of a strong partnership of international and regional organizations, national governments at all levels, the private sector, civil society organizations, and development partners in forging synergies to help reduce hidden hunger. The BNFB project has resulted in stronger national and community institutions, a critical mass of change agents with the capabilities to train others, and service providers in the value chains of OFSP, PVA maize, and high-iron and -zinc beans who will contribute to improving nutrition and increasing incomes. The BNFB model can be extended beyond the initial proof-of-concept period and adapted to other countries committed to scaling up biofortified crops.

The main lessons learned include:

- The project showed that national governments cannot promote or allocate resources for biofortified crops that have not been officially released in the country. This calls for earlier engagement at the national/institutional budget preparation stage in order to have the time and resources needed.
- Having national and regional champions and advocates, and strengthening their capacity, enhances ownership and technical competence of national and regional institutions to carry out advocacy for policy change and raising of new investment for biofortification initiatives.
- The BNFB project leveraged the processes defined by the East African Community and Southern African Development Community seed protocols to expedite the release of two high-iron and -zinc bean varieties from Rwanda and Burundi and two PVA maize varieties from Zimbabwe in Tanzania in a shorter period.
- Although PVA maize was released during Y1 and high-iron and -zinc beans during Y3, their seed was not widely available to farmers and other producers by the time the project ended. The gains by BNFB need to be leveraged and followed up with different scaling support mechanisms or programs to effectively catalyze the scaling-up of the biofortified crops, exploit emerging opportunities, and allow for special creativity.

- Onn the basis of the outcomes of the RAC project on scaling up OFSP and of the BNFB project on promoting and scaling up multiple biofortified crops simultaneously, the project succeeded in demonstrating (1) the usefulness of a multisectoral and multi-partner mechanism, (2) the gains from linking ongoing technology investments, (3) connecting these to policy dialogue and public awareness, and (4) strengthening institutional and individual capacity at national and country levels to produce and consume biofortified crops. There were challenges and conflicts with the partnership model, but sound leadership. Therefore, the BNFB scaling-up model can be rolled out in other countries, regions, and continents to support similarly complex scaling-up projects and programs working on biofortified crops.

PROJECT BACKGROUND AND OVERVIEW

The Building Nutritious Food Baskets (BNFB): Scaling up Biofortified Crops for Nutrition Security project was a $5m, 3-year project that ran from November 2015 to October 2018 and was funded by the Bill & Melinda Gates Foundation (BMGF). It was led by the International Potato Center (CIP) and implemented by a consortium of partners working on multiple nutritious staple crops in Nigeria and Tanzania. BNFB was built on the achievements, success, lessons learned, and scaling-up approaches of the Reaching Agents of Change (RAC) project implemented by CIP and Hellen Keller International between June 2011 and August 2015. But BNFB broadened the focus from just orange-fleshed sweetpotato (OFSP) to a multicrop nutritious food basket. BNFB was an action research initiative implemented to demonstrate how multiple biofortified crops (i.e., vitamin A sweetpotato, vitamin A cassava, vitamin A maize, and iron-rich beans) could be scaled up together at country level using a food basket approach. The goal of BNFB was to help reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops at scale in Nigeria and Tanzania. Its specific purpose was to demonstrate how scaling-up could be achieved through a concerted effort of a range of CGIAR centers and programs and other partners and stakeholders. The consortium and implementing partners worked together on advocacy to influence the formulation and implementation of policy; raise new investment; carry out nutrition education; and undertake social and behavior change communication initiatives to create demand, strengthen capacity, and promote institutional learning to support the scaling-up of multiple biofortified crops. BNFB especially targeted young children under the age of 5 and women of reproductive age. This report describes BNFB's implementation process and highlights the key results, sustainability strategies, and lessons learned.

PROJECT DESIGN, PARTNERSHIPS, AND STAFFING

In designing BNFB the consortium partners developed an emerging strategy for scaling up biofortified crops in Africa. The team identified and prioritized the key gaps to be addressed in the value chains of the nutritious crops that were ready for such scaling. BNFB worked with national governments, research and training institutions, private sector, NGOs, development partners, and regional and international organizations. This broad array of partners forged linkages with complementary ongoing projects and initiatives and filled critical gaps for greater synergy and value addition. The project's two specific objectives were to strengthen (1) the enabling environment for investments in biofortified crops and (2) institutional and community capabilities to produce and consume biofortified crops to demonstrate a scaling-up model through a food basket approach. The project aimed to catalyze policy change, combined with efforts to mobilize resource commitments by governments, development partners, and the private sector. It sought to build national and community capabilities to produce and consume biofortified crops for improved nutrition and increased incomes in both rural and urban areas. BNFB recognized the role that women play in agriculture and nutrition, and its resource mobilization strategy responded to the needs of women and youth.

The design assumed that the four biofortified technologies would be ready or nearly ready to scale up at the onset of the project. These crops were OFSP, pro-vitamin A (PVA) maize and vitamin A (yellow) cassava for Nigeria, and OFSP, PVA maize, and high-iron beans for Tanzania. The preconditions were that there would be (1) some commitment from national stakeholders to support the promotion of biofortification through dissemination of released varieties, communication, and education; (2) ongoing agricultural and nutrition projects run by CGIAR and other agencies developing and/or promoting biofortified crops; (3) institutional and political support by host governments to facilitate policy dialogue on biofortification; and (4) willingness and capacity of stakeholders to share information and participate in project activities.

By design BNFB targeted change agents, who were influential organizations or individuals at the national and community levels in the public and private sectors and civil society organizations. The change agents, advocates, and champions were responsible for implementing or facilitating change from their strategic national and regional positions to scale up biofortified crops. It was anticipated that 2.175m additional households (HH) would adopt biofortified crops in Nigeria and Tanzania resulting from the investment over 5 years (i.e., by 2020). The project tested the hypothesis that scaling-up depends on a supportive policy environment, strong institutional capacities, and proven technologies. The project was officially launched in March 2016 in Arusha, Tanzania.

BNFB was a collaborative effort of multidisciplinary and multi-organizational partnerships. These were the International Center for Tropical Agriculture (CIAT) for high-iron and -zinc beans; the International Maize and Wheat Improvement Center (CIMMYT) for biofortified PVA maize; CIP for OFSP, advocacy, and capacity development; the International Institute of Tropical Agriculture (IITA) for PVA maize; HarvestPlus for yellow cassava and country-level promotion of biofortification in Nigeria; the Forum for Agricultural Research in Africa (FARA) for policy engagement and advocacy at regional level; and the governments of Nigeria and Tanzania. A range of national partners, including national agriculture research systems (NARS), the private sector, academic institutions, and community-based institutions in Nigeria and Tanzania, was also involved. A complete list of partners is available in Appendix 1.

CIP had overall responsibility for all technical and financial aspects of the project, including those delivered through the project's implementing partners. During the inception meeting, the partners agreed on their specific roles and responsibilities. Sub-grant, collaborative, and hosting agreements were signed with CIP based on the individual mandates of the entities and the services needed to attain the project objectives (see Appendix 2).

BNFB staff constituted nine full-time professionals, 14 part-time staff, and five full-time technicians at IITA, as well as casual workers and consultants with varying levels of time commitment to the project (see Appendix 3 for the project's organogram). The core team worked closely with other technical experts in their institutions at community, national, and regional levels. BNFB also collaborated with other staff from CIP, CIAT, CIMMYT, IITA, FARA, and HarvestPlus, as well national and regional advocates and champions of biofortification, who provided in-kind complementary support.

Implementation Processes

BNFB implementation was guided largely by the intermediate results (IRs) and key milestones defined under each of its objectives. But at the same time it ensured that the approaches and methods for monitoring advocacy, capacity-building, and seed systems activities were in place.

Intermediate results for objective 1

Objective 1 focused on achieving five IRs relating to the provision of supportive policies and investment environments for biofortification in Nigeria and Tanzania and at regional level for increased production and consumption of biofortified crops to reduce hidden hunger (Box 1).

Box 1: Intermediate results for objective 1

IR 1.1: Policies, strategies, and plans developed/formulated and implemented that prioritize support to biofortification to accelerate the scaling of biofortified crops within wider agricultural and nutrition/health sectors. The milestones under this IR were:

- Country and regional advocacy strategy/plan for Nigeria and Tanzania developed and fully implemented
- Country and regional multisectoral policy platforms established in each country
- Biofortified crops as priority value chains included in regional agricultural strategies and plans such as the post-Malabo CAADP national agricultural and food security investment plans
- Projects and programs that are gender mainstreamed at all levels of the project cycle

IR 1.2: Capacity for country advocates and regional champions built for continued advocacy for biofortification in Tanzania, Nigeria and at the regional level. The milestone under this IR was strategic country advocates and champions (individuals and organizations) identified and trained.

IR 1.3: Increased investments by public, private, and NGO sectors in support of biofortification. The milestones under this IR were:

- Gender-aware, pro-poor, youth-friendly, and environmentally sensitive country resource mobilization strategy/ plan for Nigeria and Tanzania
- Linkages and strategic alliances and policy platforms built
- Engendered project proposals to mobilize resources in support of biofortification in Tanzania and Nigeria
- Promotion and advocacy materials in favor of biofortification
- Nutrition education for behavior change communication programs

IR 1.4: Technical and policy platforms actively promoting evidence-based support for biofortification. The milestone under this IR was multisectoral technical and policy meetings on biofortified crops

IR 1.5: Improved global understanding of scaling up approaches. The milestones under this IR were:

- Joint monitoring, learning, and evaluation system to support learning and adaptive management by all project partners
- Processes, successes, and lessons learned white papers
- Journal publications on scaling up biofortified crops through a food basket approach

IRs 1.1, 1.2, and 1.3: Policy documents developed, capacity of advocates and champions built, and advocacy for increased investment and policy change

To better understand the gaps, define priorities, and develop the necessary interventions to address the issues affecting the scaling-up of biofortification, the project engaged consultants to conduct situation analysis studies from October 2016 to May 2017. The primary aim was to gather analytical data and information to establish the baseline status of biofortified crops and nutrition in Nigeria and Tanzania and at regional level. The country situation analyses were also intended to (1) provide input in the development of the national advocacy strategy; (2) guide the seed systems and capacity-building plans for the project; (3) identify the key actors in biofortification; (4) map out the gaps in ongoing complementary initiatives, particularly crucial crop-specific value chain gaps to which BNFB could contribute in closing; and (5) identify bottlenecks and gaps in advocacy, capacity building, and seed systems/supply.

The regional situation analysis identified (1) the regional and subregional policies and frameworks that supported biofortification, (2) policy and competency gaps, (3) the regional and subregional organizations implementing various nutrition-sensitive initiatives, (4) the organizations to target for advocacy to increase investments in biofortification, and (5) the existing environment for scaling up the production and consumption of biofortified crops. The findings and recommendations from the situation analyses were used to guide the prioritization of the key actions necessary to facilitate

increased investment in scaling up biofortified crops in sub-Saharan Africa and the determination of the broad strategic areas that formed the focus in the development of regional and national advocacy strategies for scaling up biofortification and stimulating sustainable investments in the value chains of high-iron and -zinc beans, OFSP, PVA maize, and vitamin A cassava. Primary data were collected through interviews, focus group discussions, and consultations with key informants and stakeholders working in the areas of biofortification, nutrition, agriculture, education, and health. Secondary data were collected through a systematic content review of relevant policies, published and gray literature, and strategic documents. The situation analyses studies were completed in July 2017. The reports were shared with partners and key stakeholders. They are available online on the BNFB web page, the Sweetpotato Knowledge Portal, MELSpace and the CGIAR Monitoring and Learning Platform, the CGSpace repository, and FARA'S web page.

On the basis of the findings and recommendations of the situation analyses, the BNFB team developed advocacy strategies for each country and the region for 2017 and beyond. The strategies were validated and endorsed by key stakeholders and advocates. Various advocacy activities were prioritized and implemented based on the advocacy strategies, bearing very good results. The regional level and the Tanzania country advocacy strategies were finalized in September 2017. The strategy for Nigeria was revised and completed in April 2018. During Y2 and Y3, BNFB advocacy efforts focused more on implementation of policies and raising of new investment in support of biofortification. Copies of the strategies were circulated in hard and soft versions, and they continue to be used by the advocates and champions to guide their advocacy efforts. The advocates and champions were country- and regional-level actors with a strong potential in their organizations, from diverse disciplines and sectors, and with a passionate commitment to achieve better nutrition impact through biofortification innovation. To ensure wide reach, the strategies were made available online and cross-posted or linked to partner websites and online platforms (e.g., those listed above). The strategies were also cross-posted and cross-linked on partner websites for wider reach. BNFB interpreted advocacy to be a strategic set of activities designed to influence decisionmakers, laws and regulations, strategies, and practices to address the root causes of micronutrient deficiency. The project adopted a championship model of advocacy through engaging advocates and champions for nutrition within Africa, Nigeria and Tanzania specifically. The capacities of these national and regional champions were strengthened to enable them to effectively advocate for policy change and raise new investment for biofortification. Advocacy was carried out both publicly and privately. Awareness-raising through nutrition education to improve the knowledge of policymakers on micronutrient malnutrition was an integral part of advocacy. BNFB employed diverse approaches to carry out advocacy for policy change and implementation and raising of new investments, such as:

- One-on-one meetings to sensitize policymakers and create awareness on biofortified crop
- Training for implementing partners on the benefits on biofortified crops in reducing hidden hunger
- Advocacy campaigns/sensitization meetings with different stakeholder target audiences
- Advocacy meetings, workshops, and policy dialogues with members of parliament, representatives from government ministries, national- and local-level public, private sector, civil society, and development organizations, schools, community leaders, religious organizations, and others
- Exhibitions, agricultural shows, fairs, and trade shows
- Media advocacy
- Demos, field days, and the like.

BNFB developed a project logo and the tagline "*Combating hidden hunger through nutritious food baskets*," which were used on all project documents. The project's diverse advocacy and social and behavior change communication materials were used to support advocacy efforts and behavior change at country, regional, and international levels. At regional level, the materials were developed with the African Union Commission and the African Union New Partnership for Africa's Development. Logos of all the implementing partners were included on the materials alongside that of BNFB. In Tanzania the materials were translated into Kiswahili. Advocacy materials were disseminated widely at all BNFB and partner events. Over the 3 years of implementation, BNFB developed branded promotional materials of diverse nature and content.

To strengthen media advocacy BNFB organized media learning-events in Nigeria and Tanzania that equipped journalists with the skills to advocate for biofortification through the media in their countries. In Tanzania BNFB partnered with the Tanzania Agricultural Journalists Forum and the Tanzania Food and Nutrition Centre (TFNC) to launch a competition for journalists. The project actively employed the social media tools of Twitter, Facebook, Instagram, and WhatsApp to promote biofortification.

IR 1.4: Policy and technical platforms actively promoting evidence-based support for biofortification

In 2015 the project management team carried out reconnaissance missions to identify strategic partners to host the technical and policy platforms needed to ensure coordination of advocacy and raising of new investment for biofortification. The platforms aimed to foster collaborative efforts and learning and to improve the implementation of activities to deliver biofortified crops at scale in Tanzania and Nigeria. In 2016 BNFB worked with two strategic host institutions identified during the reconnaissance missions: the Ministry of National Budget and Planning in Nigeria and the prime minister's office in Tanzania. The project team met with key individuals several times and facilitated retreats, workshops and training, and mentorship for the two focal points. BNFB supported the two institutions to hold meetings. The objectives were to engage policymakers to influence the formulation of policies, strategies, and plans; entrench statements on biofortification in policies; and allocate resources to support the implementation of the policies.

During Y2 and Y3 BNFB launched crop-specific platforms in Nigeria and Tanzania. The objective was to bring together key actors from the value chains of each of the commodities (i.e., producers, seed companies, vine multipliers, processors, and marketers). Each platform elected its office-holders, who then worked with BNFB and organized meetings to share progress, challenges, and opportunities and to exchange ideas and information. The platform members carried out advocacy on biofortified crops for policy change to help raise new investment and deliberate on ways to strengthen the value chains.

IR 1.5: Improved global understanding of scaling-up approaches

In 2016 BNFB developed and rolled out a joint monitoring, learning, and evaluation (MLE) system to support learning and adaptive management by all the project partners. During the project, BNFB documented the processes, compiled information about successes and failures, carried out studies on the biofortified crops, and identified key lessons. During Y2 BNFB commissioned a study to analyze the emerging impact of RAC for learning purposes. In 2017 and 2018, the project team made presentations on the project's progress and results at relevant regional meetings and prepared journal article manuscripts and booklets on the BNFB scaling-up model and lessons learned.

IRs for objective 2

Objective 2 focused on achieving three IRs concerned with ensuring effective institutional capacities of the public, NGO, and private sectors for the delivery of biofortified crops at scale in Nigeria and Tanzania (Box 2).

Box 2: IRs for objective 2

IR 2.1: Strengthened capacities and competencies of investors and executing institutions to design and implement technically strong, cost-effective, and gender-sensitive investments that drive uptake of biofortified crops. The milestones under this IR were:

- Targeted and gender mainstreamed ToTs' learning modules on priority areas for biofortified crops
- Capacities for institutions built to deliver ToTs' learning modules on priority areas for biofortified crops
- Critical mass of service providers trained through the step-down cascading model

IR 2.2: Supportive agencies (producers, farmer organizations, marketers, processors) facilitated to self-organize around issues of biofortification. The milestones under this IR were:

- Crop-specific strategies to accelerate the uptake of biofortified crops
- Crop-specific champion platforms
- National seed agencies, the private sector and farmer/women/youth groups involved in large-scale production of seeds of the biofortified crops
- Commercial processors processing biofortified food products
- Study on effectiveness and sustainability of the three models of seed production systems: government-led, commercial/private sector-led, and community-led

IR 2.3: Biofortification mainstreamed in national crop programs, and biofortified varieties of staple crops prioritized in the development and release process. The milestones under this IR were:

- Pipeline varieties of biofortified crops officially released
- Relevant varietal release committees include release criteria that give higher consideration to new crop varieties with enhanced micronutrient content

IR 2.1: Capacity strengthening approaches for institutions and individuals

BNFB aimed to strengthen the capacity of national and community implementing agencies to design and implement technically strong, gender-sensitive, and cost-effective programs that drive the uptake of OFSP, yellow cassava, PVA maize, and high-iron and -zinc beans. The project adopted the RAC cascading-training model (Fig. 1) and different approaches to strengthen the capacity of institutions at national and community levels and individuals. These approaches included four specific efforts. First, it supported national and community institutions through pretraining workshops to help them offer training to adults. In that way BNFB trained a cadre of trainers who in turn would train others in a cascading fashion, to end up with primary, secondary, and tertiary facilitators. The project provided seed money for step-down courses run by change agents trained to cascade training to farmers and end-users, as well as provided technical and equipment support. Fourth, BNFB offered mentoring and coaching to facilitate mainstreaming of biofortification in national crop programs, prioritizing of biofortified varieties of staple crops, and increase of production and consumption of biofortified crops.

BNFB supported the national institutions whose capacities were strengthened under RAC (i.e., Sokoine University of Agriculture [SUA] in Tanzania and the Agricultural and Rural Management and Training Institute in Nigeria), along with other national and community agencies, with the training required to build their capabilities to deliver a ToT course on the nutritious food basket.

The project further provided technical expertise in the planning and implementation of training courses organized by the institutions and in marketing the annual fee-based courses organized by the institutions in Tanzania and Nigeria that were part of the sustainability mechanism built by RAC. The core BNFB technical partners provided technical expertise in the planning and implementation of training courses organized by the selected national and community institutions. It equipped them with the knowledge, skills, facilities, and equipment necessary to develop and host technically strong, cost-effective, and gender-sensitive training courses. The capacity development interventions used hands-on, applied adult learning approaches; delivery was supported and strengthened by learning modules and resources developed by BNFB. The facilitators trained by these agencies then became master or primary trainers and worked with their management to organize and host annual ToT courses (Fig. 1).

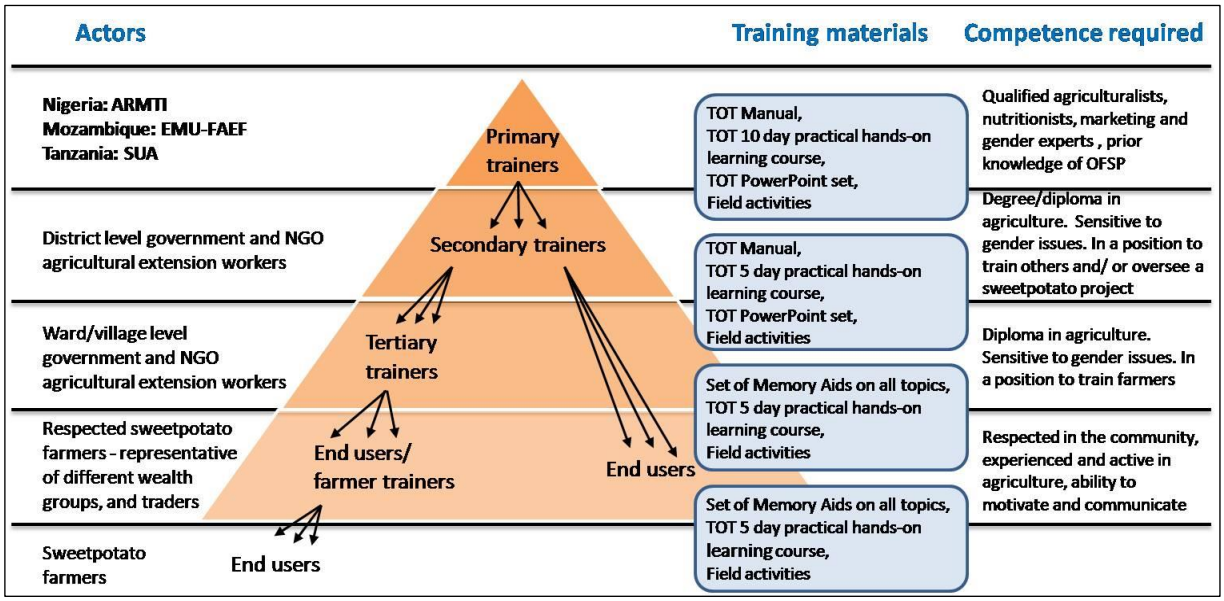


Figure 1: The RAC and BNFB cascading-training model.

BNFB ran courses for strategic partners who were working in the BNFB geographic areas or on activities aligned to its objectives. The courses were fee-based or funded, and their duration depended on the needs of the target audience in regard to the production and consumption of biofortified crops and foods. The cadre of trainers trained by the selected institutions became secondary trainers and were expected to step down the training to other trainers, who would cascade it downwards to the level of farmers' group leaders to ultimately reach farmers. To support the training courses and ensure sustainability, the BNFB team developed three learning toolkits. The team created an inventory of existing training resources and conducted a needs assessment to establish the critical gaps that needed to be filled. Specialized consultants were engaged to work with a multidisciplinary team of technical experts in partner organizations to develop the content for the learning modules on biofortification, PVA maize, and high-iron and -zinc beans that would be similar to the RAC ToT manual. BNFB then revised the *Everything You Ever Wanted to Know about Sweetpotato* training manual to fill the gaps identified and capture new knowledge on OFSP. The project team worked closely with a multidisciplinary team of CIP scientists and a senior consultant based at the Natural Resources Institute, UK, to review and update the training material. The team identified gaps in the material; added new knowledge; and harmonized the content to produce targeted, gender-mainstreamed learning modules for training adult learners, with a heavy emphasis on learning-by-doing. The key topics reviewed and updated were on facilitating training sessions,

sweetpotato varietal selection, nutrition, seed systems, and MLE. All the learning toolkits developed contained PowerPoint presentations, quizzes, and memory aid cards.

BNFB endeavored to contribute to the development of future leaders in research through offering research fellowships:

- The project offered a 3-month research fellowship to a TFNC staff member at the Biosciences eastern and central Africa–International Livestock Research Institute hub in Nairobi. The fellow focused on analyzing the nutritional and food composition of OFSP, PVA maize, and high-iron and -zinc beans, as well as food products from Tanzania. The fellow was expected to generate data to inform stakeholders involved in biofortified crop processing and value addition and to train others in Tanzania upon returning home.
- Under the leadership of CIAT and TARI–Selian (formerly Agricultural Research Institute–Selian), BNFB collaborated with SUA and provided one fellowship to an MSc student in 2017. The fellow was expected to determine the nutritive value of high-iron and -zinc beans and their products and make serving recommendations for school children aged 6–15 years as part of his MSc thesis. That information was to be used to guide product formulation and feeding patterns to improve children's nutrition.

In addition to the training courses on biofortified crops and the nutritious food basket, BNFB carried out two abridged learning events that were similar to the 6-day Engendered Orange-Fleshed Sweetpotato Project Planning, Implementation, Monitoring and Evaluation Learning workshops conducted by RAC; the scope was, however, broadened to cover the nutritious food basket crops. BNFB collaborated with TFNC and Nigeria's FMARD to hold 3-day gender-sensitive learning events in the two countries. The goal was to strengthen the knowledge and skills of national advocates and champions representing the government, the private sector, and civil society institutions on project planning, implementation, monitoring, and evaluation. The trainers used the toolkit developed under RAC to guide the process, and the content focused on advocacy and raising of investment for biofortified crops. Some of the resource persons were those previously trained during the 6-day RAC learning workshops. The participants prepared action plans for the ideas they committed to pursue, and the national coordinators worked with those who were motivated and had innovative ideas to develop their concepts into project proposals.

IR 2.2 and 2.3: Supportive agencies facilitated to self-organize and biofortification mainstreamed in national programs

Nigeria and Tanzania were at different stages regarding the availability of biofortified varieties and establishment of sustainable seed systems. At project inception, Tanzania had only one crop from among the BNFB food basket crops (OFSP), whereas Nigeria had three—OFSP, PVA maize, and yellow cassava (though seed of PVA maize was not yet available to farmers). BNFB therefore focused on seed multiplication and bulking of varieties that were already officially released and fast-tracking the release of varieties either in the pipeline or with the desired characteristics. This was achieved through a collaborative effort of core partners in seed systems, working closely with national seed certification agencies in Nigeria and Tanzania. The partners were CIAT (high-iron and -zinc beans); CIMMYT and IITA (PVA maize); CIP, TARI–Kibaha, and the National Root Crops Research Institute (NRCRI)–Umudike (OFSP); and HarvestPlus (yellow cassava). Efforts were also made to include biofortification as a key criterion in fast-tracking the release of varieties.

OFSP

At the onset of the project, two varieties of OFSP had been officially released in Nigeria ('Mothers' Delight' and 'King J') and five in Tanzania ('Mataya', 'Kiegea', 'Ejumula', 'Kabode', and 'Jewel') and

were ready for scaling-up. In Nigeria BNFB worked closely with NRCRI–Umudike, other CIP projects such as the Sweetpotato Action for Security and Health in Africa (SASHA2), and decentralized vine multipliers (DVMs) to engage the release committee and fast-track the release of at least two new varieties. Active implementation of the OFSP component of the project in Nigeria started in August 2016. Linkages were established with state government institutions in the four BNFB-selected states of Enugu, Kogi, Ogun, and Taraba. These states were near the RAC states for ease of movement of planting materials. BNFB selected the DVMs to work with in each state based on three criteria: being a sweetpotato farmer with land near a source of water, having the capacity to produce sweetpotato vine cuttings, and agreeing to use and manage farm sites as demo plots. The DVMs selected received hands-on training on good agronomic practices to ensure they were capable of properly managing their demo plots and preserving and multiplying high-quality vines for dissemination. In Y3 farmer field days, participatory on-farm trials, and sensitization meetings were intensified to create awareness among the communities on the importance of OFSP in addressing hidden hunger and for food security and income generation.

In Tanzania OFSP activities were led by TARI–Kibaha, which was responsible for the project component on OFSP under objective 2 and for ensuring institutional capacities were effective for delivery of biofortified crops at scale. The level of awareness on the five OFSP varieties that had been released at the onset of BNFB was low. CIP partnered with TARI–Kibaha and forged synergy with CIP's Viable Sweetpotato Technologies in Africa project in conducting field evaluations of promising OFSP varieties and managing Mother–Baby trial sites in Dodoma and Singida.

TARI–Kibaha worked closely with public, private, and civil society organization partners to fast-track the release of at least two new OFSP varieties and to improve linkages between technical programs and other institutions so as to address the key constraints in the supply chain of OFSP. TARI-Kibaha built on its network for seed systems and technology deployment for pre-basic maintenance and basic OFSP seed production, strengthening seed systems, capacity building, advocacy and promotion, and agroprocessing. Furthermore, TARI–Kibaha collected GPS coordinates of trained vine multipliers supported by the BNFB project in Dodoma and Singida for georeferencing purposes.

PVA maize

In Nigeria only one variety of PVA maize had been released when the BNFB project started, but its seed was not yet available for dissemination to farmers. IITA partnered with seed companies, agroprocessors, NARS, regulatory bodies, training institutions, and other value chain actors to develop new varieties with the desired characteristics and to multiply PVA maize seed, create demand for it, and disseminate it to farmers. IITA evaluated PVA maize varieties across multiple locations in Nigeria in 2016 and 2017 to fast-track the release of the best performing ones, focusing on increasing production of breeder seed of different varieties. In Y3 IITA focused on seed multiplication and distribution of breeder seed to major seed companies. It forged linkages with other partners to strengthen the capacity of institutions and individuals to accelerate demand for PVA maize and share lessons from individual crop initiatives on creating demand, economic incentives for investments in seed systems, and agroprocessing. IITA supported the ToT learning module and the development of a PVA maize road map for Nigeria, working alongside other partners, and supported seed companies to take full responsibility for basic and certified seed production. The institute supported agroprocessors and established the PVA maize platform that brought together key PVA value chain actors in Nigeria.

PVA maize activities in Tanzania were led by CIMMYT, which was responsible for the project's component for this crop under objective 2. CIMMYT handled the technical aspects of the PVA maize crop value chain and the mobilization of key stakeholders to ensure that institutional capacities were

effective for delivery of biofortified maize at scale in Tanzania. CIMMYT built the capacity of selected partners from the PVA maize value chain, especially breeders, to conduct on-station and on-farm trials to fast-track the identification and release of PVA maize varieties suited for various agro-ecological zones of Tanzania. It established a PVA maize platform to accelerate the uptake of biofortified crops at scale in Tanzania, and organized and facilitated meetings for stakeholders. In 2017 and 2018 CIMMYT strengthened capacities of national seed agencies; the private sector; and farmer, women, and youth groups in large-scale production of seed of PVA maize. CIMMYT also empowered seed companies and their contract farmers and processors to take full responsibility for basic and certified seed production. It supported and incentivized producers, farmer organizations, marketers, and processors to self-organize around the issues of PVA maize. In addition, CIMMYT supported the promotion and commercialization of biofortified crop products, helped mainstream biofortification in national crop-breeding programs, and carried out and validated a maize value chain analysis and seed demand study.

High-iron and -zinc beans

CIAT spearheaded the activities on high-iron and -zinc beans in Tanzania and was responsible for the technical aspects on the crop's value chain, mobilizing stakeholders, and ensuring institutional capacities were effective for the crop's delivery at scale. According to the project design, CIAT was to start scaling up the 'Jesca' variety, a high-iron and -zinc bush bean released in Tanzania in 2016 that is adaptable to high and low areas; resistant to drought, pests, and diseases; high yielding; early maturing; and easily marketable. But during the project inception workshop in March 2016, it was decided that the variety would no longer be promoted as biofortified because there were newer bean varieties with higher levels of iron in neighboring countries. This meant that BNFB could not advocate for high-iron and -zinc beans because no variety with the recommended iron levels had been released in Tanzania. The work plan for the bean component was thus redesigned to focus on fast-tracking the release of new high-iron and -zinc beans varieties and seed multiplication.

During Y1 and Y2 CIAT, TARI–Selian, TARI–Uyole, and TARI–Maruku carried out trials of promising bean varieties from Burundi. They engaged the variety release committee to fast-track the release of biofortified beans and include biofortification as a special trait in their release. CIAT used the framework of germplasm exchange within the Pan-Africa Bean Research Alliance (PABRA) and the East African Community seed harmonization protocol in fast-tracking the release process. CIAT worked with the national bean program and the regulatory body, the Tanzania Official Seed Certification Institute (TOSCI), to evaluate climbing and bush genotypes, as well as check the improved variety 'Jesca' at multiple locations and for desirable genetic characteristics. During Y2 genotypes from the three zones with good agronomic performance were selected and submitted to TOSCI for distinctiveness, uniformity, and stability (DUS) testing and National Performance Trials (NPTs) as part of the official release process.

Seed multiplication was carried out during the rainy season at TARI–Selian, TARI–Uyole, and TARI–Maruku. Breeder seed was harvested during April–July 2018 and planted during the short-rains season of October 2018–February 2019. To ensure seed availability for farmers, BNFB supported CIAT and TARI to import breeder seed from Burundi and Uganda, which was distributed in various zones of the country to multiply seed.

CIAT supported training and capacity-building activities for national and community implementing agencies in producing and consuming high-iron and -zinc beans and carried out advocacy and promotion activities for biofortified crops. During Y2 CIAT conducted a study to determine consumer willingness to pay for the high-iron and -zinc trait in biofortified beans. In Y3 it provided small grants to farmer and producer groups to spur the production and marketing of high-iron and -zinc beans,

and worked to foster strategic large-scale production of such beans by the private sector and farmer, women, and youth groups. CIAT also strengthened the platform on the production and marketing of biofortified beans. During Y3 it empowered national partners such as contract farmers to take responsibility for basic and certified seed production.

CIAT contributed to the development of the ToT learning modules in the priority areas for biofortified beans and to the situation analysis study and advocacy strategy for Tanzania, with funding from CIP. CIAT also worked with core partners CIP and FARA on advocacy to attain objective 1 deliverables on the provision of supportive policy and investment environments for biofortification and scaling up of iron-rich beans in Tanzania.

2. FINAL PROGRESS DETAILS

Provide information regarding the entire investment's progress towards achieving the investment outputs and outcomes. In addition, submit the Results Tracker with actual results as requested. If this investment has an Integrated Product Development Plan (IPDP) that was developed with your foundation Program Officer, progress toward relevant outputs and outcomes should be updated in that document.

Overall, very good progress was made and BNFB delivered most of the expected outputs and outcomes and surpassed targets for many. Three deliverables were not fully attained, although good progress was made in each case: the new investment raised was 65.4% of the target, the number of varieties in the pipeline that were released was 58% of the target, and the number of HH reached with biofortified seed was 97% of the target. Annex 1 presents the results framework. The detailed results under objectives 1 and 2 are provided below and in partners' reports (see Annexes 2–6).

OBJECTIVE 1: STRENGTHEN THE ENABLING ENVIRONMENT FOR INVESTMENTS IN BIOFORTIFIED CROPS

Objective 1 focused on four key result and outcome indicators. The project surpassed the targets for three of them and achieved 65.4% of the target for the result area on raising new investment.

- Influenced **11 policy and strategic plan documents** to capture statements on biofortification, 3 of which were in Nigeria, 4 were in Tanzania, and 4 were at regional level. The target was 10, so this was a 110% achievement rate.
- Raised **$6,543,230** to support programs and initiatives on biofortification, which excludes funds invested by the governments under the broader umbrella of nutrition or malnutrition. The target was $10m, so this was a 65.4% achievement rate.
- Influenced **seven new national programs** to support or utilize biofortification. The target was five, so this was a 140% achievement rate.
- Key elements of the scaling-up model were documented and five key documents that contribute to improving the global understanding on scaling-up approaches were published. The target was five documents, so this was a 100% achievement rate.

The BNFB project identified and developed the capacity of **101 advocates and champions,** 32 from Nigeria, 42 from Tanzania, and 27 regional. The advocates and champions were instrumental in supporting policy engagement and the achievement of the project's tremendous results. Table 3 presents findings on the different types of funds leveraged by different types of investors to support biofortification in Nigeria and Tanzania. Figure 2 highlights the achievement against the outcome indicators aligned to Objective 1.

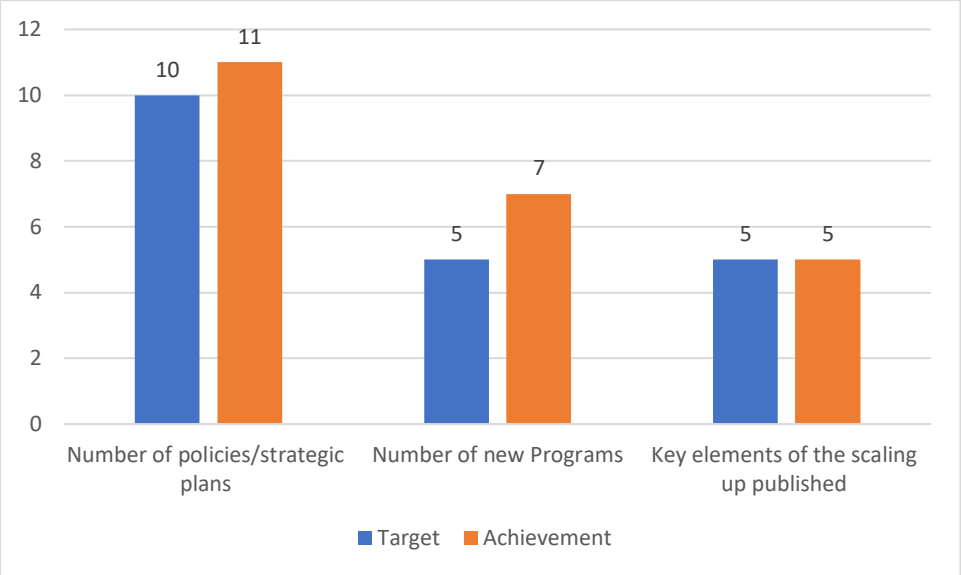


Figure 2: Overall achievement levels for the objective on strengthening the enabling environment.

IR 1.1: Policies, strategies, and plans developed/formulated and implemented that prioritize support to biofortification to accelerate the scaling up of biofortified crops within wider agricultural and nutrition/health sectors

Under this IR, BNFB influenced the inclusion of statements on biofortification in 11 key policies or strategies and plans, 3 in Nigeria, 4 in Tanzania, and 4 regional. BNFB also helped influence, explain, and support the implementation of some of the policy statements on biofortification in strategies and as activities with a budget line in implementation plans. In Nigeria the documents were:

- The Nigerian Food and Nutrition Policy (2016–2020)
- The Draft Nigerian Food and Nutrition Strategic Plan of Action
- The Agricultural Sector Food Security and Nutrition Strategy (2016–2025) of FMARD

Some state governments such as those for Oyo, Rivers, and Kano states included biofortification in their strategies.

In Tanzania, the documents were:

- MALF's food security draft strategic plan
- The Tanzania Food and Nutrition Centre's 5-year strategic plan
- The Revised Terms of Reference for the National Food Fortification Alliance (NFFA)
- The National Multi-Sectoral Nutrition Action Plan (NMNAP)

In addition, BNFB helped influence the implementation of ASDP II.

The regional documents were:

- The AfDB Multisectoral Nutrition Action Plan (2017–2021)
- The CORAF Nutrition Strategy for Implementation in Promoting West Africa Trade
- The African Union Business Plan to Guide Implementation of the CAADP–Malabo Declaration (2017–2021)

- The NEPAD nutrition document and the Resolution of the PAP–NEPAD high-level event on nutrition and food systems

Other key policy processes and documents influenced at regional level included the African Union Declaration on Scaling up Biofortification, which is expected to be submitted for endorsement during the organization's summit in June 2019, the 2nd AU Specialized Technical Committee Meeting Agenda and Report of 2017, and the communique appended to the 14th CAADP-Partnership Platform (CAADP-PP) report of 2018.

The role played by BNFB advocates, champions, and partners led to the prioritization of biofortification on the agendas of national and regional organizations and influenced the implementation of statements on biofortification contained in the policy documents influenced. This translated into a high profile for and increased investments in biofortification. Appendix 4 presents details on the policy documents BNFB influenced, the catalytic role it played in their inclusion of biofortification, and their significance.

New programs supporting/utilizing biofortification

The BNFB project influenced the design of at least seven new programs to include biofortification and supported their implementation. At the close of the project at least two of those programs had been initiated in Tanzania, two in Nigeria, and three regionally (Table 2).

Table 2: New programs supporting or utilizing biofortification

Country	Program
Tanzania	• ASDP II. Statements and targets by stakeholders from different line ministries, private sector, and civil society organizations on the implementation of biofortification. • The school-feeding programs being implemented by the five pilot districts of Arumeru, Moshi, Hai, Mbulu, and Monduli. This initiative started with high-iron beans and has plans to expand to PVA maize and OFSP. It has the support of district councils, farmers, education institutions, marketers, processors, and consumer groups.
Nigeria	• Home Grown School-feeding Program being implemented by Cross River and Abia states. This program includes OFSP in the menus. In 2015 Osun State included OFSP in the school menu and BNFB advocated for the inclusion of the nutritious food basket. About 26 of Nigeria's 36 states have signed on to the program. Others are expected, too, and also to include yellow cassava and PVA maize. • Geriatrics Department at the University College Hospital in Ibadan. OFSP was included in the patients' menu.
Regional level	• NEPAD's Flagship Program for Nutrition and Food Security. Biofortification was embraced in this program, which is currently under review, to include a stronger food systems approach and to align with SDGs, ICN2, Agenda 2063, Malabo and Decade considerations and the Resolution of the PAP–NEPAD high- level event on nutrition and food systems. • The Technology for African Agricultural Transformation (TAAT) program. This program, which includes OFSP and high-iron beans, is being implemented by CIAT and CIP, together with national partners. • The African Union's Department of Rural Economy and Agriculture's Sub-Programme area 3.4.

IR 1.2: Capacity for advocates and champions built for continued advocacy for biofortification

To support the implementation of the country and regional advocacy strategies, BNFB identified and developed the capacity of **101 advocates and champions,** 42 from Tanzania, 32 from Nigeria, and 27 from regional bodies, through six capacity development retreats carried out over the project period (see Appendices 5–7).

At regional level, FARA and CIP organized two retreats, one on 30–31 May 2017 in Kampala and the other on 24 April 2018 in Libreville, which included youth representatives. The second retreat was aligned with sub-theme 1: Strengthening the implementation capacity though improved effectiveness and efficiency of the country systems of the 14th CAADP-PP meeting. This workshop strengthened the capacity of regional advocates, champions, youth, and women to advocate for investment increase for biofortified programs and influenced the inclusion of biofortification in the 14th CAADP-PP meeting report. The side event provided a platform for discussion on mechanisms for engaging women and youth, including in biofortified crop value chains and in investment opportunities, and on incentives that will attract, empower, and retain them in nutrition-sensitive agribusiness.

Using champions and advocates for biofortification

The BNFB advocacy model of developing and using advocates and champions for biofortification at national and regional levels helped influence the entrenchment and mainstreaming of biofortification into development programs and projects within their spheres of influence.

The approach was very successful in engaging policymakers in a coordinated and sustainable manner through the national multisectoral advocacy platforms. The advocates and champions have spearheaded biofortification from their spheres of operation and the outcome is evidenced by results on the number of advocacy policy documents with statements on biofortification and the resources raised from government, private, civil society organizations, and development partners in Nigeria and Tanzania.

Two retreats were held in Tanzania, one on 6–8 July 2017 in Arusha and the other on 12–13 February 2018 in Mwanza, organized by Partnership for Nutrition in Tanzania (PANITA). Two retreats were also held in Nigeria, one on 17–18 July 2017 in Lagos and the other on 4–6 April 2018 in Abuja. Some of the advocates trained had served as biofortification advocates in RAC, and the new training allowed them to focus on the nutritious food basket. The individuals selected were influential and respected personalities, in strategic positions and from diverse backgrounds, agencies, and institutions, and included men, women, and youth. The learning retreats strengthened their capacity to carry out effective advocacy.

The advocates and champions implemented their work plans based on the advocacy strategies developed by BNFB and the terms of reference they developed and agreed on. The technical and advocacy skills acquired by the advocates and the strategies and tools provided by BNFB enabled them to engage policymakers in order to sensitize them about the magnitude of vitamin A and iron deficiencies and the role of biofortification. This was an effective and sustainable food-based approach that mitigates micronutrient deficiencies among vulnerable groups, promotes biofortified crops, mainstreams biofortification in ongoing initiatives, and raises investment. This critical team worked closely with the BNFB team to realize the results highlighted in this report on policies and new investments. Some of the advocates led initiatives on sensitization and advocacy at state, federal, or district level, as well as nutrition education programs, media awareness campaigns, and training on the production and utilization of biofortified crops. For example, one of the advocates, the state nutrition officer for the Federal Capital Territory, Abuja, advocated for support for biofortification at the Community Management for Acute Malnutrition event in the Kwali area council. That event attracted more than 100 participants from public and private sectors, some of whom were dignitaries.

Some of the advocates and champions stepped down the training on advocacy and biofortification to members of their organizations such as PANITA, which is a national forum with over 300 members belonging to civil society organizations. PANITA also operates under the framework of the Scaling up Nutrition (SUN) Global Movement. Participants were selected based on geographical representation and the nature of the civil society organizations' nutrition intervention and experience with

biofortification crops. In Nigeria one of the advocates trained by BNFB helped train and sensitize members of the Redeemed Christian Church of God (RCCG), as well as more than 200 leaders from different professions, through a 2-day event.

The regional, Nigerian, and Tanzanian advocates and champions set up dynamic WhatsApp groups that provided a forum for sharing information and exchanging ideas. The advocates have continued to engage with each other and advocate for biofortification. A key challenge experienced by advocates and champions was debunking myths with facts on biofortification, which most people considered synonymous to genetically modified organisms. The BNFB team learned that they needed to explain that the four crops being promoted were bred through natural selective breeding; they thus developed a fact sheet on biofortification and other advocacy materials to support the work of champions and advocates. Another challenge was explaining what to invest in and how much to invest. The project used the RAC investment guide toolkit to guide investors and implementers.

BNFB engaged a consultant to support the regional team in training 24 experts from Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mozambique, Nigeria, Rwanda, Senegal, Tanzania, Uganda, and Zimbabwe on 25 September 2018. The training, which was on becoming an effective biofortification advocate, took place at a detailed learning event during the 9th Annual Sweetpotato for Profit and Health Initiative Technical Meeting held in Nairobi. This group continues to advocate for biofortification in their respective countries.

The critical team of national and regional champions has helped to accelerate the scaling-up of biofortified crops in rural and urban areas in the two countries. Biofortification has also been embraced by the agricultural, nutrition, health, and education sectors, among others.

IR 1.3: Increased investments by the public, private, and NGO sectors in support of biofortification

BNFB and its partners mobilized **$6,543,230**, representing **65.4%** of the targeted $10m. The funds supported various biofortification initiatives in Nigeria and Tanzania (Table 3). Most of the funds mobilized were from external development agencies, followed by the private sector, NGOs and foundations, and national and local governments. HarvestPlus, which worked closely with federal and state governments of Nigeria and with international development partners (using their own resources), raised $2m both directly and indirectly for biofortification. Appendix 8 presents details on the investments. A further $12,895,000 is in the pipeline in the form of submitted proposals at various stages of processing, where the funds have been committed but not yet disbursed (see Appendix 9).

Table 3: Investments raised for biofortification in Nigeria and Tanzania, 2015–2018

Type of Investor	Nigeria	Tanzania	Total ($)	Total (%)
National governments	214,180	90,000	304,180	5
Local governments	-	31,695	31,695	0.48
External governments/international development agencies	955,000	808,516	1,763,516	27
NGO/foundations	882,685	80,309	962,994	15
Private sector	1,016,465	464,380	1,480,846	23
Investment by HarvestPlus	2,000,000		2,000,000	31
Grand total	**5,068,330**	**1,474,900.6**	**6,543,230.70**	

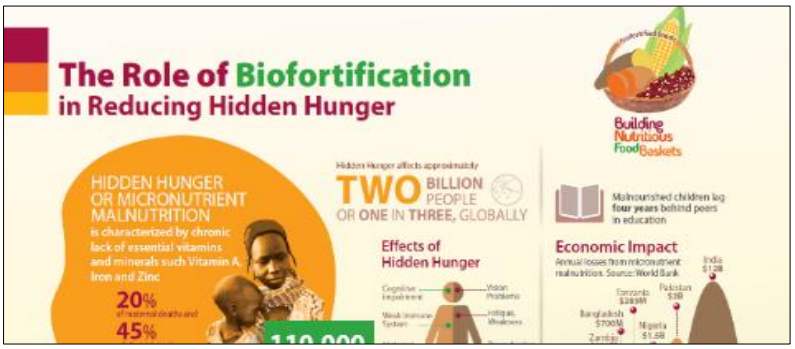
Several seed companies and agroprocessors have invested in biofortification but were reluctant to disclose their level of investment, which they considered confidential information.

The governments of Nigeria and Tanzania, through their key institutions such as Nigeria's FMARD and MoBNP and Tanzania's ministries of agriculture and health and the prime minister's office, and national research institutions have invested significant sums in biofortification to cater for staff salaries, research activities, land, and fixed costs for staff implementing initiatives on addressing hidden hunger. The investment from national and local governments may appear low in our accounting; however, it has been challenging to isolate the allocations for biofortification from the larger national figures. For example, in Tanzania ASDP II committed $96m for a 5-year period within its subcomponents 2.3 and 2.5, which include biofortification. Subcomponents 2.3 on agricultural research for development and 2.5 on food and nutrition security were allocated $67m and $29m, respectively. Nigeria raised $5,068,330 (78.1% of the total investments raised), and Tanzania raised $1,423,721 (21.9%) (see Table 3).

Promotion and advocacy

BNFB engaged in diverse promotion and advocacy activities, generating important results including the following:

- The champions and advocates continued using the OFSP investment guide toolkit developed by RAC in their advocacy efforts.
- Social and behavior change communication materials in English and Swahili and nutrition education materials were developed and disseminated in print and electronic format to a wide range of stakeholders. The materials include:



Infographic on the role of biofortification in reducing hidden hunger.

  - A communication plan, which served as the road map on how the project communicated, branded, disseminated, and monitored social behavior change communication and promotion, awareness creation, and advocacy for biofortified crops.
  - A folder and advocacy, social and behavior change communication materials to support biofortification advocacy, promotion, and awareness creation. The materials include nine flyers, brochures, and factsheets in English and Swahili on diverse topics; one infographic on biofortification; 11 pull-up banners (3 of which were translated into Swahili); 13 success stories (1 of which was translated into Swahili); 10 online blog stories; three videos; and one newsletter article. The infographic and the facts on biofortification factsheet have been used widely for advocacy in Africa. The latter has been translated into Swahili and Amharic.
- BNFB participated in more than **20 key exhibitions** at regional and country levels. These included national agricultural shows and events, farmer field days, and visits to demo plots showcasing the nutritious food basket crops. The national advocates and champions and other stakeholders also attended several shows, fairs, and exhibitions.

BNFB team advocating to the former first lady of Tanzania.

- BNFB disseminated more than **15,000** flyers, brochures, and other materials to various partners and stakeholders. These materials were uploaded to the Sweetpotato Knowledge Portal and the BNFB webpage, as well as websites of partner organizations for wide access. Some materials have been cross-posted and cross-linked to partner websites for wide reach and are also available online on MELSpace, the CGIAR Monitoring Evaluation and Learning platform, and the CGSpace repository. Consequently, biofortification has received tremendous attention from policymakers and communities in Nigeria and Tanzania and beyond. This increased awareness translated into a rise in demand for biofortified crops and foods and their increased production and consumption. The heightened awareness was also an important element and key driver in advocacy for policy change and in raising of new investments.

Media engagement

- BNFB used media engagement, including social media, as a vehicle to (1) create awareness and educate the public and other stakeholders on the benefits of biofortified crops and foods, (2) promote and advocate for policy change, and (3) for social and behavior change communication. BNFB and the biofortification agenda were featured in various TV news, newspaper features, articles, documentaries, and blogs in Nigeria and Tanzania.


Guardian

FEATURE

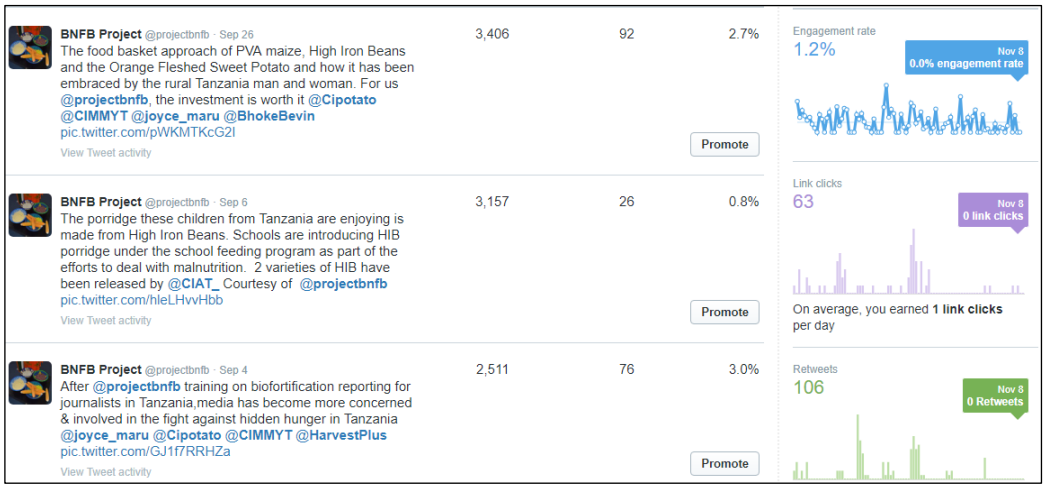
Govt challenged to boost budget for combating malnutrition

Feature article on key message to parliamentarians in Tanzania.

- The training of **11** journalists in Nigeria and **30** in Tanzania helped debunk the myths around biofortification and ensured accurate reporting. The journalists became agents of change and played a key role in highlighting the problem of hidden hunger and its economic impact and in sensitizing and advocating to relevant authorities and policymakers to prioritize biofortification. Most of these journalists published articles or aired radio or television messages on biofortification. The results of this capacity-building initiative were a number of high-quality print and online articles, features, documentaries, and radio and television programs in English and Swahili, all of which contributed to BNFB advocacy efforts and the scaling-up of biofortified crops.
- About **45 journalists** participated in the "Biofortification excellence in journalism media contest" in Tanzania and prepared and published 50 media products: 25 in print, 20 on radio, and 5 on television. The winners were celebrated at a colorful ceremony on 20 July 2018 in Arusha, Tanzania. The former Minister of Agriculture, Dr. Charles Tizeba, was the guest of honor. These journalists have continued creating awareness on biofortification, educating the public and other stakeholders on the benefits of biofortified crops and foods, and promoting and advocating for policy change. The media campaigns have played a key role in highlighting the problem of hidden hunger and its economic impact. They have also helped to sensitize relevant authorities and policymakers to prioritize biofortification and take appropriate action, including creating an enabling environment and mobilizing resources for biofortification. The videos, radio programs, features, stories, and articles published by journalists in Tanzania are available on the websites of the various media houses for wide reach. The journalists have continued to publish different materials targeting diverse audiences.
- BNFB embraced and used **social media** for raising awareness on biofortification. Various stakeholder WhatsApp groups were created, which became popular and provided timely and practical information. Other social media tools that were well utilized included Twitter,

Facebook, Instagram, and Flicker. Examples of the analytics from Twitter and Facebook are presented below.

Twitter



Facebook

Analytics from Twitter and Facebook.

IR 1.4: Policy/technical crop specific platforms promoting evidence-based support for biofortification

BNFB strengthened the capacity of two national multisectoral policy platforms on biofortified crops. In Nigeria it partnered with MoBNP, in collaboration with key line ministries, development partners, civil society organizations (especially FMARD), and the Ministry of Health, along with Civil Society Scaling-Up Nutrition in Nigeria (CS-SUNN), and UNICEF to fight malnutrition and to influence implementation of policy documents such as the Food and Nutrition Policy and National Nutrition Strategy/Plan. In Tanzania BNFB partnered with the prime minister's office and worked closely with the Ministry of Agriculture, Ministry of Health, PANITA, TFNC, and development partners to influence policy and implementation of policy documents with statements on biofortification such as

NMNAP and ASDP II. The prime minister's office and the Ministry for Budget and Planning worked closely and holistically with other public sector actors, development partners, civil society organizations, and private sector actors (including the SUN Movement) to coordinate nutrition activities in their countries and to track nutrition targets, including for biofortification.

Under the umbrella of the policy platforms, the High-Level Steering Committee on Nutrition in Tanzania and the National Committee on Food and Nutrition in Nigeria promoted and advocated for biofortification. BNFB supported the two multisectoral platforms to hold **eight meetings** in Tanzania and **three meetings** in Nigeria that contributed to the prioritization of biofortification in policy documents and helped raise new investment in support of biofortification. In Tanzania the meetings were:

- The ad hoc meeting with officials of the prime minister's office, TFNC, and the NFFA on 29 June 2017. This meeting resulted in the revision of NFFA's terms of reference to include biofortification and the formation of a task force on biofortification.
- The National Summit on Food Fortification, 23–25 August 2017, where biofortification was captured in the opening remarks of the vice president of Tanzania, Her Excellency Samia Suluhu Hassani. She urged leaders to ensure that resources allocated to curb malnutrition and for fortification, whether industrial or through biofortification, were disbursed on time. She appealed to implementing partners to ensure that farmers had access to certified seed of the biofortified crops.
- A workshop to inform senior policymakers in the prime minister's office about biofortification and its contribution in addressing micronutrient malnutrition in the country was held on 11–12 April 2018. The knowledge acquired empowered members of the Department of Coordination of Government Business and will support their work in reviewing and contributing to policy documents. During this workshop, the policymakers drafted a policy brief on biofortification.
- On 14–15 July 2018, a meeting was held in Morogoro with senior government officials from the prime minister's office; Ministry of Agriculture; Ministry of Health, Community Development, Gender, Elderly and Children; Office of the President; and Ministry of Education, Science and Technology, all of which play a role in the implementation of NMNAP. The meeting helped to improve awareness and understanding on biofortification and guide decisions on and factoring in biofortification during coordination of policy reviews, resource mobilization for investment, and implementation of NMNAP and other policy documents. The meeting shared progress and refined plans for implementation of NMNAP. Attendees pledged to explore opportunities for allocating resources to biofortification and to include it in project proposals.
- Engaging the Parliamentary Group on Nutrition (17–18 May 2018), Food Security and Children's Rights, which sensitized members of parliament on the economic impact of micronutrient malnutrition and the role of biofortification as a practical, cost-effective, and sustainable solution. The BNFB team held a very successful advocacy session with about 58 parliamentarians in Dodoma. The executive director of PANITA, the acting executive director of TFNC, and the BNFB senior country coordinator made presentations that highlighted the hidden hunger status in Tanzania and its economic impact. They corrected misconceptions about biofortification and its potential in complementing other approaches to end micronutrient malnutrition. The parliamentarians heeded the call to action and requested a longer seminar on biofortification, nutrition, and the strategies that Tanzania could adopt to ensure seeds of biofortified crops were accessible to farmers in all parts of the country. They suggested that the audience include the budget, agriculture, livestock and water, and social development and services parliamentary

committees. They committed to support the efforts to scale up biofortification and called for more resources from national and local levels of government to support programs on biofortification.

- Workshop to support policymakers from the prime minister's office was held in August 2018, which yielded a policy brief on NMNAP with a focus on biofortification.
- At a meeting with parliamentarians in September 2018, four parliamentary committees committed to strengthen the efforts of the parliamentary nutrition committee through increasing awareness on the role of biofortification as a complementary, cost-effective, and sustainable intervention for combating hidden hunger. They pledged to work with the necessary organs of government, private sector, and development partners to raise new investment for biofortification.
- At the High-Level Steering Committee meeting in July 2018 led to an explication and implementation of NMNAP. The advocacy efforts of the national multisectoral advocacy platform in Tanzania also led to the acquisition of an atomic absorption spectrophotometer worth $90,000 for TFNC through support from the International Atomic Energy Agency.

In Nigeria, BNFB supported three quarterly multisectoral platform meetings on food and nutrition held in Gombe State in the northeast, Kano State in northwest, and Nasarawa State in north central, as well as engaging with traditional and religious leaders:

- The meeting in Gombe, on 31 October 2017, was part of the multisectoral response to the state of emergency declared on malnutrition. The outcome of this event and subsequent advocacy engagements led to the commissioners of agriculture, budget, and national planning committing to mainstream biofortification in their nutrition-sensitive intervention in Gombe.
- The multisectoral meeting in Kano was held on 10 July 2018 led to subsequent engagements with policymakers; the Kano Emirate Committee on Health; the Academia and Nutrition Society of Nigeria; and the king of Kano, who is a strategic gatekeeper, nutritionist, and chair of the board of the Nutrition Society of Nigeria. The king of Kano assured members of the platform that the state would include biofortification in its programs and activities. The state government also allocated a demo farm and pledged support for planting materials and training of farmers. In addition, the king of Kano was recognized as a champion of biofortification and a voice for nutrition in the state.
- The multisectoral platform meeting, held in Nasarawa on 29 October 2018 and co-supported with CS-SUNN, helped strengthen partnerships with key actors in biofortification in Nigeria. The national multisectoral policy platform, in collaboration with UNICEF and other development partners, organized a meeting for 150 religious and traditional leaders who act as gatekeepers for food and nutrition interventions in 19 states in northern Nigeria. BNFB provided technical input. The meeting educated the participants on the status of malnutrition in the country and the role they could play in reducing it by supporting complementary interventions, including biofortification, through the messages in their sermons and programs for behavior change and health improvement.

Through engagement with the national multisectoral policy platform, BNFB helped enhance knowledge on biofortification and mainstreaming of biofortification in the nutrition programs and projects in the three states. In addition, the ministries of agriculture, health, education, and women affairs, the Primary Health Care board, and the University of Ibadan reported including biofortification in their programs and highlighted some of the activities they had carried out.

The national multisectoral policy platforms in Nigeria and Tanzania continue to bring together key public, private, civil society, and development actors to mainstream biofortification in national and local programs and interventions and to advocate for increased investment in it.

Crop-specific technical platforms established

In 2017 BNFB established **five technical crop-specific platforms** on OFSP, PVA maize, and high-iron and -zinc beans; two platforms were in Nigeria and three in Tanzania. The project supported **11 meetings** of these platforms (Table 4).

Table 4: Number of crop specific platform meetings

Platform Meeting	OFSP	PVA Maize	High-Iron and -Zinc Beans
Nigeria	20 July 2017 6 July 2018	18 December 2017 5 July 2018	
Tanzania	28 September 2017 17 July 2018	28 September 2017 20 February 2018 19 July 2018	7–8 July 2017 19–20 July 2018

Through these crop-specific platform meetings and subsequent joint planning activities, linkages among the key actors—specifically producers, seed producers, and disseminators, researchers, processors, educators, and marketers—were strengthened. The meetings provided for joint planning on seed road maps and discussion of issues pertaining to the value chains of the three crops and fostered collaboration and learning efforts. This has enhanced joint problem-solving and priority-setting. The platforms have also helped (1) identify and exploit opportunities for the growth of the industry and (2) promote biofortified crops. Key outcomes from the crop-specific platforms include advocacy for biofortified crops, which has led to increased investment in them from the private and public sectors; the rise in the number of their producers and agroprocessors; and the growth in their demand in rural and urban areas. Agroprocessors such as AFCO Investment Company Ltd, Mama Organic, Sokoine University Graduate Entrepreneurs Cooperative (SUGECO), Perfect Foods, JAGEF Group, Wakulima Agri-Food Company Ltd in Tanzania and Mahauty Health Solutions Company in Nigeria, most of which started during the implementation of BNFB, reported increased demand for and acceptability of OFSP, PVA maize, and high-iron and -zinc beans. Each platform created a WhatsApp group to facilitate the sharing and exchange of information and knowledge.

Each platform considered some potential sustainability strategies for its life after the BNFB timeframe. Some of these were the introduction of membership fees, self-sponsorship, integration into new initiatives, fund raising, cost sharing, and registration as a legal body such as an association. The platform members acknowledged that the platforms had strengthened the linkages between value chain actors that translated into new investments for seed production and dissemination, and increases in the numbers of agroprocessors and agripreneurs in OFSP, PVA maize, high-iron and -zinc beans, and yellow cassava. The platforms served as avenues for ensuring a continuous supply of seed and linking of producers to processors and consumers.

BNFB supported two meetings of seed systems' platforms, one in each country. The meetings helped the crop thematic leaders and the core project team to jointly plan for seed and address issues in a holistic approach covering all the biofortified crops.

IR 1.5: Improved global understanding of scaling up approaches

BNFB documented its implementation process, successes, and lessons; it contributed to the global knowledge on scaling-up of technologies. BNFB demonstrated the application of an effective scaling-up model that simultaneously links policy engagement, national and community capacities, and

proven technologies of different institutions to scale up multiple biofortified crops. BNFB tested the hypothesis that "scaling up is dependent on supportive policy environment, strong institutional capacities and proven technologies." There were synergistic benefits from combining experiences and expertise of multiple partners working on different biofortified crops to use a nutritious food basket to address hidden hunger. The results from the studies conducted, the learning from the action research, and the lessons learned were documented. BNFB literature outputs include four journal articles at various stages of completion and three draft policy briefs, therefor surpassing the required target of **five** research reports, lessons learned, and a success stories booklet. (Appendix 10 shows the publications and their purpose and value.)

The documents published, printed, and disseminated were uploaded on the BNFB web page and on other sites for wide reach. They include:

- The consumer acceptance and willingness to pay report
- The maize seed demand and PVA maize value chain study report
- The RAC ex-post evaluation study report
- BNFB insights from the field booklet
- An article entitled Advocacy for Scaling up Biofortified Crops for Improved Micronutrient Status in Africa: Approaches, Achievements, Challenges and Lessons was submitted to and accepted by the *Proceedings of the Nutrition Society* (Cambridge University Press).
- Work on the BNFB lessons learned booklet continues.

In addition to the reports and booklets, BNFB prepared manuscripts for four journal articles that are now in various stages of completion. Some of these have been submitted to open-access, peer-reviewed journals for consideration. The publications have contributed to the body of knowledge on biofortification and scaling-up of biofortified crops through a food basket approach. In addition, the project developed four draft policy briefs, two of which were for regional level, one was for Nigeria, and one was for Tanzania. BNFB also conducted studies including a nutritional analysis of high-iron and -zinc bean products, OFSP, and PVA maize food products in Tanzania (see IR 2.1).

OBJECTIVE 2: STRENGTHEN INSTITUTIONAL AND COMMUNITY CAPABILITIES TO PRODUCE AND CONSUME BIOFORTIFIED CROPS

Objective 2 aimed to build institutional and community capacities to produce and consume multiple biofortified crops. It also sought to design and implement technically strong and cost-effective interventions that drive the uptake of biofortified crops. Very good results were achieved under this objective for each of its five key indicators (see Fig. 2). BNFB surpassed its targets in three of the indicators and achieved 58% on the indicator on the number of biofortified crop varieties released and 97% on the indicator on the number of HH reached with biofortified seed.

- The capacity of **40** national and community agencies and institutions was strengthened to enable them to organize and implement gender-sensitive programs and projects on biofortification. This represented **a 200% achievement** of the target.
- A total of **11,433** change agents—2,633 in Nigeria, 8,747 in Tanzania, and 53 regionally—were trained in the critical areas of the value chains of the four biofortified crops and on biofortification. This was **a 114% achievement** of the target.
- **Seven** varieties of three biofortified crops that were in the pipeline were fast-tracked and officially released in Nigeria and Tanzania, achieving 58% of this target. Several other varieties

were at the advanced stages of release and are likely to be released in 2019.

- The project reached at least **94,037 HH** with seed of OFSP, PVA maize, and high-iron and -zinc beans. HarvestPlus reported reaching 905,907 HH in Nigeria with yellow cassava, bringing the total number reached in the two countries to **999,944 HH.** This represents 97% of the target.
- **Nine** small-scale commercial processors—eight in Tanzania and 1 in Nigeria—were processing biofortified food products by the end of the project. This represented **a 225% achievement** of the target (four processors). In addition, several startup companies got into the market.

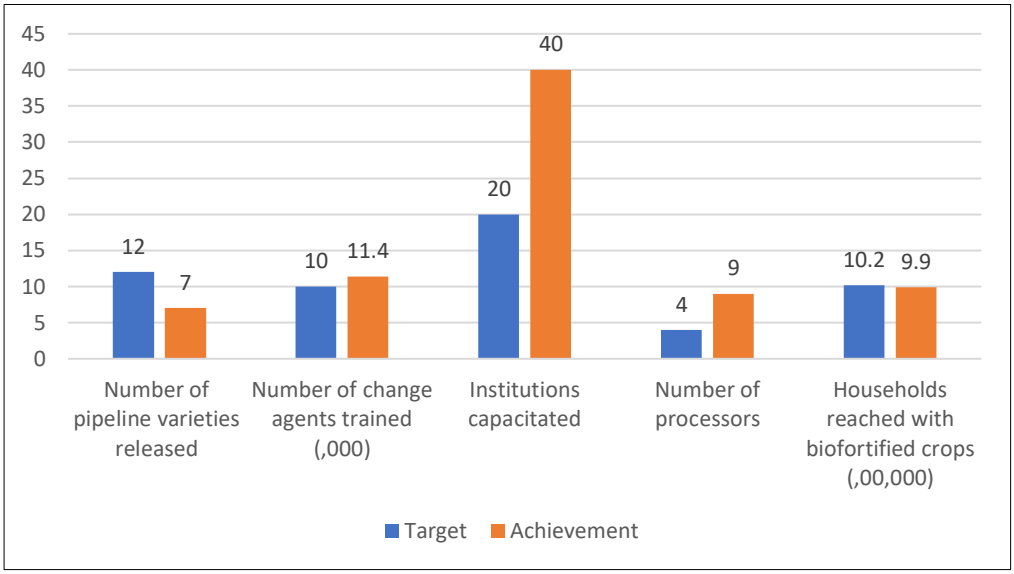


Figure 2: Achievement of indicators aligned to strengthening institutional and community capabilities.

IR 2.1: Strengthened capacities and competencies of investors and executing institutions to design and implement technically strong, cost-effective, and gender-sensitive investments that drive uptake of biofortified crops

BNFB strengthened the capacity of institutions and individuals to design and implement programs in support of biofortification. The institutions included national- and community-level agencies from government and private and civil society sectors in agriculture, health, education, and nutrition. The skills and knowledge with which the individuals were equipped were based on the critical capacity gaps identified by the situation analysis and the needs assessments. The training areas included nutrition education; advocacy for policy change and raising of investments; seed production, agronomy, agribusiness, processing, value addition, and utilization; and project planning, implementation, and M&E. The key achievements are discussed in the following paragraphs.

Institutional capacity strengthening

The capacity of **40** national and community agencies and institutions, 13 in Nigeria and 27 in Tanzania, was strengthened to organize, implement, and support programs and projects on biofortification in various subjects. The target was 20 agencies, so this was a **200%** achievement. The institutions included government ministries, national research institutions, local district councils, academic institutions, schools, seed companies, private agroprocessing companies, civil society organizations, community-based organizations, religious groups, and youth and women groups (see Appendix 2).

Individual capacity strengthening

Male and female participants of a ToT course learn to establish an OFSP nursery.

Through the development of primary, secondary, and tertiary trainers and the step-down training approach, BNFB enhanced the capacity of more than **11,433** change agents in the critical areas of the value chains of the four biofortified crops. The target was 10,0000, so BNFB had a **114%** level of achievement (see Appendix 2). This is a critical mass of change agents with the capacity to continue stepping down the training to reach end-users. The areas of focus for the training were similar to those for the institutions. Attention was paid to the utilization of biofortified crops, and the training included preparation of nutritious meals using different recipes. BNFB strengthened the capacity of youth advocates and agripreneurs and equipped them with knowledge and advocacy skills for engaging policymakers, raising investment, and agroprocessing. Since the training courses on project planning, implementation, and M&E were held, five change agents have prepared proposals on biofortification. Some of these have successfully generated new investment, whereas others are at different stages of processing.

The change agents trained included individuals in public and private sector institutions and civil society organizations, including women and youth. (The figure for the change agents is compiled from training events conducted directly by BNFB and partners and from the findings of a survey conducted in 2018.) BNFB directly supported 19 ToT courses with seed money from the project. An additional 118 step-down courses were held, 39 of which were supported by BNFB, 64 by partners, and 15 were end-user courses (Fig. 1) to fill the gaps identified by partners. In sum, **137 training events** were held, 46 in Nigeria, 88 in Tanzania, and 3 regionally. An online survey of trainers trained by BNFB showed that more than 4,717 individuals (2,643 female) were trained through **64 step-down courses**—23 in Nigeria and 41 in Tanzania. The survey, which was conducted between August and November 2018, evaluated the effectiveness of the ToT courses. The responses analyzed were from 38 individuals out of the 46 invited to participate, for an 82% response rate.

Table 5 shows the breakdown in the composition of the change agents trained. BNFB strengthened linkages and the development of partnerships that promoted stronger vertical and horizontal linkages with in-country capacity development initiatives, empowered agencies working with vulnerable groups to supply and demand biofortified crops, and fostered ownership and institutionalization of the courses.

Table 5: Change agents trained

Country/Region	Number of Courses	Change Agents Trained		
		Male	Female	Total
Nigeria	46	1,374	1,259	**2,633**
Tanzania	88	4,062	4,685	**8,747**
Regional	3	21	32	**53**
Total	**137**	**5,457**	**5,976**	**11,433**

BNFB targeted critical capacity gaps in the nutritious food basket areas as opposed to focusing on specific gaps along the value chains of the single commodities. However, most of the training courses were on OFSP, followed by the nutritious food basket, PVA maize, and high-iron and -zinc

beans, since seed of the latter two crops was not available until Y3 of the project. Biofortification was covered in all the training courses, helping make the nutritious food basket approach gain ground.

The training courses equipped the supportive actors (i.e., producers, farmer organizations, marketers, processors, youth, and religious organization leaders) and individuals with the capacities and competencies to design and implement technically strong, cost-effective, and gender-sensitive programs and projects to drive the uptake of biofortified crops and facilitate self-organization of groups around issues of biofortification. Some of the priority areas the change agents have focused on include production, utilization, and processing of biofortified crops, focusing on different recipes and different ways to prepare biofortified crops; seed systems' quality control and quality assurance; nutrition education; agripreneurship; concept note/proposal writing; advocacy for policy change; raising of investments; and biofortified crop promotion and sensitization. The individuals and national and community institutions whose capacity was strengthened in Nigeria and Tanzania continue to train other change agents from the value chains of OFSP, high-iron and -zinc beans, and PVA maize through step-down training based on the needs identified in the communities, where resources are available. A success story that demonstrates the impact of the ToT and step-down courses is available online.

BNFB supported two learning events on the planning, implementation, and M&E of gender-mainstreamed biofortified crop projects, where 44 participants were trained. In Tanzania BNFB partnered with TFNC to conduct a pretraining event for resource persons on 30 April–1 May 2019. This was followed by a 3-day course on 2–4 May 2018 that trained 16 participants (8 female). In Nigeria BNFB, together with FMARD, organized a pretraining session on 12–13 June 2018. This was followed by a training event on 14–15 June 2018 for 28 participants (18 female). The trainees were equipped with skills in developing concept notes and proposals. Since the training, five proposals on biofortification have been developed. The skills will continue to be immensely valuable for resource mobilization for biofortification.

BNFB strengthened the capacity of youth and women—for example, by including youth in the agribusiness training carried out in Nigeria and Tanzania, and by involving women and youth in the advocacy training carried out in Gabon and Gambia during the CAADP–Partnership Platform meeting in 2018. For PVA maize and high-iron and -zinc beans, most of the institutions whose capacity was strengthened have focused on crop production. This is because, unlike for OFSP, PVA maize and high-iron and -zinc bean seeds are not yet available on the market.

Fellowships

BNFB offered two graduate fellowships in Tanzania in response to the findings of the situation analysis study, which had identified gaps in micronutrient analysis and testing in the country. The MSc fellowship involved CIAT, SARI, and SUA; the student completed course work in 2018. The delay in releasing the high-iron and -zinc beans in Tanzania affected the start date for this study. The study is still going on, and the fellow will embark on the nutritional analysis of the beans and their products as part of the research thesis in 2019, under the direction of CIAT. The objectives of the study were to determine the nutritive value of high-iron and -zinc beans and their consumable products and to recommend daily serving quantities for school children aged 6–15 years. Besides serving as a guide for nutritionists, the findings and recommendations of this study will be useful in product formulation, guiding feeding patterns for improved nutrition, and providing crucial information on micronutrient content and nutritional composition of high-iron and -zinc bean products.

BNFB collaborated with TFNC to jointly support one of its staff, Mr. Tedson Lukindo, for a research fellowship in July–September 2018 at the Biosciences eastern and central Africa–International Livestock Research Institute hub in Nairobi. The fellow, who was supervised by CIP's regional food nutritionist, focused on nutritional and food composition analysis for OFSP, PVA maize, and high-iron and -zinc beans and food products from Tanzania. He generated valuable data that will inform various stakeholders involved in agroprocessing and value addition for biofortified foods. He will train other researchers and technicians at TFNC and other institutions in Tanzania.

Learning materials

BNFB developed three ToT modules and revised the ToT manual developed by the RAC project:

- *Biofortification: a sustainable solution to hidden hunger.* This module is useful in defining the context of biofortification or as an introduction to biofortification during training.
- *High-iron beans: a biofortified solution for iron deficiency.*
- *Pro-vitamin A maize: a biofortified solution for vitamin A deficiency*. The project has continued to use and test these learning resources with partners and end-users.
- *Everything You Ever Wanted to Know about Sweetpotato.* BNFB completed a revision of this ToT manual developed by the RAC project, making major changes to four topics

The project collaborated with TARI–Kibaha to develop two simplified training manuals in Swahili for use in Tanzania on OFSP production, agronomy, value addition, and utilization. The manuals were based on the content of the RAC ToT manual for sweetpotato. BNFB also created an OFSP farmer-to-farmer training video in Kiswahili, with subtitles in English, for Tanzania. In Nigeria BNFB helped Catholic Relief Services (CRS) develop an OFSP recipe booklet. These materials are available as public goods and learning resources for partners and others to adapt and use. The instructional materials have been disseminated widely in print and soft copy and have been used at various learning events. The learning modules have ensured consistency in the delivery of courses and harmonization of technical terms in biofortification. The manuals have also helped simplify the biofortification technical language.

Other value-adding and nonconventional capacity development initiatives

BNFB strengthened the capacity of nonconventional capacity development initiatives such as crop-specific and advocacy platforms and WhatsApp discussion groups in Nigeria and Tanzania through mentorship and coaching. The impact has been tremendous, and members of the platforms have continued running the affairs of the advocacy and crop-specific platforms beyond the project period. The WhatsApp groups have been dynamic and effective in solving problems, creating demand for biofortified crops and products, finding markets for biofortified produce, sharing critical information and knowledge, announcing important events, and facilitating learning among members. The youth WhatsApp group has been particularly active and has helped motivate its members in investing in biofortified crops, some of whom have diversified their range of processed products or improved on branding. The platforms and WhatsApp groups have provided a learning platform for change agents to share critical information and knowledge and to exploit opportunities for business or new investment.

Members of the OFSP platform discussing processing opportunities.

BNFB supported selected DVMs in Nigeria to acquire irrigation equipment to ensure availability of vines at the onset of the rains. It also strengthened the capacity of private and public sectors to release biofortified crop varieties, multiply and disseminate seed, and process biofortified foods. In Tanzania BNFB supported AFCO Investment Company Ltd to import 1 t of PVA maize grain from Zimbabwe in 2017 for piloting of product-processing in three regions of Dar es Salaam. More than 700kg of processed products from the PVA maize were sold in 2017. In 2018 new outlets were opened for selling PVA maize products in Dar es Salaam, Mwanza, and Morogoro.

PVA maize grain for processing.

BNFB helped support the establishment of demo plots in Nigeria and Tanzania.

Mainstreaming gender and diversity in capacity development interventions

BNFB deliberately mainstreamed gender in its activities, recognizing the role of men, women, and youth in the value chains of biofortified crops. During the 2017 annual review and planning meeting, the project trained the implementing team on how to mainstream gender in project activities, which allowed the team to do that in the activities under the two project objectives.

The project produced and utilized various ToT learning modules and resources that mainstreamed gender in all stages of the value chains of the biofortified crops and included specific gender topics. An example is the ToT manual on *Everything You Ever Wanted to Know about Sweetpotato*.

> So far we can say that after BNFB's financial support and providing us with right skills and planting materials, we are on the right track in the implementation of interventions that have seen our communities adopt, produce and consume OFSP.
>
> (Mrs. Margaret Ringo, WWW TAG secretary)

The ToT and step-down courses targeted individuals and different groups, specifically youth, women, men, religious groups, and small-scale enterprises. Out of 11,433 agents of change trained, 52% were women. Specific interventions targeting youth in agribusiness were conducted in Nigeria and Tanzania, such as the advocacy skills training for women and youth in Gabon during the CAADP–Partnership Platform meeting. This effort equipped them with knowledge and skills for engaging policymakers, raising investment, and agroprocessing. Youth appreciated farming as "cool" and as a business; they felt empowered to become advocates of biofortification and to use social media tools.

BNFB partnered with religious organizations such RCCG in Nigeria and WWK under the leadership of Tanzania Assemblies of God to mainstream biofortification in their programs. Following that, RCCG and WWK entrenched biofortified crops in their ongoing programs, and they continue to conduct step-down training.

Gender and diversity mainstreaming has translated into increased production and stimulated the demand and consumption of biofortified foods among vulnerable populations such as women of reproductive age and children under 5 years of age. Processors, including the youth, are able to access markets for their produce, creating demand and ensuring availability of raw materials for processing. Gender and diversity inclusion in BNFB has improved the livelihoods of the project's target groups and their nutritional status.

Box 3: Capacity development for impact

- The training courses equipped supportive agencies (producers, farmer organizations, marketers, processors, youth, and religious organization leaders) and individuals with capacities and competencies to design and implement technically strong, cost-effective, and gender-sensitive programs and projects that drive the uptake of biofortified crops and facilitate self-organization of groups around issues of biofortification.
- BNFB strengthened linkages and development of partnerships that promoted stronger vertical and horizontal linkages with in-country capacity development initiatives, empowered agencies working with vulnerable groups to supply and demand for biofortified crops and cultivated ownership and institutionalization of ToT courses.
- The individuals and national and community institutions whose capacity was strengthened by BNFB continue to train other change agents and institutions through ToT and step-down trainings, thus demonstrating sustainability of capacity development activities beyond the project period. This was evidenced by the findings of the RAC ex-post evaluation study and a quick online survey conducted by BNFB late 2018.
- There was increased private sector involvement in Nigeria and Tanzania through small-scale commercial food processors and seed companies investing in biofortified crops; for example, OFSP puree has become a major ingredient in the baking industry and saves up to 30% on the cost for wheat flour.
- The training courses on project planning, implementation and M&E have translated into concept notes and proposals on initiatives on biofortification, some of which have generated new investment.

IR 2.2: Enhanced awareness of and increased organizational action for biofortification among key stakeholder groups (farmer organizations, religious organizations, marketers, processors, consumer groups)

Creating nutrition awareness in the community

Community mobilization was a key strategy in stimulating action, community education, and awareness creation on the nutrition benefits of biofortified crops. BNFB's awareness creation initiatives were implemented in partnership with a range of actors, including CGIAR centers and programs and community, national, regional, and international stakeholders. The partners held various sensitization- and awareness-creation events such as demos, farmer field days, open days, and workshops for multiple audiences such as policymakers, technical experts, street vendors, and the general public. The BNFB team and partners used different oral, print, radio, television, social media, and social and behavior change communication materials (see IR 1.3 under advocacy, for tools and media used). These events helped to create awareness and sensitize communities on the benefits of biofortified crops and their role in ensuring the health and productivity of a nation. The awareness creation and learning that took place translated into increased demand for biofortified crops and foods, strengthened the capacity of value chain actors, informed decision-making by policymakers at all levels, and increased allocation of resources in support of biofortification.

Community mobilization event in Morogoro, Tanzania.

Some BNFB partners have played a key role in facilitating this through either food preparation demos or farmer field days. For example, in November 2017 SUGECO, through its Nutrition Awareness and Cash Crops Value Chain project, conducted biofortified food preparation demos in 13 sites along the project area (i.e., in Zombo, Kiegea, Kibedya dispensary, Magubike Health Centre, Kisanga village, Msange Health Centre, Ngiloli village, Ibuti village, Ulaya Health Centre, Mtumbatu

Health Centre, Msolwa, Berega Hospital, and Nyameni village). Some **2,419** community members, **27** village leaders and extension officers, and **321** students learned how to make OFSP porridge, juice, mandazi, chapatti, pastry, and PVA maize porridge. BNFB carried out sensitization activities on OFSP for street vendors in Dodoma and Dar es Salaam, increasing awareness on the benefits of biofortified crops and ultimately raising their consumption levels.

In Nigeria the support to the ministries of agriculture, education and women affairs, the Primary Health Care Board, and the University of Ibadan fostered inclusion of biofortification in their programs and saw them conduct various sensitization and outreach activities in support of biofortification. At a platform BNFB supported in partnership with CS-SUNN, the Nutrition Department of the University of Ibadan reported that it had reached five local government authorities in Oyo State with education, awareness, and sensitization on biofortified crops.

Advocacy to hospitals and clinics to consider inclusion of biofortified foods in patients' menu led the University College Hospital, Ibadan, to start feeding OFSP meals to geriatric patients on a pilot basis with the plan of expanding to other units. Policymakers, development organizations, schools, farmer organizations, and the media played a key role in creating awareness on the complementary role of biofortification in nutrition-sensitive interventions. These events have translated into increased investment in and production and consumption of biofortified crops.

Religious organizations such as RCCG in Nigeria and WWK in Tanzania have mainstreamed biofortification into their development programs. RCCG has entrenched biofortified crops in its programs in schools and clinics. It continues to sensitize members of its congregation on the benefits, production, and processing of biofortified crops through outreach missions. WWK has continued to pass on the training it received to its community, which has led to increased production and consumption of OFSP.

IR 2.3: Biofortification increasingly mainstreamed in national crop programs, and biofortified varieties of staple crops prioritized in development, release, and utilization

Mainstreaming biofortified crops in the school-feeding programs

The BNFB project influenced the inclusion of biofortification in **five** national programs in Nigeria and Tanzania, meeting the set target of five.

BNFB partnered with schools and involved school children as agents of change in catalyzing the production of high-iron and -zinc beans and OFSP in Tanzania. Twenty-six primary schools were identified and supported to establish high-iron and -zinc bean field demos. The demos served as a bridge to the surrounding communities, particularly to the parents, school-based institutions such as school committees, and other community groups that endorsed and supported the approach. Each school received 10kg of seed of 'Jesca' bean variety that was to be planted on a quarter of an acre and was expected to yield at least 100kg of seed. Each school was required to replant 90kg when the bean seed was harvested and then give 10kg to a new school. The 90kg of seed planted in the second season was expected to yield 1,100kg of seed, 100kg of which would be given to 10 other schools as part of the spillover process. It was expected that this approach would allow 286 new schools to be reached by 2020. The supporting school teachers were trained on quality seed production and postharvest management.

In Tanzania 1,200 HH in Iramba district were reached with OFSP vines handed to school children to take to their parents. Vines of 'Kabode' and 'Ejumula' varieties were distributed in five schools on 8–9 March 2018 to 200 children in each of four schools and 400 children in one school. Each child

received 50 cuttings of each variety. The vines were distributed after meetings were held to sensitize parents about OFSP. Parents who did not have children in school received vines from DVMs.

In Nigeria BNFB engaged in advocacy at all levels for inclusion of biofortification in the national home-grown school-feeding program. This saw Abia and Cross River states commence serving pupils OFSP-based food. In Abia OFSP is served weekly in at least 40 schools, which is 5% of the public elementary schools in the state. The state governor instructed that OFSP meals be fanned out to all public schools in the state.

Vine dissemination through school children.

Cross River State started its pilot with 10,000 pupils in April 2018, serving OFSP cookies. One of the BNFB advocates was engaged in training the school-feeding team to make the cookies using an OFSP-wheat flour composite.

Supporting the public, private sectors, and communities for production and processing of biofortified crops and products

BNFB enabled **94,037 HH** to get access to seed of biofortified crops. These comprised 29,764 HH in Tanzania and 41,063 HH in Nigeria that were reached with OFSP; 2,680 HH in Tanzania were reached with PVA maize seed; 3,530 HH in Tanzania were reached with small packets of high-iron and -zinc beans; and 17,000 HH in Nigeria benefited from the certified PVA maize seed produced by seed companies. HarvestPlus reported that 905,907 HH in Nigeria were reached with yellow cassava over 2017 and 2018. This would bring the total number of HH reached with biofortified crops in Nigeria and Tanzania to **999,944,** which would be a **97% level** of achievement against the target of 1.02m.

BNFB strengthened the capacity of the private sector to process and market biofortified food products. **Nine** processors benefited from this, surpassing the target of four set for this indicator (a **225% level** of achievement). BNFB empowered nine small-scale commercial processors (eight in Tanzania, one in Nigeria) to process biofortified food products. Several small-scale firms have established startups for processing biofortified crops as detailed below:

Tanzania

- AFCO Investment Company Ltd continued to process and market OFSP and PVA maize flour in the target areas.
- Mama Organic started processing and selling OFSP flour, PVA maize, and high-iron and -zinc bean flour after its staff attended a training course for youth agripreneurs organized by BNFB and SUGECO.

- JAGEF Group started processing high-iron and -zinc beans. The group has initiated the process of certification for its products with the Tanzania Food and Drug Authority (TFDA).
- SUGECO started processing OFSP and PVA maize flour and bakery products.
- Perfect Farm Group started processing PVA maize, high-iron and -zinc beans, and OFSP flour.
- Wakulima Agri-Food Company Ltd, which is registered by the Tanzania Agricultural Modernization Association, started processing OFSP flour.

JAGEF Group is continuing in commercializing bean flour.

In addition, TARI–Kibaha and Matoborwa Company Ltd are arranging for the company to process OFSP in Tanzania. A memorandum of understanding was developed for signing at ministerial level. The company has been proactive in this, producing prototype OFSP products as soon as roots of the appropriate varieties became available.

Tanzania

- BNFB strengthened the capacity of trainers from five small institutions in Tanzania on integrating biofortified crops in agribusiness, especially OFSP product development. The institutions were SUGECO, SRI–Kibaha, Upendo Bakery, Ushirika wa Neema (a religious organization from Moshi), and Kinshaga Foods (a local bakery). The trainers were introduced to the puree technology; nutritious products that were competitive in the market; food hygiene, health and safety; and equipment maintenance. The practical sessions focused on options for using OFSP puree for value addition, especially in culinary, bakery, and the meat businesses. Participants learned how to prepare puree and made various products including bread, buns, ketchup, meat burgers, and juice. The training was hosted by SUGECO in Morogoro on 22–23 May 2018.
- The private sector, especially the bakery industry, has taken up the practice of the skills learned and integrated them in their processes, saving on production costs for flour and promoting nutritious OFSP bread. For example, because of the increased demand for these skills, SUGECO conducted similar training on puree technology on 25–28 July 2018 in Morogoro, with 34 (25 female) self-sponsored participants from various backgrounds such as small-scale agroprocessors, bakery owners, doctors, nurses, journalists, farmers, and representatives of NGOs like World Vision–Tanzania. Another 35 self-sponsored participants enrolled for the course that was scheduled for September 2018. This demonstrates the impact of BNFB's capacity development efforts and how the knowledge and skills on agroprocessing and integrating biofortified crops into agribusiness (especially OFSP) product development have cascaded to national and community institutions.

Male and female participants during the learning event on OFSP puree technology.

- In Tanzania BNFB strengthened the capacity of five district councils (Arumeru, Moshi, Hai, Mbulu and Monduli) that had expressed interest in integrating high-iron and -zinc beans into their school-feeding programs. Twenty-six primary schools were identified and engaged in establishing the bean field demo plots. These plots served as a model for the surrounding communities, particularly for parents and community- or school-based institutions such as school committees, which endorsed the approach. Local agribusinesses such as agrodealers and traders were also involved.

> Show us how to fish instead. We are proud of the support and capacity building offered to SUGECO and now we are working hard to make sure that the **enlightened torch keeps on shining, for the benefit of everyone in Tanzania.**
>
> (SUGECO executive director)

In addition to the organizational action supported by BNFB as described under IR 2.1, the project supported various stakeholder groups to produce and process biofortified food products as discussed below.

Tanzania

High-iron and -zinc beans

- To increase availability of seed of 'Selian 14' and 'Selian 15', the two high-iron and -zinc beans varieties released in Tanzania, CIAT, through BNFB, partnered with TARI–Maruku, TARI–Selian, and TARI–Uyole to import breeder seed of the varieties from Burundi (i.e., 100kg of 'Selian 14' and 200kg of 'Selian 15') and Uganda (i.e., 500kg of 'Selian 14') in 2017/2018. The seed was distributed in various zones in the country, with the project expecting to increase the seed multiplication area to 118.5 acres. Additional seed multiplication activities occurred during the rainy season at TARI–Selian, TARI–Uyole, and TARI–Maruku. A total of 1.3 t of breeder seed was harvested in April–July 2018, which was planted back on 3 ha during the October 2018–February 2019 season.
- Seven small-scale and startup processors were identified from three zones for high-iron and -zinc beans. They were JAGEF Group, Maisha Plus, and Hans College from northern zone; Royal Oven, Zinduka Women Group, and Esau College from southern highlands; and Marcelina Magezi in Missenyi. JAGEF Group continued to process and commercialize composite bean flour and has initiated the process of certification with TFDA. One bakery in Sumbawanga was expecting to start baking bean-based products. The introduction of high-iron and -zinc beans complemented ongoing efforts to address micronutrient malnutrition. More products are being developed for rural and urban markets.
- Farmers and other value chain actors were exposed to 'Selian 14' and 'Selian 15' bean varieties through six demo plots established in Babati, Mbulu, and Hanang districts from November 2017 to March 2018. A field day organized by TARI–Selian and Mbulu District Council was conducted in Mbulu in March 2018. Policymakers, schools, and farmers were sensitized on the benefits of the biofortified varieties and the need to switch to them for their higher micronutrient levels.

Acting DED, Mr. Maico Karain (second left) during a field day in Murukuchida village.

Farmer field day at Mukuruchida village in Mbulu.

- Farmer field days were conducted in 11 primary schools in Moshi Rural, Hai, and Meru districts. Cooking and food preparation demos were organized to expose the community to information about iron deficiency, anemia, and the role of high-iron and -zinc beans and the nutritious food basket. A total of 377 participants (215 female) attended.
- Beginning in August 2018, high-iron and -zinc beans were introduced in the southern highlands and the Lake Zone. Five district councils in the Lake Zone received technical support from TARI–Maruku. In the southern highlands, NAFAKA, Caritas Mbeya, and Mbozi had shown interest in introducing biofortified beans through the school approach. Demand for certified and quality declared bean seed was increasing and was estimated to be more than 100 t for the October 2018–February 2019 rainy season.

PVA maize

- Through BNFB CIMMYT supported some private sector actors to promote production and consumption of vitamin A-rich maize products by providing certified, early generation seed of the crop for hybrid maize production. During the life of the project, 347kg of inbred lines and single crosses of parent seed and more than 1,100kg of hybrid seed were sent to Tanzania from Zimbabwe for seed production and use in demo plots.
- Support by CIMMYT through a small grant and training helped build the capacity of AFCO Investment Company Ltd to process PVA maize and market its products. This saw the company process 794kg of PVA maize flour and market PVA maize products in 21 shops, as well as reach 403 women with nutrition messages and PVA maize products through sensitization events at seven health reproductive health clinics. The behavior change and other communication products developed by the company and BNFB (i.e., 3,500 flyers, 100 posters, two banners, and 20 t-shirts), along with social media, were used to promote PVA maize and its products. Besides AFCO, other small businesses empowered by BNFB such as SUGECO, Perfect Farms, Mama Organic, and Wakulima Agri-Food Company have started processing PVA maize.
- CIMMYT's support to Meru Agro Tours Company Ltd helped to fast-track the official release of two PVA maize varieties, 'Meru VAH517' and 'Meru VAH519', in October 2016. In the subsequent 2 years CIMMYT partnered with Aminata, Tanseed International, and MAMS Seed Company, providing them small grants to expedite variety release and promotion of PVA maize. This partnership allowed CIMMYT to provide 72 new hybrids for evaluation by the three seed companies. By the time the project was closing, three of the varieties were at the advanced stages of release. Meru Agro Tours Company had planted 11 ha of PVA maize grain in Mbozi, southern Tanzania, to produce grain for processing.

- In 2017/18 CIMMYT produced 800kg of 'Meru VAH517' grain to act as a backup for the processing and marketing initiative. Moreover, CIMMYT and Meru Agro Tours Company worked together to make available 1 MT of 'Meru VAH517' seed and small packs of the variety for demo and promotional purposes. About 5,300 packets of 50, 100, and 200g were distributed to members of parliament; 200 (200g) packs were given out by BNFB staff directly and 2,100 (100g) packs were distributed to farmers via agrodealers in 2018. A further 3,000 (50g) packs were distributed in shows in Mbeya, Morogoro, Arusha, and Mwanza in early August 2018. Meru Agro Tours Company also produced 180kg of single cross parent seed of 'Meru VAH517' in 2017 and planted 4.6 ha of the single cross parent seed of the two hybrids in that location under irrigation in 2018. About 6.4 ha of certified seed has been planted in Kahe. Certified seed of the two PVA varieties was expected to become available in the market by early 2019.

OFSP

TARI–Kibaha continued to support organizational action for scaling up OFSP in the following ways:

- Distributed 22,400 OFSP vine cuttings to 345 HH in Ilindi ward in Bahi district.
- Worked closely with the 11 district councils to allocate funds to multiply and disseminate OFSP. This in an important approach in ensuring sustainability. In 2017/18, at least $15,695 was allocated by the district councils of Iramba, Bahi, Mkalama, and Manyoni to support OFSP activities. Systematic monitoring of vine multipliers established that TARI–Kibaha had reached 8,211 HH directly with OFSP, including 1,200 through schools, and 17,590 HH indirectly. The Enhancing Nutrition Services to Improve Maternal and Child Health in Africa and Asia project implemented by World Vision had reached an additional 2,000 HH in the same area with vines.
- Using their own resources, the Research, Community and Organizational Development Associates (RECODA) reached 4,090 HH with OFSP. For Perfect Farms this was 1,000 HH and for Tanzania Agricultural Modernization Association it was 132 HH. Perfect Farms reached an additional 30 HH with high-iron and -zinc beans and 80 HH with PVA maize.

Nigeria

PVA maize

- Through BNFB IITA produced 10 t of breeder/foundation seed of PVA maize varieties, which was distributed to Premier Seed Company, Maslaha Seed Company, Gold Agric Nigeria Ltd, and Savanah. These companies produced and sold 170 t of PVA maize certified seed from that seed. Seed availability allowed networking of PVA maize producers and processors that had been initiated through the PVA maize platform. Data on seed sales for 2018 show that an estimated 8,500 ha of land was planted with PVA maize varieties, which was expected to yield at least 17,000 t of grain. Some 17,000 HH were provided certified PVA maize seed for the June–September 2018 season.
- Some 39,000 ha of seed were planted for certified seed production; the crop was harvested in November 2018. Preliminary data from the seed companies indicate that 780 t of certified seed was harvested, sufficient for 78,000 HH.

OFSP

- BNFB, through CIP, introduced OFSP in Enugu, Kogi, Ogun, and Taraba states, which were selected because they were near the states of earlier or ongoing OFSP projects such as RAC, Rainbow, and SASHA2. BNFB helped establish 12 demo plots, each 0.5 ha, to support OFSP promotional activities. When the crops were harvested, field days were held in Enugu, Kogi, and Ogun states. Extensive publicity was carried out to attract government and private sector

participation to elicit collaboration and support for BNFB efforts. With these four states included, Nigeria now has 12 states producing OFSP.

- During Y3 of the project, 'Solo Gold', a new OFSP variety, was released based on its superior agronomic and nutritional traits and is expected to spur OFSP productivity. Now Nigeria has three OFSP varieties.
- BNFB established 10 DVMs in each of the four states, increasing the area under vine production. Enugu and Taraba states put 4.1 ha and 4.4 ha under vine production, respectively, targeting production of more than 2m cuttings. Ogun and Kogi states established about 0.2 ha of vine plots each to produce more than 200,000 cuttings. A survey carried out in partnership with the Agricultural Development Programme officers during Y3 showed that 41,063 HH had received vines through BNFB and other partners (Table 6). BNFB faced challenges (e.g., drought and destruction of the crop by domestic animals) in some of the states that affected the volume of vines distributed to HH. The purchase of a few irrigation kits by BNFB for some DVMs in the very dry areas helped ensure availability of vines for farmers at the onset of the rains.

Table 6: Households in Nigeria that received OFSP vines during 2015–2018

State/Institution	Direct HH	Indirect HH
Enugu State	790	1,508
Taraba State	1,929	5,822
Ogun State	645	0
Kogi State	25	–
Jigawa & Yobe States (Women in Nutrition in Northern Nigeria)	2,438	–
Oyo State	288	–
Redeemed Christian Church of God	80	–
CRS	2,7,538	–
Total	**33,733**	**7,330**

- BNFB strengthened the capacity of Mahauty Health Solutions Company, which is currently making OFSP infant-weaning products. Several other small-scale processors are using OFSP as a key ingredient for bread, muffins, snacks such as chin chin, crisps, and cookies, juice, and kunu, a local beverage. The BNFB project has supported various stakeholder groups to scale up the production and processing of biofortified food products.

Households reached with yellow cassava by HarvestPlus

Using their own funds, HarvestPlus supported seed production and multiplication and reached 905,907 HH in Nigeria with yellow cassava in 2017 and 2018.

Release of biofortified crop varieties and their utilization

BNFB supported the fast-tracking of the release of seven biofortified crop varieties, three in Nigeria and four in Tanzania (see Table 7).

Table 7: Biofortified crop varieties released and their utilization

Country	Crop Variety Released	Institution Releasing	Year	Initial Utilization of Seed
Nigeria	PVA maize: 'Sammaz 49'	Institute for Agricultural Research–Zaria with support from IITA and HarvestPlus	2016	2017
	PVA maize: 'Sammaz 52'	Institute for Agricultural Research–Zaria with support from IITA-BNFB	2017	2018
	OFSP: 'Solo Gold'	NRCRI in collaboration with CIP	2018	2018
Tanzania	PVA maize: 'Meru VAH517'	Meru-Agro with support from CIMMYT-BNFB	2016	2018
	PVA maize: 'Meru VAH519'	Meru-Agro with support from CIMMYT-BNFB		2018
	High-iron and -zinc beans: 'Selian 14'	TARI-Selian with support from CIAT-BNFB	2018	2018
	High-iron and -zinc beans: 'Selian 15'	TARI-Selian with support from CIAT-BNFB	2018	2018

Between November 2015 and October 2018, BNFB played a catalytic role in strengthening the capacity of and supporting 12 national agricultural research institutions (5 in Nigeria, 7 in Tanzania), government ministries, and release committees to promote the inclusion of and mainstream biofortification in the national agricultural research breeding programs. Since then, the biofortification trait has been included as a key criterion in releasing biofortified crops. In Nigeria the institutions were:

- NRCRI–Umudike for OFSP
- Institute for Agricultural Research, affiliated to Ahmadu Bello University, Zaria, for PVA maize
- National Varieties Release Committee
- National Agency for Food and Drug Administration and Control, a federal agency under the Federal Ministry of Health
- FMARD for OFSP, PVA maize, and yellow cassava

In Tanzania, the national agricultural research institutions comprised:

- TARI–Kibaha for OFSP
- TARI–Selian
- TARI–Maruku
- TARI–Uyole
- TOSCI
- TFDA
- Ministry of Agriculture

BNFB supported and strengthened the capacity of 11 private seed companies, 6 in Nigeria and 5 in Tanzania. The ones in Nigeria were Seed Company, Premier Seeds, Maslaha Seeds, Jirkur Seed, Gold Agric, and Savanah. In Tanzania they were Meru Agro Tours Company, Aminata, Tanseed International, MAMS Seed Company, and IFFA seeds. BNFB also enhanced the capacity of national research institutes in different agro-ecologies and seed quality control bodies in evaluating, releasing, and registering biofortified varieties.

BNFB worked with private sector partners together with ongoing breeding programs and projects supported by CGIAR and the Alliance for a Green Revolution in Africa to fast-track the release of seven biofortified staple crop varieties (i.e., OFSP in Nigeria, two PVA maize varieties in each country, and two high-iron and -zinc beans in Tanzania). There was renewed interest by national and

local governments and the private sector to assist farmers to engage in the production of biofortified crops. Details on some of the key results on the varieties released, utilized, and developed by the BNFB project are presented in the following section.

PVA maize

In Nigeria IITA, in collaboration with seed companies, supported the release of 'Sammaz 49' and 'Sammaz 52' PVA varieties in 2016 and 2017. By 2018 seed had been multiplied and some farmers had begun accessing the seed of the varieties. Through the PVA maize platform stakeholders were actively engaging in discussions on the varieties' production, marketing, and processing, particularly by small and medium-size enterprises. It is anticipated that with increased processing, more HH, particularly in urban areas, will access and consume PVA maize products.

A total of 100 elite PVA maize varieties or genotypes were evaluated during the project period. The varieties included single cross hybrids, three-way cross hybrids, top cross hybrids, and open pollinated types. They were evaluated across lowland tropic and mid-altitude locations in Nigeria. The vitamin A-rich varieties were evaluated in Jos, Ikenne, Saminaka, Zaria, Bagawda, and Kadawa. It is expected that the elite varieties that have a beta-carotene content of 14 µg/g (earlier varieties had 10 µg/g) will be proposed for registration and release by seed companies by 2020.

In Tanzania CIMMYT, through BNFB, supported Meru Agro Tours Company to release 'Meru VAH517' and 'Meru VAH519' PVA varieties in 2016. The release of the two varieties in under 5 years is a significant achievement in a country that had no PVA maize varieties at the start of the project. BNFB supported Meru Agro Tours Company in multiplying certified seed and, in 2018 the company harvested 18 MT of the seed and had sold 89% of it to 2,600 farmers by November 2018.

CIMMYT supported Aminata, Tanseed International, MAMS Seed Company, and IFFA Seeds to expedite the evaluation of 72 new PVA maize hybrids. Three varieties are at advanced evaluation phases (i.e., DUS, NPTs, or farmer evaluations) prior to release by the regulator.

High-iron and -zinc beans

CIAT worked with TARI–Maruku, TARI–Selian, and TARI–Uyole in Tanzania to expedite the evaluation and eventual release of two climbing, high-iron and -zinc bean varieties (i.e., 'Selian 14' and 'Selian 15'). These were officially released in January 2018 and launched by the then minister of agriculture, Hon. Eng. Dr. Charles Tizeba (MP), on 20 June 2018 at TARI–Selian in Arusha.

CIAT supported the evaluation of 10 bush genotypes and 'Jesca', an improved variety, for multilocational yield trials and evaluation for other desirable genetic characteristics in different agro-ecologies using harmonization policies. The trials were conducted in TARI–Selian; Machine Tools, TARI–Uyole; Tukuyu, and Kagera. CAL 96, Ngwakungwaku, RWR 2154, and KAB 06F2-8-35 genotypes were selected during farmers' participatory variety selection events based on their good agronomic performance across the three zones and marketability traits. The agro-ecological adaptation traits considered were resistance to insect pests and diseases, high yields, and early maturity. The marketability traits were taste and grain color, size, and shape. The best candidates were expected to be submitted to TOSCI for NPTs and DUS evaluation in December 2018.

Ensuring timely access of seed by farmers and in sufficient quantities was challenging and would have taken 3 years if the conventional seed release system had been followed. BNFB expedited the process in Tanzania by importing 800kg of breeder seed from Burundi and Uganda for seed production. CIAT engaged TARI–Selian, TARI–Maruku, and TARI–Uyole, as well as contract farmers, for seed multiplication that allowed 10 acres of land to be put under seed. By September 2018 BNFB had reached at least 3,500 HH with small promotional packs of high-iron and -zinc beans. Farmers

were expected to be able to access seed for planting during the short rains of October 2018–February 2019.

OFSP

For OFSP the number of DVMs in each of the BNFB states in Nigeria increased to 10, meaning that the area under vine production also expanded. At least two bundles of OFSP vines were cultivated and the roots consumed in each of the HH that received vines. One new OFSP variety with the varietal code name UMUSPO4 and trade name 'Solo Gold' was released officially on 26 July 2018, bringing the total of officially released OFSP varieties in Nigeria to three. Results from on-farm trials showed that the genotype 'Namanga' had promising qualities. It is expected to be released in 2019.

TARI–Kibaha was strengthened to supply and maintain pre-basic OFSP seed. Partners such as decentralized vine suppliers and farmer groups were empowered to multiply and disseminate OFSP vines. By the end of the project, TARI–Kibaha had not released any new varieties, missing the target of two varieties. But four Mother trials and 26 Baby trials had been established and maintained in Mpwapwa, Hombolo, and Kiomboi involving 11 varieties: 'Kabode', 'Kakamega', 'Ejumla', SPKBH06/676, D6-02, 'Mataya', 'Alveria', 'Ex-Luambano', 'Kiegea', 'Jewel', and 'Naspot 13'. They were harvested in June 2018. This was the second season for the multilocational trials, and the results for SPKBH 03/03, SPKBH 03/676, 'Ex-Luambano', and 'Naspot 13' varieties, which had superior qualities, formed the basis for applying to TOSCI for NPTs and DUS evaluation for their release. These varieties are expected to be released in 2019.

Ensuring availability of vines for planting at the onset of the rains was challenging because drought limited their conservation. TARI–Kibaha, therefore, continued to maintain pre-basic seed and carried out seed multiplication in Nguguni in Dodoma and Ruvu in Kibaha. TARI–Kibaha partnered with TARI–Hombolo and multiplied pre-basic and basic seed for the central zone. TARI-Kibaha also used the school model of disseminating vines to farmers. These efforts helped to disseminate vines to 1,200 primary school children. The students received nutrition education and skills on how to plant the vines and were asked to take the vines home for their parents to plant. Box 4 summarizes the value-add by BNFB to national implementing partners in achieving IR 2.2 and 2.3 and mainstreaming biofortified crops in national programs.

Box 4: Significant value add by BNFB to national implementing partners in achieving IR 2.2 and 2.3

- CIAT, in partnership with TARI–Selian, hosted a workshop for district officials from Monduli, Meru, Hai, Mbulu and Moshi rural districts to discuss the nutritional status and deficiencies in their districts and to sensitize them on the role of biofortification in addressing iron, zinc and vitamin A deficiencies. At the end of the workshop, work plans on how to mainstream the nutritious food basket in each district council, targeting schools, were developed. The approaches included engaging with parents or communities who supply food to schools and holding field demonstrations on high-iron and zinc beans in the schools with the support of the schools and district teams.
- CIAT partnered with TARI–Selian to reach 26 primary schools to establish demonstration fields for high-iron and zinc beans. SRI–Kibaha reached four more schools in the central zone of Tanzania for OFSP vine distribution. OFSP had recently been piloted with commendable progress through the use of rural primary school-going children to fast-track the distribution of its vines. Using school children as change agents will serve three purposes: (1) it will be a long-term behavior change approach to improve nutrition of families as the children will carry their appreciation of nutritious food into adulthood, (2) it will be a strategic approach to reach many households with the biofortified crops, and (3) the demonstration fields in the schools will serve as a bridge between the schools and their community and as a model particularly for the children's parents and school-based institutions such as school committees.
- The provision of PVA maize materials by CIMMYT to the seed companies was catalytic in nature and meant to expedite variety release and promotion of released varieties. With the 18 new genotypes provided to Aminata for testing and the support provided to MAMS and Tanseed International seed companies, it is anticipated that at least an additional five new PVA maize varieties will be released in Tanzania by 2020. The release of seven PVA maize varieties, including Meru VAH517 and Meru VAH519, by BNFB in under 5 years will be a significant achievement in the country that had no PVA maize varieties at the start of the project. The catalytic promotion funds will help to create awareness in the market and influence the change of attitudes and behavior of farmers and consumers who are accustomed to white kernel maize. The promotion of PVA maize by BNFB was also an incentive for the seed companies to participate in research for new varieties. It is anticipated that they will be motivated and keen to invest resources towards that endeavor since they will have the assurance that the market is already prepared and enlightened.
- Through the support of BNFB, AFCO Investment Company Ltd opened seven new outlets for selling PVA maize flour. It continued to sell PVA maize products in 21 shops, with the volume of the flour sold during the reporting period reaching 794 kg. Apart from the increased sales from the additional outlets, the improved network has helped to ensure that the products are accessible to many consumers who previously had to travel long distances for them.
- The partnership between BNFB and Radio Maria that was organized through SRI–Kibaha was synergistic, and the timing of the airing of the programs was synchronized to coincide with time during the planting season when the messages would be most useful. BNFB anticipated that the education and information provided through the radio would benefit farmers and promote OFSP in the central region for its increased production and consumption.
- In Nigeria the strong relationship between IITA and private seed companies and between the companies and their contract farmers, plus the existence of the PVA maize platform that brought together key stakeholders, created a good environment for the smooth flow of different classes of seed, whether breeder or certified seed. The seed companies worked with contract growers and provided them with breeder seed disseminated by BNFB. The training of trainers and the step-down training conducted by BNFB were very useful in providing the necessary information on the production of PVA maize varieties. Maslaha and Premier Seed, the two major seed companies involved in the production of certified seed in 2017 engaged five of their active contract seed growers/farmers to produce 150 MT of certified seed.
- BNFB introduced OFSP in four new states in Nigeria, i.e. Enugu, Ogun, Taraba and Kogi, and continued to support and to build the capacity of these states to prioritize and scale up the crop. Without BNFB, it is unlikely that the states would have adopted the crop. At least 12 main sweetpotato producing states in Nigeria are growing the crop. The addition of Solo Gold variety, which is superior in agronomic and nutritional traits, is likely to spur productivity.
- In both Nigeria and Tanzania, the project strengthened the national breeding programs. Seven biofortified varieties were released and many other promising genotypes were in the breeding pipeline. Moreover, there was renewed interest of national and local governments to assist farmers to engage in the production of biofortified crops. The project played a catalytic role in achieving these results.

MLE System Development

Although the M&E process was well articulated in the project document, there was a need to come up with a structure that would help deliver the complex project design and provide direction for its realization. During Y1 the BNFB team developed an MLE plan that outlined the project's key deliverables, outputs, milestones, outcomes, impacts, and indicators of success. It highlighted what the project would monitor and evaluate, provided tools on how that was to be done and for

reporting, the types of progress reports to be produced (including their templates), and the frequency of reporting.

To help explain and internalize the MLE plan, BNFB engaged the services of an MLE expert and held a workshop on 21 September 2016 in Dar es Salaam for the core team of thematic leaders and key implementing partners. The workshop was meant to ensure that all partners had a common understanding of how to deliver the expected results and how to coordinate their actions and ensure the project was on track, in order to facilitate sound M&E and systematize project MLE.

BNFB developed an online reporting and data repository system with a dashboard. It provides access to key performance indicators and targets; baseline data; monitoring tools; and bi-weekly, monthly, quarterly, and bi-annual reports. This platform facilitated the compilation of annual progress and technical reports and serves as a data storage mechanism. The dashboard was essential for BNFB accountability and for documentation of the implementation process. It was useful to all project partners and management; it supported learning, adaptive management, and informed decision-making. Other CIP projects are considering adopting this tool for the value it adds to management systems.

MILESTONE DEVIATION

Three outcome-level indicators had been partially achieved by the end of the project but had very good progress (see Table 8).

Table 8: Key indicators whose achievement was behind schedule and the reasons for that

Indicator	Reason for Not Meeting Target
At least $10m committed by donor, philanthropists, private sector, or government for biofortification	The project targeted to raise $10m to support initiatives on biofortification in Tanzania and Nigeria. New investments totaling $6,543,230.70 were recorded during the project period, representing **65.4% level of achievement** (Appendix 8). The target of $10 m had been arrived at based on the assumption that both countries had a ready-to-go basket of biofortified crops. But Tanzania had only OFSP officially released. The absence of the food basket crop varieties in Tanzania slowed down the momentum for raising resources as the focus was given to only OFSP in the first 2 years of the project. Raising of investments for the food basket activities commenced only in the second half of Y2. Tanzania raised only $1,423,720.60, representing 28.5% of its target. Nigeria raised $5,068,330, achieving its target. Nigeria had the food basket crop varieties at the start of the project. Nonetheless, $12,895,000 is in the pipeline in Tanzania and Nigeria (see Appendix 9). The project is optimistic that a significant proportion of those funds will be released to close the $3.4m funding gap. Moreover, the two governments have allocated significant resources for biofortification in their midterm national development and nutrition programs. If those resources are documented, the $10m target will be surpassed by a large margin.
Twelve varieties in the pipeline fast-tracked for release	Out of the 12 varieties in the pipeline in Nigeria and Tanzania that had been targeted for fast-tracking for release, BNFB succeeded in fast-tracking the release of only 7 (**58% target**). But the project also managed to push the more promising materials up the pipeline for release. The project achieved this working with national institutions and the private sector (in the case of PVA maize) in Tanzania and Nigeria. It is anticipated that national institutions will sustain the momentum and leverage their own resources to release these varieties. 2019 looks promising for the release of the varieties in the pipeline. For instance, in Tanzania at least 10 varieties, 4 of which are high-iron and -zinc beans and 6 are OFSP, are lined up for release. In Nigeria, one OFSP variety is anticipated to be released by the end of the year. All these materials were either quite low in the release pipeline when BNFB started operations or were not the subject of research, which was the case for the 4 high-iron and -zinc beans. In Tanzania beans and PVA maize varieties had not yet been released because of the change in the project design, so the biofortified varieties had to be introduced from neighboring countries. It was not until Y3 of implementation that high-iron and -zinc bean varieties were released.
At least 2.175m HH reached with biofortified crops by 2020	The project targeted to reach at least 2.175m HH by December 2018, but by the project end 999,944 HH had been recorded as growing the biofortified crops, equivalent to **97%** of the 3-year target. The target would have been achieved if Tanzania had had the crop varieties for the food basket when the project started. The pace in reaching HH is likely to accelerate when seeds of high-iron and -zinc

Indicator	Reason for Not Meeting Target
	beans and PVA maize become available in the Tanzanian market. The project witnessed such a trend in Nigeria with PVA maize seed. By the time of the project's closing, bulking of high-iron and -zinc beans and PVA maize seed was going on in earnest (see IR 2.2). Based on the findings and lessons from the RAC ex post survey, the momentum created by this project will likely see the surpassing of targeted 2.175m HH by the target date of 2020.

KEY CHALLENGES

The project encountered a number of challenges during its implementation:

- Although BNFB was contributing to the reduction of hidden hunger, the project design did not include the analysis of the effect to which the intake of vitamin A and iron- and zinc-rich biofortified crops had reduced vitamin A and iron and zinc deficiencies. This would have been important to provide a strong evidence base on the efficacy for the four biofortified crops in Nigeria and Tanzania.
- The project design anticipated that biofortified crop technologies in Nigeria and Tanzania would be ready to go at the onset. However, only OFSP was ready for scaling up in Tanzania and OFSP and yellow cassava in Nigeria. PVA maize and high-iron and -zinc beans had not been released in Tanzania, whereas in Nigeria PVA maize had been released but farmers could still not access the seed. This meant that the implementing team could not advocate for varieties that had not yet been officially released and implementation of several activities was delayed. For example, the focus during Y1 and Y2 shifted to promoting a nutritious food basket, seed multiplication took longer than anticipated, and in Tanzania PVA maize and high-iron and -zinc beans had not reached farmers by the time the project closed.
- Poor awareness and misconceptions about biofortified crops persisted in both countries. National partners were concerned about the fear that the biofortified crops being promoted were genetically modified. Advocacy and promotion of the biofortified crops were therefore challenging as the project team had to first debunk the myths around biofortification.
- In Nigeria the shortage of animal feed during the dry season led farmers to graze their livestock on OFSP farms. This discouraged vine producers from multiplying vines during the dry season, which resulted in their shortage during the planting season. In Tanzania the change of the rainfall pattern in the central zones affected the Mother–Baby trials, resulting in delays in collecting evaluation data.

SUSTAINABILITY

By design, BNFB had sustainability mechanisms built in from the onset, which was essentially about scaling up and maintaining at a certain level the consumption of the biofortified crops for nutrition security in Nigeria and Tanzania. BNFB was a complex multipartner, multisectoral, and multicrop initiative that was pegged to national priorities and to working with public and private sector actors in co-financing advocacy, capacity-building, and seed systems activities through a "take lead, empower, take off" approach. BNFB leveraged ongoing activities and played a catalytic role by filling critical and strategic priority gaps in ongoing interventions for greater synergy and value. It put in place sustainability strategies that will ensure that its activities will continue beyond its life. The sustainability mechanisms are seen in the project activities and their details are summarized in the following paragraphs.

ADVOCACY FOR NEW INVESTMENT AND POLICY CHANGE

BNFB helped to craft three advocacy strategies that continue to be used. Their implementation will help ensure systematic action by multiple sectors and partners. In addition, BNFB helped to institutionalize biofortification in community, national, and regional programs that continue operating even after the project period. Furthermore, the project strengthened the capacity of a cadre of 101 advocates and champions located in strategic positions in national and regional public, private, NGO, and community-based organization institutions to ensure sustainability. These institutions continue to implement the advocacy strategies, raising new investment, and engaging high-level policymakers such as parliamentarians to ensure resources are allocated to support programs and projects in favor of biofortification. The critical team of advocates and champions hosted in these institutions continues to implement the advocacy strategies and policy documents for increased investment and to influence policy in support of biofortification. BNFB also facilitated the establishment of four advocacy WhatsApp platforms—one each in Tanzania and Nigeria, one regional and one youth—advocates and champions who are still active in sharing information and solving problems. The coordination of advocates and champions will be necessary to maintain the momentum and to advance the biofortification agenda.

BNFB facilitated the entrenchment of biofortification in 11 policy documents and in the CAADP process. These policies are being implemented at country and regional levels and are translating into increased investment and activity in biofortification. Nigeria's MoBNP and the prime minister's office in Tanzania, and initiatives by regional and international implementing partners with initiatives on biofortification such as FARA, CIP, and HarvestPlus, will track implementation of the policy statements on biofortification.

The results show that the sources of funding for biofortification are diverse, that there is funding in the pipeline, and that there is increased momentum of national governments to invest in biofortification, all of which BNFB helped drive. The project helped raise $6.5m in new investment for biofortification, which, together with the $12.9m in the pipeline, indicates that momentum for biofortification is building.

BNFB strengthened the capacity of two national multisectoral policy platforms and five technical crop-specific platforms for OFSP, PVA maize, and high-iron and -zinc beans, all of which are locally owned. The policy platforms are hosted within the MoBNP in Nigeria and the prime minister's office in Tanzania. They continue to coordinate action, steering policy and technical aspects of biofortified crops. The crop-specific platforms are at varying levels of maturity, with some ready to register as legal entities while others need more time and support to be appreciated by stakeholders and to mature to a level where they could run on their own.

INSTITUTIONAL AND INDIVIDUAL CAPACITY DEVELOPMENT AND COMMUNICATION MATERIALS

In its work with partners addressing micronutrient malnutrition at international, regional, national, and community levels, BNFB acted as a catalyst and helped to strengthen the partner's institutional capacity to deliver the biofortification technology. Institutions such as CIP, CIAT, CIMMYT, HarvestPlus, and FARA will continue to support programs and projects on biofortification through add-on projects. In addition, the more than 41 stakeholder agencies whose capacity was strengthened by BNFB have institutionalized the BNFB agenda in their training programs. Primary facilitators in institutions such as the Agricultural Research and Management Training Institute in Nigeria, TARI–Kibaha, and SUGECO who were trained under BNFB and RAC projects have continued to apply the knowledge and skills they acquired and to step down the training. By the time of the project closure, BNFB had trained 11,433 change agents and equipped them will the skills and

knowledge to design and implement gender-sensitive projects on value chain components of biofortified crops. The cases of Agricultural and Rural Management and Training Institute and SUGECO are examples of the sustainability of the RAC and BNFB training model. Awareness has been created and there has been increasing demand for training to fill various critical gaps in the value chains of the nutritious food basket crops. The national and community institutions and other partners continue to offer fee-based or sponsored training courses in Nigeria and Tanzania, with spillover effects to other African countries.

BNFB has produced various instructional toolkits to support advocacy and training on the value chains of OFSP, PVA maize, and high-iron and -zinc beans that implementing partners in various countries in Africa and beyond continue to use. It also co-developed and disseminated social and behavior change communication materials in English and Swahili that partners continue to use and can adapt for their needs to heighten the demand for biofortified crops. In addition, the critical team of journalists that BNFB trained continues to write media articles and produce radio programs and documentaries that create the demand for biofortified crops and foods. The communication materials bear the logos of the governments of Nigeria and Tanzania and of the African Union and are available on various open-access platforms for printing or repackaging. This means that any partner in Africa from the two project countries can continue to use them. Partner institutions, academic institutions, or other users have been encouraged to use or adapt and reproduce the instructional and communication materials and, where appropriate, integrate them into their curricula. For example, in Tanzania BNFB continued to partner with TFNC along with other nutrition stakeholders to develop guidelines on micronutrients and in-service training curricula for community health workers. TFNC is also working with the Ministry of Education in developing school-feeding guidelines and reviewing the maternal, infant, and adolescent nutrition guidelines to ensure that biofortification is mainstreamed in them, which will ensure the sustainability of the biofortification agenda.

SEED SYSTEMS

The BNFB seed systems core project team worked closely with national and community partners such as research institutions, seed companies, community groups, and primary and secondary vine multipliers. BNFB provided breeder and foundation seed and facilitated cross-crop dialogues with national certification bodies for the use of a multicrop approach in identifying and addressing bottlenecks in the release of biofortified crop varieties. BNFB therefore laid the foundation for mainstreaming variety breeding for high micronutrient levels, and future protocols will favor biofortified crops. BNFB strengthened the breeding capacities of public, private, and civil society organization partners and fast-tracked the release of seven biofortified crop varieties. The national partners are already multiplying seed for dissemination to farmers using government funds, as part of the budgets of NARS and from ongoing programs. National seed agencies, the private sector, farmers, women, and youth groups were incentivized and empowered for strategic large-scale production of biofortified crops through training, small grants, and technical backstopping. However, at project completion, seed of PVA maize and high-iron and -zinc beans had not reached farmers; its dissemination was expected to occur during the short rains (October 2018–February 2019). Studies conducted by BNFB on willingness to pay for biofortified beans and PVA maize value chain and seed demand have provided critical information on seed demand and pricing.

BNFB worked with diverse partners in implementing its activities (see Appendix 2), and these partners will continue the work. A number of proposals were submitted and others were in the pipeline at project closing. We expect some of these to turn into projects, as will new initiatives from the government, development partners, and the private sector. These will add value to the foundation laid by BNFB.

3. GEOGRAPHIC AREAS TO BE SERVED

Provide the final list of countries and sub-regions/states that have benefitted from this work and associated dollar amounts. If areas to be served include the United States, indicate city and state. Add more rows as needed. More information about Geographic Areas to Be Served can be found here.

Location	Foundation Funding ($)	Year 1: Expenses ($)	Year 2: Expenses ($)	Year 3: Expenses ($)	Total Balance ($)
Nigeria	2,500,000	380,663	1,074,529	987,878	56,930
Tanzania	2,500,000	385,456	998,839	1,172,635	-56,930
TOTAL	5,000,000	766,120	2,073,368	2,160,512	0

4. GEOGRAPHIC LOCATION OF WORK

Provide the final list of countries and sub-regions/states where this work has been performed and associated dollar amounts. If location of work includes the United States, indicate city and state. Add more rows as needed. More information about Geographic Location of Work can be found here.

Location	Foundation Funding ($)	Year 1: Expenses ($)	Year 2: Expenses ($)	Year 3: Expenses ($)	Total Balance ($)
Nigeria	1,703,397	214,774	1,008,860	386,249	93,514
Tanzania	2,909,949	481,958	933,171	718,723	776,096
Kenya	100,000	31,421	22,685	510,313	- 464,420
Ghana	82,035	15,000	12,584	89,174	- 34,723
Global	204,620	22,966	96,069	456,053	- 370,467
TOTAL	5,000,000	766,120	2,073,369	2,160,512	- 0

5. LESSONS LEARNED

Describe the top one to three takeaways or lessons learned from this project.

- The BNFB advocacy strategy for policy change and resource mobilization hinged on the presence of a ready-to-go food basket of biofortified crops in Tanzania and Nigeria. But at the project onset in Tanzania, only OFSP had been officially released, so advocating for policy change and investments based on an existing biofortified food basket was not practical. At project inception, Nigeria had released multiple biofortified crops, hence the project delved into the advocacy activities and ultimately achieved the set targets for most of the indicators. In Tanzania only OFSP was ready for scaling up, and priority was redirected to promoting biofortified crops and fast-tracking the release of the varieties in the pipeline. BNFB's experience confirmed the lesson learned under RAC that government cannot promote or allocate resources for varieties not officially released in the country. This calls for earlier engagement at the national/institutional budget preparation stage in order to have the time and resources needed.
- The BNFB project confirmed the importance of the advocates and champions model in advocating to policymakers at different levels. On the basis of the findings of the RAC ex post evaluation, which was carried out 2 years after the project ended, scaling-up initiatives require at least 5 years for national and regional partners to take ownership of the process and enable the project to fully realize its objectives.
- The project leveraged the processes defined by the East African Community and Southern African Development Community seed protocols to expedite the release of two high-iron and -zinc bean varieties and two PVA maize varieties in Tanzania. The seed protocols allowed access to genotypes from Rwanda and Burundi, for high-iron and -zinc beans, and Zimbabwe, for PVA maize. This shortened the variety release process by requiring only one season of participatory farmer trails before their submission to TOSCI for DUS, NPTs, and release. BNFB learned that regional seed protocols can be extremely useful in expediting the release of crop varieties and

for a project like BNFB that had a proof-of-concept purpose, the release could be delivered in 3 years.

- Although PVA maize was released during Y1 and high-iron and -zinc beans during Y3, their seed was not widely available to farmers and other producers by the time the project ended. The seed of the two crops was expected to become available to farmers during the short rains of 2018, which was after the project had ended. BNFB therefore lost 2½ years of work, and several activities that depended on the availability of the seed to farmers were delayed. The gains by BNB need to be leveraged and followed up with different scaling support mechanisms or programs to effectively catalyze the scaling-up of the biofortified crops, exploit emerging opportunities, and allow for special creativity.
- BNFB was a complex and ambitious project that tested a scaling-up model for multiple crops based on the hypothesis that such a model requires a supportive policy environment, strong institutional capacities, and proven technologies. Given the outcomes of the RAC project on scaling up OFSP and of the BNFB project on promoting and scaling up multiple biofortified crops simultaneously, the project succeeded in demonstrating (1) the usefulness of a multisectoral and multipartner mechanism and (2) the gains from linking ongoing technology investments, connecting these to policy dialogue and public awareness and strengthening institutional and individual capacity at national and country levels to produce and consume biofortified crops. There were challenges and conflicts with the partnership model, but sound leadership and management of the project and commitment by the partner institutions and staff yielded synergistic outcomes that amounted to more than what any individual partner could have achieved on its own. The BNFB scaling-up model therefore can be rolled out in other countries, regions, and continents to support similarly complex scaling-up projects and programs working on biofortified crops.

6. FEEDBACK FOR THE FOUNDATION

Provide one to three ways the Foundation successfully enabled your work during this project. Provide one to three ways the Foundation can improve.

BMGF supported the implementation of BNFB activities over the 3 years in the following ways:

- The program officer provided monthly guidance on project implementation. The feedback provided during the consultative meetings helped expedite decision-making, pointed out new opportunities, and facilitated prompt corrective action.
- BMGF invited BNFB to the PVA maize stakeholders meeting in Abuja and several other meetings in the region to share results. The feedback from the PVA maize meeting and the learning from other actors scaling up technologies provided insights into ways to address key challenges, pointed to opportunities, and allowed expansion of our network of partners and linkages to actors in the value chains of the biofortified crops. The expanded network of partners helped to advance the BNFB project goal and objectives.
- BMGF staff attended two review and planning meetings, as well as the closeout meeting, which helped in understanding the project's advancement and in consolidating details on the progress made over different reporting periods, the challenges, the opportunities, and the lessons learned. These interactions helped the BMFB program officer and the in-country team to understand the complex scaling-up model that BNFB was testing.

- BMGF commissioned an external evaluation of the impact of the work that the Gates Foundation supports. The outcome is expected to provide insights into the value and efficiency of the BNFB scaling-up model and recommendations on what the future initiatives can focus on.

7. GLOBAL ACCESS AND INTELLECTUAL PROPERTY

If your funding agreement is subject to Intellectual Property Reporting, please click the following link to complete an Intellectual Property (IP) Report.

If not, please acknowledge by typing "N/A": __N/A____

To delegate permissions to another member of your project team or for any questions regarding the Intellectual Property Report, please contact GlobalAccess@gatesfoundation.org.

8. REGULATED ACTIVITIES

Do you represent that all Regulated Activities[1] related to your project are in compliance with all applicable safety, regulatory, ethical and legal requirements? Please mark with an "X":

__N/A___ N/A (no Regulated Activities in project)

_____ Yes

_____ No (if no, please explain below)

1 Regulated Activities include but are not limited to: clinical trials; research involving human subjects; provision of diagnostic, prophylactic, medical or health services; experimental medicine; the use of human tissue, animals, radioactive isotopes, pathogenic organisms, genetically modified organisms, recombinant nucleic acids, Select Agents or Toxins (www.selectagents.gov), Dual Use technology (http://export.gov/regulation/eg_main_018229.asp), or any substance, organism, or material that is toxic or hazardous; as well as the approvals, records, data, specimens, and materials related to any of the forgoing.

9. SUBGRANTS

If your grant agreement (not applicable to contracts) is subject to expenditure responsibility and permits you to make subgrants to organizations that are not U.S. public charities or government agencies/instrumentalities, please complete the Subgrantee Checklist and attach a copy with this progress narrative for each such subgrantee.

FINANCIAL UPDATE

The purpose of the Financial Update section is to supplement the information provided in the "Financial Summary & Reporting" sheet in the foundation budget template, which reports actual expenditures. This section is a tool to help foundation staff fully understand the financial expenditures across the life of the project. Together, the Financial Update section and budget template ("Financial Summary & Reporting" sheet) should provide a complete quantitative and qualitative explanation of variances to approved budget.

Note: If you are using an older version of the budget template, this information could be in a different location in your template.

1. Summary

Briefly describe how total project spending compared against the budget and how your assumptions changed as the project progressed.

This financial report provides an overview of the BNFB project over its 3-year period (Nov. 2015–Jan. 2019). The project spent $5m. This reflects 100% utilization of the approved budget for implementing project activities and the 3-month supplemental phase. The implementation period spanned November 2015–October 2018, and the no-cost extension covered the period November 2018–January 2019. Table F1 summarizes the expenditures against the budget under the various budget categories, which were all within the allowable range.

During the latest reporting period (Y3 and Y4), the project used 100% of the allocated budget. Variances between budget categories range between 1% and 5% (see Table F1).

During the project life sub-awardees used 97% of their allocated project live budget. This is $1,461,442 out of allocated budget of $1,514,222, leaving a balance of $52,780 (see Table F1).

Table F1: Project life expenditures against project budget

		Nov 2015 - Oct 2016	*Nov 2016 - Oct 2017*	*Nov 2017 - Oct 2018*	*Nov 2018 - Jan 2019*			
OPP1137764	**PROJECT BUDGET**	**YEAR 1:**	**YEAR 2:**	**YEAR 3:**	**Year 4:**	**Total**	**Balance**	**% Spent**
Budget Categories	**Budget**	**Expenses**	**Expenses**	**Expenses**	**Expenses**	**Expenses**		
	USD	**USD**	**USD**	**USD**	**USD**	**USD**	**USD**	
Personnel	**1,491,450**	347,524	554,283	639,970	- 30,040	**1,511,737**	- 20,287	101%
Travel	**239,502**	61,393	85,109	98,863	107	**245,473**	- 5,970	102%
Consultants	**251,141**	40,258	122,883	50,254	26,357	**239,752**	11,389	95%
Other Direct Costs	**851,511**	125,078	354,980	383,025	26,340	**889,423**	- 37,912	104%
Sub-awards	**1,514,222**	91,937	685,675	716,554	- 32,724	**1,461,442**	52,780	97%
TOTAL DIRECT COST	**4,347,826**	**666,191**	**1,802,929**	**1,888,667**	- **9,960**	**4,347,826**	- **0**	**100%**
Indirect cost	**652,174**	99,929	270,439	276,551	5,255	**652,174**	- 0	100%
TOTAL BUDGET	**5,000,000**	**766,120**	**2,073,368**	**2,165,218**	- **4,705**	**5,000,000**	- **0**	**100%**

As indicated in the Y3Q3 financial narrative report, we had projected that the project partners might not use their total allocated budget. In project Y3 and Y4, sub-awardees spent 93% of their allocated budget. This is $683,830 in expenditures, out of allocated budget of $736,610, leaving a balance of $52,780 (see Table F2).

Table F2: Y3 and Y4 expenditures against project allocated budget

	Nov 2017 - Jan 2019	*Nov 2017 - Oct 2018*	*Nov 2018 - Jan 2019*			
Year 3:	**Year 3 & 4 :**	**Year 3:**	**Year 4:**	**Total Expenses (Y3 + Y4)**	**Budget Balance**	**% Spent**
Budget Categories	**Budget**	**Expenses**	**Expenses**	**Expenses**		
	USD	**USD**	**USD**	**USD**	**USD**	
Personnel	589,644	639,970	- 30,040	**609,930**	- 20,286	103%
Travel	93,000	98,863	107	**98,970**	- 5,970	106%
Consultants	88,000	50,254	26,357	**76,611**	11,389	87%
Other Direct Costs	371,453	383,025	26,340	**409,365**	- 37,912	110%
Sub-awards	736,610	716,554	- 32,724	**683,830**	52,780	93%
TOTAL DIRECT COST	**1,878,706**	**1,888,667**	- **9,960**	**1,878,707**	- **0**	**100%**
Indirect cost	281,806	276,551	5,255	**281,806**	- 0	100%
TOTAL BUDGET	**2,160,512**	**2,165,218**	- **4,705**	**2,160,513**	- **0**	**100%**

Over project Y4 period (Nov. 2018–Jan. 2019), CIP made final project adjustments as the project was coming to an end. This includes aligning total costs to project allocated budget where any over expenditure was reallocated to other CIP cost centers. The adjustments of expenditures incurred during the period are summarized below.

Personnel: Costs include reversal and adjustment of cost that were non-allowable by the donor. These costs are automatically generated by our financial system at the end of each month. And since the project was coming to an end, final adjustments made resulted in a negative total cost of –$30,040.

Travel: These were travel costs incurred during project implementation but captured late in the accounting system. Final invoices were submitted after closure of Y3, hence charged in the Y4 period.

Consultants: These included consultancy charges for editing, formatting, and laying out of BNFB documents and reports that had not been completed; formatting and updating the revised OFSP ToT Manual on *Everything You Ever Wanted o Know about Sweetpotato*; updating the OFSP summary investment guide, and for Godfrey Mulongo, the MLE specialist, whose contract ended in October 2018 and was then engaged as a consultant.

Other Direct Costs: Costs include rent, communication, and previous period (Y3) expenses which had not been charged into the accounting system before closure of the period.

Sub-awards: These included adjustments and registration of partners reported expenses in line with their final financial reports.

Table F3 highlights the total disbursements to partners over the project life against the total expenditures reported. During Y3 there were contractual amendments in line with the amendment of the BMGF's funding schedule where partners were to receive their final payment after submission and approval of their final project reports as detailed in Table F3 over the entire project period and Table F4 during Y3.

Table F3: Partners expenditure over the project life based on funds disbursements

Sub-grants Organization	Project Life		
	Disbursements	Reported Expenditures	Refunds to Partners
CIAT: Biofortified beans-Tanzania	386,462	396,171	9,709
FARA: Regional Advocacy	197,714	204,622	6,908
CIMMYT: Biofortified Maize-Tanzania	351,652	351,652	-
IITA: Biofortified Maize and Cassava-Nigeria	415,834	431,632	15,798
SRI Kibaha: Seed Systems	76,619	77,365	746
TOTAL	**1,428,281**	**1,461,442**	**33,161**

Table F4: Y3 partners' expenditure based on funds disbursements

	A	B	C (A–B)	
Sub-grants Organization	Y1 Disbursements ($)	Y1 Reported Expenditures ($)	Y1 Carry Over Cash Balance ($)	Y1 Spent
CIAT: Biofortified beans–Tanzania	96,236	25,648	70,588	27%
FARA: Regional Advocacy	64,593	18,976	45,617	29%
CIMMYT: Biofortified Maize–Tanzania	129,200	17,754	111,446	14%
IITA: Biofortified Maize and Cassava–Nigeria	104,430	18,098	86,332	17%
SRI–Kibaha: Seed Systems	14,881	11,461	3,420	77%
TOTAL	**409,340**	**91,937**	**317,403**	**22%**

Sub Grants	D Year 2: Disbursements	E (C + D) Year 2: Cash Balance Available	F Year 2: Reported Expenditures	G (E - F) Year 2: Cash Balance	Year 2: % Spent
Organization	USD	USD	USD	USD	USD
CIAT: Biofortified beans-Tanzania	172,194	242,782	162,030	80,752	67%
FARA: Regional Advocacy	47,205	92,822	96,474	- 3,652	104%
CIMMYT: Biofortified Maize-Tanzania	116,801	228,247	142,280	85,967	62%
IITA: Biofortified Maize and Cassava-Nigeria	119,362	205,694	265,716	- 60,022	129%
SRI Kibaha: Seed Systems	28,603	32,023	19,175	12,848	60%
TOTAL	484,165	801,568	685,675	115,893	86%

Sub Grants	H Year 3: Disbursements	I (G + H) Year 3: Available Cash	J Year 3: Reported Expenditures	K (I - J) Refunds to Partners	% Spent
Organization	USD	USD	USD	USD	USD
CIAT: Biofortified beans-Tanzania	118,032	198,784	208,493	9,709	105%
FARA: Regional Advocacy	85,916	82,264	89,172	6,908	108%
CIMMYT: Biofortified Maize-Tanzania	105,651	191,618	191,618	-	100%
IITA: Biofortified Maize and Cassava-Nigeria	192,042	132,020	147,818	15,798	112%
SRI Kibaha: Seed Systems	33,135	45,983	46,729	746	102%
TOTAL	534,776	650,669	683,830	33,161	105%

2. Latest Period Variance

Provide explanation for any cost category variances outside the allowable range. Explain causes, consequences for the project, and mitigation plans if relevant. Report whether or not approval for the variance has been obtained from your Program Officer.

Note: "Latest period variance" compares actuals to previous projections for the period. See "Financial Summary & Reporting" sheet in the foundation budget template for calculated variance. If you are using an older version of the budget template, this information could be in a different location in your template. Allowable variance is defined in your grant agreement.

The latest reporting period covers November 2017 to January 2019 (Y3 and Y4). The no-cost extension period enabled the project team to wind up final payments and write the final report. The project does not have any cost category variance outside the allowable range (see Table F5).

Table F5: Project life budget variance justification

Budget Categories	Expenditures	Spent	Justification
Personnel	1,511,737	101%	The over-expenditure of 1% is associated with personnel costs during the no-cost extension period which is close to the projection made by CIP when requesting a no-cost extension.
Travel	245,473	102%	There was a slight over-expenditure on travel budget based on costs incurred to hold the critical meeting that BNFB held in March 2018 to determine critical areas the project should focus on to meet its objectives within the remaining timeframe.
Consultants	239,752	95%	There was a 5% under expenditure on the consultancies budget category based on the quotations received from consultants.
Other Direct Costs	889,423	104%	Overall, there was a 4% over expenditure on the Other Direct Cost budget category, which supported costs related to advocacy and training events.

Sub-awards	1,461,442	97%	Sub-grantees used 93% of their allocated budget. All partners, other than CIMMYT and TARI–Kibaha, spent 100% of their allocated budgets. CIMMYT spent 87% of its budget because some of the activities planned could not be implemented because PVA maize seed was not yet available to farmers and likewise there was no grain for agro-processors. TARI–Kibaha spent 99% because the project ran out of time and could not follow up on some of the planned activities to fast-track release of varieties. The remaining balance was absorbed in personnel, travel, and other direct costs.
Indirect cost	652,174	100%	
TOTAL BUDGET	**5,000,000**	**100%**	

3. Total Grant Variance

Provide explanation for any cost category variances outside the allowable range. Explain causes, consequences for the project, and mitigation plans if relevant. Report whether or not approval for the variance has been obtained from your Program Officer.

Note: "Total grant variance" compares actuals plus current projections to the budget. See "Financial Summary & Reporting" sheet in the foundation budget template for calculated variance. If you are using an older version of the budget template, this information could be in a different location in your template. Allowable variance is defined in your grant agreement.

By the end of the project life, there were no budget variances.

4. Sub-awards (if applicable)

Use the chart to provide the name(s) of the sub-grantee(s) or subcontractor(s), actual disbursement for this reporting period, total disbursement to date from the primary grantee to sub-awardee, total spend to date by the sub-awardee and total contracted amount.

Note: The total of actual disbursements for this reporting period should equal the actual Sub-awards expenses reported on the "Financial Summary & Reporting" sheet in the foundation template for this reporting period. If you are using an older version of the budget template, this information could be in a different location in your template.

Organization	Actual Disbursement for This Reporting Period ($)	Refunds to Partners ($)	Total Disbursed from Primary Awardee to Sub to Date ($)	Total Sub-awardee Spent to Date ($)	Total Contracted Amount ($)
CIAT: Biofortified beans-Tanzania	118,032	9,711	396,173	396,171	396,170
FARA: Regional Advocacy	85,916	6,906	204,620	204,622	204,620
CIMMYT: Biofortified Maize-Tanzania	105,651		351,652	351,652	403,800
IITA: Biofortified Maize and Cassava-Nigeria	192,042	15,798	431,632	431,632	431,632
SRI–Kibaha: Seed Systems	33,135	746	77,365	77,365	78,000
TOTAL	**534,776**	**33,161**	**1,461,442**	**1,461,442**	**1,514,222**

5. Other Sources of Support (if applicable)

List and describe any sources of *in-kind* project support or resources received in the reporting period.

Note: Names of the other sources of funding and their contributions (U.S.$) should be included in the budget template on the "Financial Summary & Reporting" sheet in the foundation budget template in the Funding Plan table. If you are using an older version of the budget template, this information could be in a different location in your template.

All project partners and implementing institutions have complemented the work of BNFB from other institutional resources (human talent and financial). The technical and administrative teams backstop various activities and processes that are difficult to quantify financially (e.g., reviewing and

revising the learning modules based on their technical expertise). Technical staff from the project and implementing partners have complemented the activities carried out by BNFB by providing technical input in the development of the learning manuals and backstopping project activities on other cross-cutting areas such as nutrition and gender.

CIP for example has spent $348,323 to cover project management support costs/research support and related indirect costs.

Describe how interest earned and/or currency gains were used to support the project.

During the project life, the project earned $2,813 bank interest, while our partners (CIMMYT) earned $347. Out of the total $31,60 interest earned, CIP used $906 to cover the cost of enumerators who were engaged in Nigeria to fast-track the collection of M&E data.

Privacy and Non-Confidentiality Notice

For Foundation Staff to Complete

Analysis (required if PO assessment differs from grantee/vendor assessment or if there are unexpended funds)

Progress Analysis

Include analysis of significant project variances and key learnings that may inform portfolio discussions for progress against the strategic goals.

Budget and Financial Analysis

Include analysis of unexpended funds or over expenditures. Refer to the Unexpended Grant Funds Policy for options available when recommending how to handle unexpended grant funds, or reach out to your primary contact in GCM.

APPENDICES

APPENDIX 1: AGREEMENTS SIGNED BETWEEN CIP AND OTHER PARTNERS

Sub-grant agreements

- **CIAT** signed the sub-grant agreement in May 2016
- **CIMMYT** signed the sub-grant agreement in May 2016
- **FARA** signed the sub-grant agreement in March 2016
- **IITA** signed the sub-grant agreement in March 2016
- **TARI** (formerly Sugarcane Research Institute – Roots and Tubers Program) Kibaha signed the sub-grant agreement in August 2016

Hosting and collaborative agreements

- The **Ministry of Science and Technology, Raw Materials and Research Development Council** in Nigeria had an ongoing hosting agreement with CIP since 2014, which was renewed in 2016
- A collaborative agreement was developed and signed with the **National Root Crops Research Institute** (NRCRI) of Nigeria on 23 February 2017
- CIP and the **MoBNP** of Nigeria developed a draft collaborative agreement in November 2016
- **FMARD** in Nigeria signed a collaborative agreement with CIP in March 2017 in Nigeria
- CIP and **CRS** in Nigeria developed a draft collaborative agreement in March 2017

APPENDIX 2: BNFB IMPLEMENTING PARTNERS WITH THE CAPACITY FOR SCALING UP BIOFORTIFIED CROPS

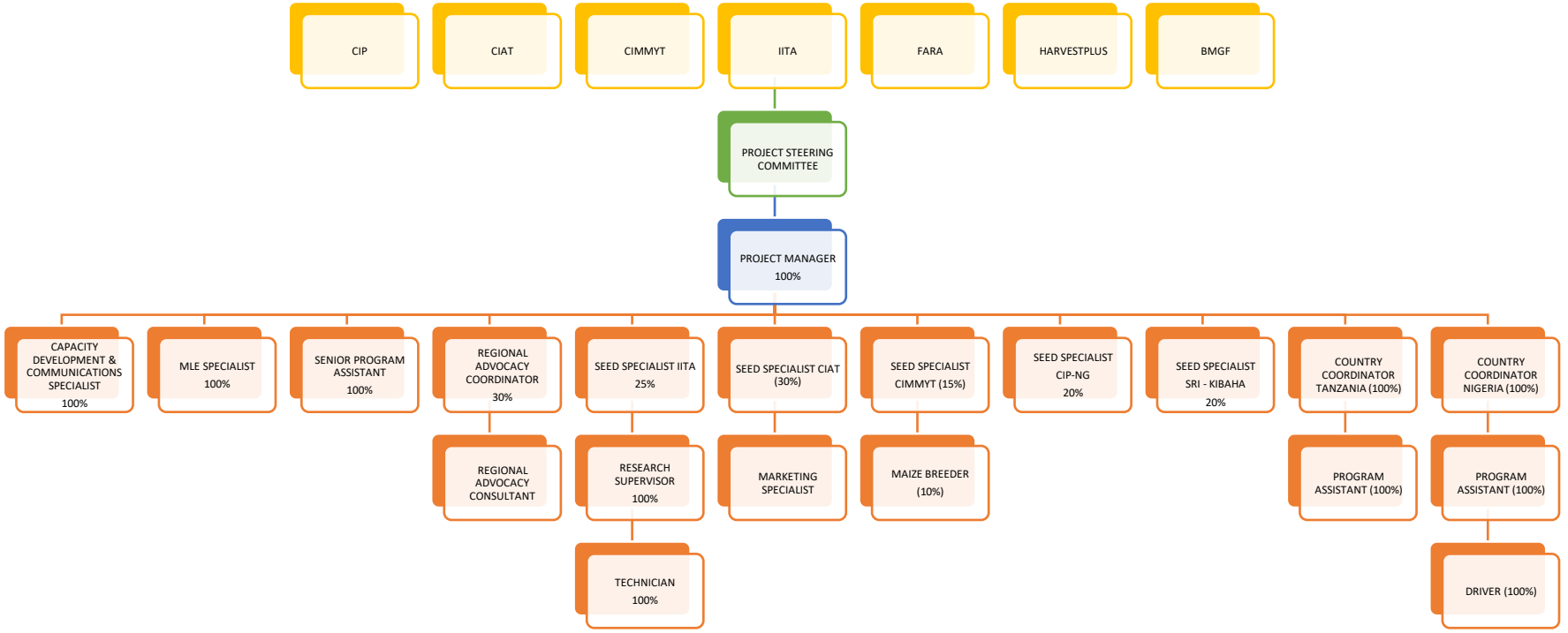
Nigeria

Institution	Area of focus
1. National Root Crops Research Institute – Umudike 2. National Agency for Food and Drug Administration and Control 3. Agricultural and Rural Management Training Institute 4. National Agricultural Seeds Council 5. Enugu State Agricultural Development Programme 6. Kogi State Agricultural Development Programme 7. Ogun State Agricultural Development Programme 8. Taraba State Agricultural Development Programme 9. Federal Capital Territory Agricultural Development Programme 10. Catholic Relief Services	Research; seed production, multiplication, certification, standards and dissemination; processing; marketing of OFSP; advocacy; resource mobilization; capacity development
11. Premier Seed Company 12. Seed Company 13. Value Seed Company 14. Maslaha Seed Company 15. Gold Agric Seed Company 16. Savannah Agricultural Research Institute	Research, production, marketing and distribution of PVA maize seed; training
17. Mahauty Health Solutions	Agroprocessing
18. Federal Ministry of Budget and National Planning 19. Federal Ministry of Health 20. Redeemed Christian Church of God 21. Raw Material Research and Development Council 22. Federal Ministry of Agriculture and Rural Development 23. Civil Society Scaling-Up Nutrition in Nigeria 24. Global Alliance for Improved Nutrition 25. Save the Children – Nigeria 26. Helen Keller International	Advocacy, promotion, awareness creation, policy engagement and implementation, resource mobilization, training, production, utilization, dissemination

Tanzania

Institution	Area of focus
1. Tanzania Agricultural Research Institute – Selian 2. Tanzania Agricultural Research Institute – Uyole 3. Tanzania Agricultural Research Institute – Maruku 4. Arumeru District Council 5. Moshi District Council 6. Hai District Council 7. Mbulu District Council 8. Monduli District Council	Research and production of high-iron and zinc beans, seed multiplication and distribution
9. Meru Agro Tours Company Ltd 10. MAMS Seed Company 11. Tanseed International 12. AFCO Investment Company Ltd	Research, production and marketing of PVA maize seed; processing; seed multiplication and distribution
13. Sokoine University of Agriculture 14. Tanzania Agricultural Research Institute – Kibaha 15. Tanzania Official Seed Certification Institute 16. Tanzania Food and Drugs Authority	OFSP research; production, multiplication and dissemination of vines; seed certification
17. JAGEF Group	Processing
18. Wanawake Waumini Wakristo 19. Sajaranda Bible College in Tanzania 20. Hombolo Research Institute 21. Sokoine University Graduate Entrepreneurs Cooperative 22. Research, Community and Organizational Development Associates 23. Mkalama District Council 24. Ilindi District 25. Tanzania Agricultural Modernization Association 26. Ushirika wa Neema (religious organization in Moshi) 27. World Vision Tanzania 28. FarmAfrica, Tanzania	Production, processing, marketing and dissemination of OFSP vines; capacity development; processing
29. Tanzania Food and Nutrition Center 30. National Food Fortification Alliance 31. prime minister's Office 32. Ministry of Agriculture 33. Ministry of Health Community Development, Gender Elderly and Children 34. Tanzania Agricultural Journalist Forum 35. Partnership for Nutrition, Tanzania	Policy engagement and implementation, advocacy promotion, awareness creation

APPENDIX 3: BNFB ORGANOGRAM



APPENDIX 4: POLICY DOCUMENTS THAT INCLUDE BIOFORTIFICATION, THE CATALYTIC ROLE BNFB PLAYED IN THAT, AND THE SIGNIFICANCE OF THE POLICY

#	Strategic or Policy Document	BNFB Role	Significance of Strategic/Policy Document
1.	Ministry of Agriculture, Livestock and Fisheries' food security draft strategic plan	After Margaret Natai, a nutritionist at the Ministry of Agriculture, Livestock and Fisheries and an advocate under RAC, informed BNFB of an impending revision of the ministry's 5-year strategy in 2016, BNFB requested for the opportunity to provide technical input and support the review process. BNFB was invited to various technical meetings and granted opportunity to provide input to the draft, which it did, calling for the inclusion of biofortification in the plan.	Inclusion of biofortified in this key document sets the stage for prioritization of biofortified crops in the ministry's agenda and resource allocation. It is anticipated, therefore, that the ministry and other partners will likely set apart funds to support the implementation of interventions on biofortified crops.
2.	TFNC's 5-year strategic plan	The hosting of BNFB in the TFNC office had various advantages, such as the opportunity for firsthand knowledge of the nutrition and health plans of TFNC and the government at large. For instance, early in 2017 the project was made aware on efforts to revise TFNC's 2012–2016 strategy, and in February it held meetings with the director in charge of policy and the acting director of TFNC to discuss participation in the review process. BNFB was allowed to attend the technical review meetings and it provided input in the first and second drafts of the document, calling for inclusion of biofortification, which had not been included in the 2012–2016 strategy.	TFNC is the arm of the government responsible for coordination of technical and policy issues and action on nutrition in Tanzania. TFNC works closely with the prime minister's Office, especially the Directorate of Nutrition, and has convening powers to bring together technical actors from different sectors. TFNC is responsible for hosting technical committees to discuss policy and nutrition issues. The strategic plan facilitates the implementation of the national priorities outlined in Tanzania's Vision 2025 and the National Strategy for Growth and Reduction of Poverty II (MKUKUTA II). Furthermore, the strategy is likely to attract funding, and some of that will be set aside for activities on the promotion, production and consumption of biofortified crops, which the strategy prioritizes.
3.	Terms of reference for the National Food Fortification Alliance (NFFA)	After intensive consultations, TFNC collaborated with BNFB and hosted a meeting on 29 June 2017 that brought together members of NFFA in Dar es Salaam. The meeting was aimed at advocating for inclusion of biofortification in the agenda and TORs of the alliance. NFFA formed a biofortification task force led by BNFB to deliberate on and help synchronize its activities with the priority areas of the BNFB advocacy strategy for scaling up biofortified crops for nutrition security in Tanzania. BNFB and TFNC then hosted a national multi-stakeholder meeting on 29 June 2017 that ratified the inclusion of biofortification as one of the areas of attention under the umbrella of NFFA.	NFFA deals with vitamin A and iron-folic supplementation, food fortification, salt iodation, and micronutrient powder supplementation for children aged 6–23 months. It brings together stakeholders in industrial food fortification from public and private sectors, academia, NGOs and multisectoral and bilateral organizations. Including biofortification in NFFA's revised TORs ensures a holistic approach is applied in industrial fortification and that biofortification will be championed by NFFA. Moreover, NFFA is already an established multisectoral national structure and its entrenching of biofortification will ensure its sustainability
4.	National Multi-Sectoral	The director of TFNC requested BNFB to provide technical support in the	NMNAP reflects Tanzania's commitment to addressing the

#	Strategic or Policy Document	BNFB Role	Significance of Strategic/Policy Document
	Nutrition Action Plan (NMAP)	drafting of NMNAP. BNFB thus got a role in the technical group working on the key result area of micronutrients. The country coordinator participated in all the meetings that drafted the document and succeeded in getting biofortification entrenched in the implementation plan.	unacceptably high levels of malnutrition. It is the highest demonstration of Tanzania's political will and government commitment to nutrition. NMNAP complements the policy within the government's Five Year Development Plan II (FYDP II), 2016/17–2020/21, and is a double-action plan that addresses malnutrition in all its forms. NMNAP "translates into a single comprehensive national plan the nutrition relevant national, regional and international commitments that Tanzania has made" (NMAP, p. 3).
5.	Nigerian Food and Nutrition Policy (2016–2020)	BNFB held several preliminary consultations with the Federal Ministry of Budget and National Planning in Nigeria, which has the mandate to drive the food and nutrition agenda in 9 key line ministries and 17 departments, agencies, development organizations and other stakeholders. BNFB supported the multisectoral platform and actively participated in the multisectoral quarterly meeting held at the end of October 2017. The theme of the meeting was "Multisectoral response to the declared state of emergence on malnutrition in Nigeria." BNFB made a presentation on the holistic approach to responding to malnutrition and advocated for the mainstreaming of biofortification in organizational programs to compliment ongoing efforts to end malnutrition in Nigeria. BNFB further participated in various relevant multisectoral meetings to review the national advocacy brief, the nutrition newsletter and the National Policy on Food and Nutrition in Nigeria	The document captures statements on the dissemination, processing and marketing of biofortified crops to alleviate micronutrient deficiency. It further recognizes biofortification and commits the government to funding and promoting the crops for nutrition security in the country. It is anticipated that the implementation of this policy will unlock investments from the government and development partners in support of programs on biofortification.
6.	Draft Nigerian Food and Nutrition Strategic Plan of Action	The country coordinator attended the launch of the revised National Food and Nutrition Policy on 6 September 2016, where the guest of honor, the first lady of the federation, was made the nutrition ambassador for Nigeria. However, the policy document refers to nutritious foods not explicitly to biofortification. BNFB worked closely with the Ministry of Budget and National Planning who have attended follow-up discussions on a mechanism to address biofortification	This document operationalizes the Nigerian Food and Nutrition Policy (2016–2020) by outlining the practical steps to implement the aspirations in the policy, including biofortification.
7.	Agricultural Sector Food Security and Nutrition Strategy (2016–2025) of FMARD	BNFB organized an advocacy program at FMARD in April 2017, attended by the minister of state, the permanent secretary, three senior advisors to the minister, the director to the minister, 12 other directors from the ministry, and heads of units or divisions. BNFB presented up-to-date information on	This strategy was developed to guide the activities of FMARD and the wider agricultural sector in Nigeria for improved nutrition. The document outlines the aspirations of the strategy, indicating that its implementation will ensure effective advocacy for

#	Strategic or Policy Document	BNFB Role	Significance of Strategic/Policy Document
		biofortification and exhibited biofortified crops available in Nigeria. Afterwards, BNFB was invited as a member of the task force to help draft and review the strategic document.	mobilizing the necessary human, material and financial resources and encourage sustained commitment to agricultural development for improved nutrition. Biofortification is featured under priority area No. 2: Diversify household food production and consumption, especially targeting women, and increase access to micronutrient rich foods. The inclusion of biofortification in this document has ensured that FMARD has mainstreamed biofortification it its programs such as the nutrition program and has allocated resources in support of biofortified crops.
8.	AfDB Multisectoral Nutrition Action Plan (2017–2021)	Through FARA and the regional advocates, BNFB engaged AfDB on the sidelines of various regional forums and meetings. BNFB further provided advocacy materials and shared the regional biofortification strategy with AfDB. BNFB was also invited to provide input into the draft Action Plan.	The action plan sets out the bank's vision and intended actions to spearhead the development of safe and nutritious food systems in Africa during 2017–2021. The action plan specifies three areas of intervention, with biofortification being covered under area No. 3 on increased production and consumption of safe and nutritious foods. The plan commits to support efforts geared towards overcoming scaling up challenges for biofortification. The bank further commits to mainstreaming biofortification in its programs, including in funding.
9.	CORAF Nutrition Strategy for Implementation of Promoting West Africa Trade Integration	FARA met with Rehana Valley, the consultant developing the nutrition strategy for CORAF, in Accra and briefed her about BNFB and what FARA and regional champions are doing in nutrition. They discussed key issues that could be considered in the draft CORAF nutrition strategy. FARA shared the BNFB regional advocacy strategy with her and other documents showing evidence of the impact of biofortification on improving an individual's nutritional status.	This strategy emphasizes the multiple benefits associated with the ability of households and individuals to have a wide range of agricultural commodities for consumption, recognizing the importance of food as a key contributor to a good nutritional state. The strategy is a key reference document for the West Africa Agricultural Productivity Program (WAAPP) countries in their efforts to effectively address the inclusion of nutrition in agricultural and food systems. Therefore, the inclusion of biofortification effectively ensures the prioritization of biofortified crops in WAAPP countries' agendas.
10.	African Union Business Plan to guide implementation of the CAADP-Malabo	FARA and CIP organized a side event during the 14th CAADP Partnership Platform meeting held in Gabon on 25–27 April 2018. The side event was titled "Increasing youth and women participation in biofortified crop value chains."	The main purpose of the AU-CAADP Business Plan (2017–2021) is to provide a clear, concise and agreed upon strategic framework for guiding implementation and delivery of the commitments

#	Strategic or Policy Document	BNFB Role	Significance of Strategic/Policy Document
	Declaration (2017–2021)	BNFB sponsored 5 female and 4 male youth, including a journalist, to participate in the side event and showcase their work in promoting biofortified foods through agribusiness. The youth were part of the advocacy capacity enhancement training organized on 24 April in Gabon, where regional champions shared experiences and lessons from their advocacy work. BNFB further contributed to the formulation of the final communique that called upon governments to prioritize nutrition-sensitive value chains and create agribusiness opportunities for women and the youth. Additionally, through collaborative advocacy efforts of BNFB, HarvestPlus and AU, biofortification was included in the 2nd AU Specialized Technical Committee Meeting agenda and was later endorsed at that meeting.	outlined in the CAADP-Malabo Declaration. The business plan has seven result areas. Biofortification is prioritized under result area number three, which is "Ending hunger in Africa by 2025: access to and use of increased agricultural inputs and mechanization, post-harvest management, homegrown school feeding, biofortification, food and nutrition knowledge management, nutrition status and nutrition coordination, food/diet diversification, and social protection."
11.	Communique on the PAP and NEPAD nutrition document and the Resolution of the PAP–NEPAD High Level Event on Nutrition And Food Systems	Through the leadership of FARA, BNFB and the biofortification champions participated in the PAP and NEPAD nutrition event on 7 March 2018 in South Africa. The PAP Nutrition and Food Systems resolutions were presented and global linkages and opportunities for improved nutrition and food systems were enhanced. Awareness on biofortification and its role in combating hidden hunger was raised among the PAP members, policy-makers and other stakeholders who were encouraged to mainstream food-based approaches, including biofortification, in regional agricultural and nutrition policies, strategies and investment plans. In the final communique, participants recognized the importance of flagship programs such as home-grown school feeding; food fortification, including biofortification; maternal and child nutrition; capacity development; and policy and advocacy. The document was endorsed by the other committees during the plenary session of PAP in May 2018.	In this resolution, African leaders made a landmark commitment to remove nutrition-related barriers that prevent children and societies from realizing their full potential. Biofortification was included as one of the key strategies in that commitment.

APPENDIX 5: BIOFORTIFICATION ADVOCATES AND CHAMPIONS IN NIGERIA

#	Name	Position	Organization
1.	Towobola Zainab	Head, Nutrition and Food Safety Unit	Federal Ministry of Agriculture and Rural Development
2.	Gabriel Roselyn Ronke	Deputy Director	Ministry of Budget and National Planning
3.	Adeola Ojo Mojirade	Deputy Director	Raw Materials Research and Development Council
4.	Onadipe Rotimi Bolaji	CEO	Young Entrepreneur Council
5.	Oguzor Buduzhi Gift	Nutritionist	Primary Health Care Development Agency
6.	Moses Nagbiku, Celia Penny	Health Educator	Civil Society Scaling-Up Nutrition in Nigeria
7.	Ayoola Olobunmi Olutoyin	Director	O-Meal
8.	Olatunde Ganiyat Olayinka	Lecturer	Federal University of Agriculture, Abeokuta
9.	Okey-Onyema, Ebere Mercy	Farmers' Coordinator	Non governmental organization
10.	Onyi Esther	Farmers' Coordinator	Non governmental organization
11.	Afolabi Samson	Manager	Premier Seed
12.	Fashire Yemisi	Farmer	Private sector
13.	Olayiwola Adeola	Youth Coordinator	Osun Youth Empowerment Scheme
14.	Faruq	Rural Facilitator	National Development of Employment
15.	Loko Veronica Dayo	OFSP Desk Officer	Federal Ministry of Agriculture and Rural Development
16.	Okoro Clementina	Nutritionist Coordinator	Federal Capital Territory
17.	Akinbinu Adeyinka	Assistant Director	Federal Ministry of Agriculture and Rural Development
18.	Uruakpa John	Nutrition Officer	Ministry of Health
19.	Adesanmi Abimbola	National Team Leader	Home Grown School-Feeding Program
20.	Onabolu Adeyinka	Senior Advisor	Federal Ministry of Agriculture and Rural Development
21.	Virgy Claire	Farmer	Private sector
22.	Samuel Folake	Senior Lecturer	University of Ibadan
23.	Akanbi Babatunde	Professor	Ladonko Akintola University
24.	Moma Philippa	Consultant	Private sector
25.	Jane Arinze Egemonye	Advocate	Civil Society Scaling-Up Nutrition in Nigeria
26.	Okanlawon Foluke	Farmer	Private sector
27.	Iheonu Mary	Assistant Director	Agricultural Development Program - Federal Capital Territory
28.	Alonge Temitope	Farmer	Private sector
29.	Ayansanwo Taiwo	Program Manager	Agricultural Development Programme
30.	Jubril Elizabeth	Farmer	Private sector
31.	Caroline Felix-Doko	Farmer	Private sector
32.	John Oveh-Atah	Assistant Director	Agricultural Development Programme

APPENDIX 6: BIOFORTIFICATION ADVOCATES AND CHAMPIONS IN TANZANIA

	Name	Position	Organization
1.	Areth K. Teophil	Researcher	TOSCI
2.	Faraja Kassim	Communication Officer	PANITA
3.	Dr E. Towo	Food Scientist	TFNC
4.	Mussa Twangilo	Journalist	TBC
5.	Tumain E. Mkange	Programme Officer	Farm Africa
6.	Regina Kapinga	Advocacy & Resource Mobilization	IITA
7.	Tumaini Mkindo	Executive Director	PANITA
8.	Joyce Lyimo –Macha	Associate Professor	Sokoine University of Agriculture
9.	Hussein Mansoor	Director of R&D	MALF
10.	Kiddo Mtunda	CO-PI	TARI–Kibaha
11.	Firmin Mizambwa	Chief Executive Officer	ASA
12.	Joseph Mwambije	Journalist	ITV
13.	Mary G. Mdachi	Researcher	TARI–Selian
14.	Gerald Kitabu	Journalist	The Guardian
15.	Alain Mhando	Assistant Program Officer	TASTA
16.	Bob Shuma	Executive Director	TASTA
17.	Obey Assery	Director	Prime minister's office
18.	Dr. Vincent Assey	Director General	TFNC
19.	Celestin Mgoba	Research Scientist	TFNC
20.	Dr. Ladislaus Kasankala	Research Scientist	TFNC
21.	Novatus Tesha	Economist	Prime minister's office
22.	Sarah Mshiu	Economist	Prime minister's office
23.	Pascal Vyagusa	Economist	Prime minister's office
24.	Godfrey Benegura	Extension Officer	Wanging'ombe DC
25.	Domana Metha	Director	Perfect Farm Group
26.	Jolenta Joseph	Nutritionist	SUGECO
27.	Revocatus Kimario	Director	SUGECO
28.	Paschal M. Nchunda	Executive Director	Tanzania Agricultural Modernization Association
29.	Idda Paul	Director	Manyara
30.	Dominick Ringo	Director	RECODA
31.	Cuthbert Mwinuka	DAICO	Mkalama DC
32.	Audax Rukonge	Director	ANSAF
33.	Stephen Ruvuga	Director	MVIWATA
34.	Isaka Mashauri	Director	Tanseed International
35	Joseph Kiraiya	Assistant Director	Prime minister's office
36.	Watanga Chacha	Executive Director	Meru Agro Tours Company
36.	Edith Kadege	Principal Scientist	TARI–Selian
37	Salma R. Kikwete	Member of Parliament	Parliament of Tanzania
38	Daphroza Jerome	Nutritionist	Ministry of Agriculture
39.	Margret Natai	Nutritionist	Ministry of Agriculture
40.	Aggrey Mshana	Nutrition Officer	Ministry of Health Community Development, Gender, Elderly and Children
41	Grace Moshi	Nutrition Officer	Ministry of Health Community Development, Gender, Elderly and Children
42	Rehema Mzimbiri	Food Scientist	TFNC

APPENDIX 7: REGIONAL ADVOCATES AND CHAMPIONS

	Name	Organization	Position	Residence
1.	Anna-Marie Ball	HarvestPlus		USA
2.	Mariam Akiror	Africa Strategic Alliances, HarvestPlus	Advocacy specialist	Uganda
3.	Julia Tagwireyi	Independent consultant in food and nutrition	Member of NEPAD Food and Nutrition Expert Panel	Zimbabwe
4.	Francis Zotor	University of Health and Allied Sciences	Immediate Past President, African Nutrition Society	Ghana
5.	Kefilwe Moalosi	NEPAD	Nutrition Programme and Research Officer	South Africa
6.	Laila Lokosang	African Union Commission	Food and Nutrition Advisor	Ethiopia
7.	Nelson Ojijo	Access Agriculture	Executive Secretary	Kenya
8.	Mawuli Sablah	FAO Regional Office for Africa	Chief Technical Advisor, CAADP, Nutrition	Ghana
9.	Matilda Steiner-Aseidu	University of Ghana	Prof of Nutrition & Dean, School of Biological Sciences	Ghana
10.	Isatou Jallow	Formerly of NEPAD	Senior nutrition advisor; independent consultant	Gambia
11.	Rossana Agble	Formerly of Nutrition Unit, Ministry of Health, Ghana	Director, Nutrition Unit	Ghana
12.	Mohamed Ag Bendech	Formerly of FAO	Former Regional Nutrition Officer	
13.	Josephine Kiamba	Formerly of NEPAD	Independent consultant	Kenya
14.	Dia Sanou	Nutrition Officer for Eastern Africa	FAO	Ethiopia
15.	Gloria Essilfie	Postharvest Specialist	University of Ghana	Ghana
16.	Yemi Akinbamijo	Executive Director	FARA	Ghana
17.	Rose Omari	Consultant	FARA	Ghana
18.	Dr Margaret Akinyi Wagah	Development Concern International	International Food & Nutrition Security Consultant	Kenya
19.	Anthony Morrison	Ghana Chamber of Agribusiness	President /youth	Ghana
20.	Roseline Delali Ashigbui	Delchris Africa Ltd	Entrepreneur/ managing director/representing youth & women	Ghana
21.	Eric Nyikwagh	Freelance consultant on agribusiness and food security	Consultant/youth	Nigeria
22.	Kofi K. Acquaye	FARA	Programme Officer for YPARD Africa/ representing youth	Ghana
23.	Calistus Tandong	Freelance journalist	Journalist representing youth	Cameroon
24.	Mmachukwu Onyinye Orizu	Food processing	Entrepreneur/representing youth	Nigeria
25.	Naomi Kidumbuyo	AFCO Investment Company Ltd	Marketing and Communications Manager/ representing youth	Tanzania
26.	Jolenta Joseph	SUGECO	Lead Technical Nutritional Advisor to Youth/ representing youth	Tanzania
27.	Amina R. Mhando	SUGECO	Entrepreneur/ Youth	Tanzania

FAO = Food and Agriculture Organization of the United Nations

APPENDIX 8: RESOURCES RAISED TO SUPPORT INITIATIVES ON BIOFORTIFICATION IN TANZANIA AND NIGERIA

Implementing Institution	Category of Implementing Institution	Donor	Project Focus	Budget ($)	Location of Project	Status of Project	Duration
Chunya District Council, Tanzania	Local government	Local government	Vine multiplication and dissemination, nutrition and education	10,000	Tanzania, Chunya district	Ongoing	2017–2022
Gairo District Council, Tanzania	Local government	Local government	Vine multiplication and dissemination, nutrition and education	6,000	Tanzania, Gairo district	Ongoing	2017–2018
Iramba District Council	Local government	Local government	OFSP production	1,794	Tanzania, Iramba	Ongoing	2017–2018
Mkalama District Council	Local government	Local government	OFSP production	4,484	Tanzania, Mkalama	Ongoing	2017/18
Bahi District Council	Local government	Local government	Production of biofortified crops	7,175	Tanzania, Bahi District Council	Ongoing	2017/18
Manyoni District Council	Local government	Local government	OFSP production	2,242	Tanzania, Manyoni	Ongoing	2017/18
SRI-Kibaha	NARI	ENRICH (HarvestPlus & World Vision)	ToT courses on OFSP	27,336.10	Tanzania, multiple locations	Phase 1	2016/17
Agricultural and Rural Management Training Institute	Public tertiary training institution	Federal government	ToT courses on OFSP	84,180	Nigeria, multiple locations	Phase 1	2016/17
CRS	NGO	USAID	Distribution of biofortified crop planting materials	300,000	Nigeria, multiple locations	Ongoing	2016–2018
Premier Seed Company Ltd	Private	Private	Production and marketing of PVA maize seeds	983,486.10	Nigeria, multiple locations	Ongoing	2016–2017
Save the Children	International organization	Department for International Development (UK)	Vine multiplication and dissemination, nutrition and education	510,000	Nigeria, multiple locations in the north	Ongoing	2018–2020
CRS	NGO	USAID	Training materials (OFSP and yellow cassava)	15,000	Nigeria, multiple locations	Ongoing	2017–2018
FMARD	Federal government	FMARD	Biofortified foods as an emergence response to the food insecurity situation of IDPs in Borno State	130,000	Borno State	Completed	2016–2017
GAIN	State government	NGO	Support to Oyo State stakeholders' sensitization	4,370	Oyo State	Competed	2018

Implementing Institution	Category of Implementing Institution	Donor	Project Focus	Budget ($)	Location of Project	Status of Project	Duration
CIP leading	International organization	AfDB	OFSP production and marketing	260,000	Nigeria and Tanzania, multiple locations	Phase 1	2017–2018
Multiple (HarvestPlus and partners)	Federal and state governments and international NGOs	Other	Production, processing and marketing of yellow cassava	2,000,000	Nigeria, multiple locations	Ongoing	2017
CIAT	International organization	AfDB and PABRA	High iron and zinc bean production and marketing	600,000	Tanzania, multiple locations	Phase 1	2017–2018
TFNC	Public institution	Central government	Machinery	90,000	Tanzania, multiple locations	Ongoing	Open ended
Meru Agro Tours Company	Private sector	Private sector	Multiplication of PVA maize grain	61,000	Tanzania, multiple locations	Ongoing	2017–2018
Helen Keller International	International organization	Mondelēz International Foundation	Production and use of OFSP and other vegetables	878,315	Nigeria, multiple locations	Ongoing	
SUGECO	Private	Private	OFSP VC	318,000	Tanzania, multiple locations	Ongoing	2017–2018
Perfect Farm Group	Private	Private	Production and processing of OFSP, high-iron beans and PVA maize	18,200	Tanzania, multiple locations	Ongoing	2017–2018
AFCO Investments Ltd	Private	Private	Investment in processing, storage facilities, awareness creation, marketing	27,300	Tanzania, multiple locations	Ongoing	2017–2018
Various	Private	Private	Investments to conduct step-down courses	39,880.50	Tanzania, multiple locations	Completed	2016–2018
Various	Private	Private	Investments to conduct step-down courses	32,979	Nigeria, multiple locations	Completed	2016–2018
SRI-Kibaha	NARI	FAO	Production, marketing and processing of OFSP	51,180	Tanzania, Dodoma region	Project document	2018–2019
RECODA	NGO	NGO	Training, production, marketing & processing of OFSP	80,309	Tanzania, multiple locations	Ongoing	2017–2018
Total				**6,543,230.70**			

APPENDIX 9: RESOURCES IN THE PIPELINE

Submitting Institution	Category of Submitting Institution	Donor	Project Focus	Budget ($)	Location of Project	Status of Project	Duration
GAIN/FMARD and CIP	Multiple	EU	Production of biofortified crops	10,000,000	Nigeria, multiple locations	Concept note	2018–2021
Farm Africa/ SUGECO	Multiple	AGRA	Production of biofortified crops	2,400,000	Tanzania, multiple locations	Concept note	2018–2020
AFCO Investments Company	Private	USAID	OFSP and PVA maize value addition	50,000	Tanzania, multiple locations	Concept note	2018–2019
RECODA	NGO	SIDA	OFSP production	400,000	Tanzania, multiple locations	Concept note	2018–2020
Ministry of Agriculture, Tanzania	Public	Government	Production of biofortified crops	45,000	Tanzania, multiple locations	Budget allocation	2018–2019
Total				**12,895,000**			

APPENDIX 10: STUDIES CONDUCTED AND PUBLICATIONS PRODUCED BY BNFB

#	Title	Purpose	Value Addition	Format	Status
1.	Consumer acceptance of and willingness to pay for high-iron beans in northern Tanzania	The report looks at the status of biofortified beans in the northern zone of Tanzania, assesses consumer perception and acceptability of high-iron beans and evaluates rural and urban consumers' willingness to pay for high-iron beans compared to conventional bean varieties	The findings indicate that about 95% of bean consumers in both rural and urban areas were willing to pay for iron-biofortified bean as a hidden trait. These consumers were willing to pay a price 25% higher than the prevailing market bean price. This information guided policy-making processes and investment decisions leading to increased production and consumption of biofortified beans to help address the high levels of anemia, resulting in health and wealth benefits, particularly for poor households.	Research report	Published by CIAT, August 2018
2.	Pro-vitamin A maize within the maize seed systems and grain value chain in Tanzania	This study report documents the key actors in the maize value chain and maize seed demand and supply dynamics in Tanzania and provides information that helps to understand the PVA maize value chain. Specifically, the study provides information on the quantity of maize certified and quality declared seed produced and the level of use of farmer-saved and recycled maize seed by region and district in Tanzania. It provides a list of companies producing and marketing maize seed and their market sizes.	The study was very useful and timely in guiding decision-making by policy-makers and investors in Tanzania. Results showed that although the potential area for maize cultivation was 16,195,384 ha, the area under the crop maize cultivation in the 2017/18 season was only 4,839,842 ha, indicating there was high potential for increased production. More than 70.1 % of land that is suitable for maize cultivation is not being fully utilized. Approximately 42,000 t of seed was produced in the last 3 years, and very low quality declared seed was being produced. Seed demand was estimated at 105,000 MT (a substantial amount is recycled). About 37 companies were marketing maize seed, with 3 seed companies importing and producing seed. Maize production increased from 5.1 million tons in 2012 to 8 million MT in 2016. Productivity also improved, going from 0.5 t/ha in 2003 to 2.5 t/ha in 2016. The southern highlands had the highest productivity at 3 t/ha. The grain exported was approximately 62,000 MT in 2015 but dropped to 45,000 MT in 2017. The report was published and disseminated to guide investment decisions, and a journal article manuscript has been submitted for consideration.	Research report and journal article manuscript	Published by CIMMYT, October 2018
3.	Ex-post evaluation study on the RAC project (2011–2014)	The ex-post evaluation report highlights the relevance, effectiveness, efficiency, impact and sustainability of the RAC project (2011–2014) and how these enabled many households to access and consume OFSP. The evaluation also aimed at improving the understanding of the communities' level of knowledge gained through various capacity-building interventions and at understanding the lessons learned in scaling up OFSP that could be applied to the BNFB project	The results contributed to the global understanding on the scaling up approaches for food-based interventions. The findings showed that there was a high demand for OFSP in schools, in households and in urban areas. National and local governments continue to allocate resources for biofortification in their annual budgets. For example, the Federal Government of Nigeria provided Us$ 819,289.34 (then equivalent to N134,500,000) in funding for the Rainbow project, which helped reach well over 40,000 households. The Tanzania government has committed US$ 115 million for the implementation of NMNAP. Investment in capacity development efforts to train facilitators to train	Research report and journal article manuscript	Research report published by CIP, May 2018

#	Title	Purpose	Value Addition	Format	Status
			others has borne fruit and results show that more than 71,602 extension workers, teachers, pupils, nutrition workers at village level, and farmers have been trained, all having been reached by step-down training that started with only 38 graduates of the RAC ToT courses. The step-down approach is continuing to be used. The generic lessons learned from the ex-post evaluation of the RAC project helped guide the scaling up of the nutritious biofortified food basket and will guide future scaling up initiatives. The report concluded that RAC succeeded in building the capacity of individuals and institutions to promote and scale up OFSP in the target countries and through policy engagement and raising of new investment in support of biofortification.		
4.	Building Nutritious Food Baskets Project 'Insights from the field'	This booklet is a compilation of success stories and insights from the field gathered while implementing the BNFB project	The success stories highlight BNFB's experience and interactions with various stakeholders during its implementation. It highlights the successful partnerships and the process the project pursued to deliver results, outcomes and the emerging impact that other projects could learn from.	Booklet – print and electronic	Published and disseminated
5.	The BNFB model on scaling-up multiple crops: key lessons learned	This booklet documents the BNFB scaling up model and aims at fostering widespread understanding of a scaling up approach based on a good policy environment, strong institutional capacities and proven technologies (biofortified crops)	The process that BNFB went through has been documented and the best practices, challenges, successes, opportunities and lessons learned that could be replicated or used to inform other scaling up initiatives.	Published book – print and electronic	The manuscript is undergoing editing in readiness for publication
	Journal articles				
	FARA article	Advocacy for scaling up biofortified crops for improved micronutrient status in Africa: approaches, achievements, challenges and lessons	Article submitted to *Proceedings of the Nutrition Society* (Cambridge University Press) accepted and proof received for incorporation of comments	Article in proceedings	Article accepted and undergoing revision and editing
	CIMMYT article	The maize seed systems and grain value chain in Tanzania: implications for pro-vitamin A maize	Journal manuscript submitted to the editor in chief for consideration	Manuscript pending feedback on acceptance	Manuscript submitted to the *African Journal of Food, Agriculture, Nutrition and Development*
	CIP article 1	Scaling-up orange-fleshed sweetpotatoes: achievements, challenges and lessons learnt from the Reaching Agents of Change project	Draft manuscript being reviewed internally	Manuscript has been drafted and is being reviewed internally	Manuscript being reviewed

#	Title	Purpose	Value Addition	Format	Status
	CIP article 2	Scaling up a multi-crop food basket for nutrition security in Nigeria and Tanzania	Draft manuscript being reviewed internally	Manuscript drafted and under internal review	Manuscript being reviewed
	Policy briefs				
	Nigeria policy brief	National advocacy policy brief prepared by the Federal Ministry of Budget and National Planning	Draft policy brief developed but not completed	Draft	Draft
	Tanzania policy brief	Addressing micronutrient malnutrition in Tanzania through biofortification	Draft policy brief developed but time did not allow for completion	Draft	Draft – reviewed internally and pending finalization
	Regional policy brief	Biofortified crops for addressing micronutrient deficiency: a food-based intervention that works	Draft policy brief developed but time did not allow for its completion	Draft	Draft
	Regional policy brief	Investment opportunities in biofortified crop value chains: a proven solution to youth and women unemployment	Draft policy brief developed but time did not allow for its completion	Draft	Draft

ANNEXES

The six annexes are submitted as separate files from the main (Word) report file; Annex 1 is an Excel file, Annexes 2–6 are pdf files.

- Annex 1: BNFB Results Framework
- Annex 2: Final Technical Report—FARA
- Annex 3: Final Technical Report—CIAT
- Annex 4: Final Technical Report—CIMMYT
- Annex 5: Final Technical Report—IITA
- Annex 6: Final Technical Report—TARI–Kibaha