



Building
Nutritious
Food Baskets

Advocacy Strategy for Scaling Up Biofortified Crops for Nutrition Security in **Tanzania** (2016-2020)

AUGUST 2017



Advocacy strategy for scaling up biofortified crops for nutrition security in Tanzania, 2016–2020

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Acronyms

ANSAF	Agricultural Non-state Actors' Forum
ARI	agriculture research institute
BNFB	Building Nutritious Food Baskets Project
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Centre
CIP	International Potato Center
DFID	Department for International Development
DUS	distinctness, uniformity and stability
ESDP	Education Sector Development Plan
FAO	Food and Agriculture Organization of the United Nations
INSET	In-service Teacher Training
LGA	local government authority
MALF	Ministry of Agriculture, Livestock and Fisheries
NFFA	National Food Fortification Alliance
NPT	national performance trial
OFSP	orange-fleshed sweetpotato
PANITA	Partnership for Nutrition in Tanzania
PVA	pro-vitamin A
RAC	Reaching Agents of Change Project
SUA	Sokoine University of Agriculture
SUGECO	Sokoine University Graduate Entrepreneurs Cooperative
SWOT	strength, weakness, opportunities and threats
TBS	Tanzania Bureau of Statistics
TDHS	Tanzania Demographic and Health Survey
TFDA	Tanzania Food and Drugs Authority
TFNC	Tanzania Food and Nutrition Centre
TOSCI	Tanzania Official Seed Certification Institute
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VAD	vitamin A deficiency
WFP	World Food Programme

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1. Introduction

1.1 Background and rationale

Micronutrient deficiency, also known as hidden hunger, is one of the main silent killers of children and mothers globally. Most women of reproductive age, infants and young children suffer from deficiencies of vitamin A, iodine, iron, zinc and folate, which are associated with high mortality rates, birth defects, anemia, blindness, infertility, increased vulnerability to infections, and reduced growth rates and cognitive defects in children. In Tanzania, the prevalence of vitamin A deficiency (VAD) is 33% among children aged 6–59 months (see Fig. 1) and 42% among women of reproductive age (TDHS, 2010). Anemia prevalence among these groups is 58% and 45%, respectively (TDHS, 2016).

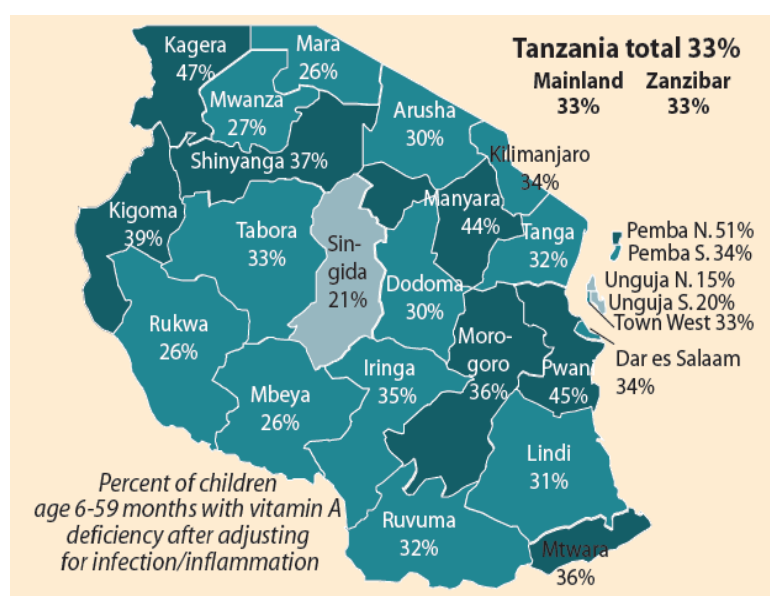


Figure 1: Percentage of children 6–59 months with VAD in Tanzania

Source: TDHS (2010)

The ravages of hidden hunger may be veiled but are dreadful nonetheless. For example, the damage caused by malnutrition in the first 1,000 days of life mostly is irreversible (Bellieni, 2016). During pregnancy women often become more deficient in micronutrients with the need to provide nutrition for the baby too, and this can impact their health and that of the baby (Haider & Bhutta, 2015). For example, micronutrient deficiency during pregnancy is associated with adverse health outcomes such as high maternal, perinatal and neonatal mortality rates; pre-term and still birth; birth defects; maternal anemia; blindness; intra-uterine growth restriction; altered immune response; increased infections; and reduced growth and cognitive deficits in the newborn (Wessells et al., 2017).

To address micronutrient deficiency, nutrition education to promote consumption of a diversified diet, supplementation, and food fortification are some of the classical strategies employed in Tanzania. Mandatory large-scale food fortification is enforced for maize flour, wheat flour and cooking oil at the industry level. Micronutrient powders are available that can be added to baby food before feeding. However, these powders are currently used only in program-specific interventions. Tanzania also offers micronutrient supplementation of vitamin A primarily to children under five years of age and iron and folic acid to pregnant women. Although these strategies have attained commendable results, there are still various challenges and limitations. For example, for their success, these interventions require enhanced infrastructure, critical mass awareness, ability to buy the needed food and supplements, a vibrant manufacturing sector, and access to markets and

health care systems. But these are often not available to people living in remote rural areas (Mayer, Pfeiffer & Beyer, 2008).

Biofortification is a sustainable and cost-effective approach to complement the efforts to reduce micronutrient deficiencies. It is the process of breeding nutrients into food crops through conventional methods. Biofortification provides a sustainable, long-term strategy for delivering micronutrients to rural populations in developing countries (Saltzman et al., 2013). Evidence shows that biofortification offers the most effective, sustainable and least-cost delivery model with regards to supplying micronutrients of importance, namely iron, zinc, vitamin A, lysine and tryptophan (Bouis & Saltzman, 2017). For instance, consumption by children and non-lactating mothers of 125 g a day of most orange-fleshed sweetpotato (OFSP) varieties can supply them with the recommended daily allowance of vitamin A (Waized et al., 2015). Some of the biofortified crops such as maize (pro-vitamin A), sweetpotatoes (vitamin A) and beans (iron and zinc) have been introduced in Tanzania by a number of agencies. All the biofortified crops currently in Tanzania are those that are conventionally bred.

Although biofortification is yet to be fully scaled up in any country (Bouis, Low, McEwan & Tanumihardjo, 2013), Tanzania has made some initial progress. It was among the five countries that implemented the Reaching Agents of Change (RAC) project from 2011 to 2015. That project focused on advocacy for increased investment in OFSP to combat vitamin A deficiency among young children and women of reproductive age and also built institutional capacities to design and implement gender-sensitive projects to ensure wide access and utilization of OFSP. Through the RAC project, 17 national advocates were trained to engage in building awareness and advocacy for investment in OFSP. RAC raised about USD 4 million for OFSP projects and programs, 3.2% of which came from local government authorities (LGAs).

The Building Nutritious Food Baskets (BNFB) project builds upon the successes of RAC to broaden the scope by adopting a food-basket approach. In Tanzania, BNFB targets three crops: OFSP, high iron and zinc beans, and pro-vitamin A (PVA) or orange maize. This three-year (2015–2018) project is funded by the Bill & Melinda Gates Foundation and is implemented by a partnership of six institutions, which are the International Potato Centre (CIP), International Centre for Tropical Agriculture (CIAT), International Maize and Wheat Improvement Centre (CIMMYT), International Institute for Tropical Agriculture (IITA), the Forum for Agriculture Research in Africa (FARA) and HarvestPlus, along with the Government of Tanzania through its national institutions, including the Sugarcane Research Institute, Kibaha, the Tanzania Food and Nutrition Centre (TFNC) and the Ministry of Agriculture, Livestock and Fisheries and its national agricultural research institutes.

BNFB aims at reducing hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops. This can be achieved by strengthening the enabling environment for investment and building institutional and community capabilities to produce and consume biofortified crops. The project has two specific objectives:

- Strengthen the enabling environment for increased investments in biofortified crops;
- Strengthen institutional and community capacities to produce and consume biofortified crops.

As part of BNFB's implementation, a situation analysis was conducted to establish the baseline status of the key thematic components of the project. It also identified (1) the key actors, (2) the needs of the communities, (3) the bottlenecks to be addressed in order to unlock the value chains of the biofortified crops in the country and prioritize interventions that needed to be implemented, (4) the main policies, strategies and plans in place that favored biofortification, and (5) areas for policy engagement. This advocacy strategy for scaling up of biofortification for nutrition security in Tanzania is informed by the outcomes and recommendations of the situation analysis. It identifies the key mechanisms, institutions and partnerships that are necessary to scale up biofortification in the country. The strategy presents broad and specific strategies to scale-up biofortification by 2020.

The latter are priority areas and practical for delivery by the BNFB project. The broad strategies are critically important but require extra resources, partnerships and time that may not be immediately available for BNFB project.

1.2 Key issues identified by the situation analysis

The situation analysis' findings can be categorized under the four topics of the policy environment, funding, institutional and structural bottlenecks and crop-specific issues pertaining to PVA maize, high iron and zinc beans, and OFSP.

1.2.1 Policy environment for biofortification in Tanzania

Tanzania has made important strides in formulating policies and programs to address malnutrition. During the situation analysis a total of 33 policy documents and 13 strategies and plans were reviewed, most of them covering important elements of nutrition. However, biofortification was seldom mentioned in that literature. It was only the National Agricultural Policy of 2013, the Agriculture Sector Development Strategy II of 2014, the Agriculture Sector Development Programme II of 2016 and the National Multisectoral Nutrition Action Plan for July 2016–June 2021 that had brief statements on biofortification. It is recommended that advocacy efforts be accelerated to ensure that the Government of Tanzania places high priority on biofortification in policy formulation and increases the national and local government budgets to cover biofortification. The Tanzania Food and Nutrition Policy and the five-year strategy of the Ministry of Agriculture, Livestock and Fisheries are currently undergoing review. Advocacy and policy engagement efforts will be necessary to ensure that biofortification is entrenched in these two important policy documents. It is also recommended that BNFB should strengthen the existing National Food Fortification Alliance (NFFA) by integrating biofortification in its programs.

The Education Sector Development Plan (ESDP) for 2016/17–2020/21 indicates that the Tanzanian Institute of Education is in the process of finalizing a new National In-service Teacher Training (INSET) framework, and that there are plans to establish a teacher professional board to formalize and coordinate actions in the teaching profession. The board, when approved, will have the task of streamlining all professional teacher education programs to meet emerging needs of those in teaching and training, from preschool to higher education. The ESDP document also indicates that Tanzania plans to strengthen school health and nutrition, particularly school feeding programs. It is therefore recommended that (1) advocacy be conducted so that the new national INSET framework incorporates nutrition and biofortification as critical elements, (2) an advocate on nutrition/biofortification be identified from the Teacher Professional Board once it is established to support the project's efforts to mainstream biofortification in teacher training programs, and (3) advocacy efforts be undertaken geared towards the inclusion of biofortified crops in the school feeding program that is proposed in the ESDP document.

1.2.2 Funding for biofortification

The national budget allocation for agriculture has been decreasing, going from 7.3% of the national budget in 2012/13 to 4.4% in 2016/17 (URT, 2016). Similarly, the nutrition sector allocations have been low, standing at 0.15%, 0.2% and 0.22% of the government's total expenditure budget in 2010/11, 2011/2012 and 2012/13, respectively. This indicates that the agriculture and nutrition sectors are not receiving the necessary attention or priority and calls for high level and accelerated advocacy efforts and sensitization so they are accorded higher priority and allocated bigger budgets. Moreover, it is recommended that funding at levels matching those for supplementation and fortification be set aside to support biofortification. The need for urgency to prioritize nutrition-sensitive agriculture in the country cannot be overemphasized.

1.2.3 Institutional and structural bottlenecks

The value chains of the biofortified crops are affected by limitations in infrastructural and human capacities. For instance, the Tanzania Official Seed Certification Institute (TOSCI) needs support to strengthen its capacity in order to speed up the release of new crop varieties. The Tanzania Bureau of Standards (TBS) requires capacity enhancement to develop quality standards for large-scale processing of biofortified foods. BNFB should work with the laboratories at its affiliated institutions such as HarvestPlus and Biosciences Eastern and Central Africa to support local institutions such as the Tanzania Food and Drug Authority (TFDA), Sokoine University of Agriculture (SUA) and TBS to develop standards and controls for biofortified crops; standards for micronutrient levels e.g. for beta-carotene, iron and zinc; and protocols for laboratory analysis of micronutrients, as well as to train technical staff and to avail laboratory equipment for analysis of micronutrients locally.

1.2.3 Crop-specific issues

This section highlights the status of OFSP, PVA maize and high iron and zinc beans. The challenges facing each crop are also presented. Appendix 2 provides an analysis of the strengths, weaknesses, opportunities and threats (SWOT analysis) facing biofortification in Tanzania and compliments the information presented in this section.

OFSP

From the situation analysis, households consumed 35.3% of the roots they produced. Overall, the situation analysis established that the production and consumption of OFSP were growing in Tanzania. Earlier studies such as Okello et al. (2017), VISTA (2016) and Waized et al. (2015) had found that OFSP had been adopted by fewer than 2% of the population, but the situation analysis established that adoption rates now stood at 12% on average in the districts where the crop had been introduced. Moreover, compared with the other biofortified crops such as high iron and zinc beans and PVA maize, OFSP was relatively well known and consumed in Tanzania. This is because it was introduced in the country much earlier than those other crops, plus the actors in its value chain were diverse. The pioneers in OFSP introduction in Tanzania were CIP, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), HarvestPlus, the Tanzania Lake Zone Agricultural Research and Development Institute and Helen Keller International. Currently there are many others in the OFSP value chain, such as the laboratory of Crop Bioscience Solutions Ltd in Arusha, which is involved in the production of disease-free planting materials through tissue culture; World Vision-Canada; the Sugarcane Research Institute, Kibaha; the Agriculture Research Institute (ARI) Ukiriguru; ARI Uyole, which is involved in research and dissemination of OFSP; and SUA, which is conducting training. The Njombe Agricultural Development Organization, Catholic Relief Services, the Tanzania Horticultural Association, and the Research, Community and Organization Development Associates provide farmers with training on production technologies. Others include Viazi Lishe Company, Sokoine University Graduate Entrepreneurs Cooperative (SUGECO) and AFCO Investments, which process and market OFSP products.

In the period of about four years now, OFSP has attracted approximately USD 11.5 million in funding, mainly from the Bill & Melinda Gates Foundation and the United States Agency for International Development (USAID), with investment levels of about USD 6.8 million and USD 3.6 million, respectively. Others include the Big Lottery with an investment of about USD 0.6 million.

Challenges facing OFSP

The main challenges affecting OFSP production in Tanzania include the limited availability of quality planting materials, low preference for the crop among consumers owing to its low dry matter, lack of awareness on its benefits, and drought stress.

OFSP also faces gender-related constraints in its value chain. For instance, Mudege and Grant (2017) aver that men were more likely to face production constraints in OFSP than were women owing to women's higher involvement in sweetpotato farming and therefore their better awareness on how to solve its production constraints. Mudege and Grant (2017) also indicate that women had the least productive lands to cultivate sweetpotato and that men were unwilling to invest in sweetpotato owing to its perceived lack of benefits and their regard of it as a secondary and a woman's crop. However, although women were more engaged in sweetpotato cultivation than were men, it was men who were often targeted with agronomic training. Moreover, women were unlikely to attend training events conducted outside the village owing to domestic demands.

Other challenges include the high susceptibility of the crop to diseases and pests; the conflict between targeting the poorest farmers, who are the most susceptible to undernutrition, and catalyzing commercial production of the crop; the lack of quality standards for the processed OFSP products; and the lukewarm commitment from SUA to sustain the training-of-trainers course on 'Everything You Ever Wanted to Know about Sweetpotato'.

PVA maize

The work on PVA maize in Tanzania is recent and BNFB is the only project currently supporting research and dissemination of the research results on the crop. BNFB work resulted in the release of two PVA maize varieties in 2016, working in partnership with Meru Agro Company. The varieties were Meru VAH 517, with a beta-carotene level of 8 parts per million (ppm), and Meru VAH 519, with a beta-carotene level of 14 ppm¹. More research is going on with various genotypes undergoing trials. For example, Tanseed International Ltd, which received three PVA maize genotypes from CIMMYT, is bulking the seed for field evaluation. Since it is barely one year after the varieties were released officially, there is no commercial production of PVA maize seed in Tanzania at the moment.

Challenges for PVA maize

There are several potential challenges for PVA maize in Tanzania. Firstly, there might be hesitation by traders and farmers to invest in PVA maize because it has little differentiation from yellow, cream or orange maize varieties that are not necessarily biofortified. Secondly, production of maize seed and grain in changing climatic conditions remains unpredictable and is in small quantities. This could discourage small and micro enterprises and large maize grain buyers. Thirdly, Tanzanians associate colored maize with the relief food of the 1980s. To change this mindset for the fast adoption of PVA maize will need a lot of awareness creation.

To scale up PVA maize in Tanzania, focus should be on awareness creation, promotion and advocacy on its benefits. Moreover, since PVA maize technologies are still low in the research pipeline, partly due to the complexities of the technologies themselves and to underinvestment, more efforts in research for new varieties and investments are needed to expedite the release of promising genotypes.

High iron and zinc beans

Like with PVA maize, work on biofortified beans is just commencing in Tanzania. Currently there are two high iron and zinc bean genotypes, namely MAC44 and RWV1129, which are in the advanced stages of the national performance trial (NPT) and are expected to be officially released later this year. In addition, multilocational trials for stability and adaptability tests are going on for eight more high iron and zinc bean genotypes with the support of BNFB. The eight genotypes are RWR 2154,

¹ The minimum PVA level for maize has been set at 6 ppm whilst the target for breeding has been set at 15 ppm. PVA maize is expected to meet 50% of the daily vitamin A requirement. It is further worth noting that white maize has practically no PVA and ordinary non-PVA yellow maize does not necessarily have provitamin A.

KAB06 F2-8-36, KAB06F2-8-35, CODMLB 001, NGWANKUNGWANKU, CODMLB 033, SMC 18 and SMC17.

In regard to partnerships, CIAT is working on seed systems with the Selian Agricultural Research Institute, the Agricultural Seed Agency, Meru Agro Company in Arusha, Beula Company and Agri-seed Company in Mbeya, and Agri Experience Company in Arusha. CIAT also provides training to farmers and researchers, working in collaboration with local agricultural research institutes such as ARI Selian, ARI Maruku and ARI Uyole, and with the Ministry of Agriculture, Livestock and Fisheries.

Challenges for high iron and zinc beans

The key potential constraint to private sector involvement in the business of high iron and zinc beans is the low market demand for bean seed. This is because bean is an open-pollinated crop and therefore its seeds can be reused by farmers for several years with little loss in yield or quality. The second challenge that could face scaling-up efforts is that the MAC44 and RWV1129 varieties are climbers, which could pose significant agronomic challenges for farmers in Tanzania who are accustomed to growing the bush varieties. Moreover, generally beans are susceptible to disease and pest infestation. Angular leaf spot, bean common mosaic virus, bean rust and bacterial blight are the most serious diseases of beans in Tanzania, while pod and bean flower sucking insects are the most devastating insect pests for beans. Other important constraints include the low funding in local research institutes, which would hinder field evaluation of new varieties.

To scale up high iron and zinc beans in Tanzania more effort is required to speed up research on new varieties. Capacity building is needed for the actors in the bean value chain on how to mitigate the diseases and pests associated with the crop. Farmers should be trained on the appropriate agronomic practices for climbing bean varieties.

2. Objectives and target of this strategy

The Government of Tanzania has been fighting to eradicate micronutrient malnutrition in the country using different approaches including food fortification, dietary diversification and micronutrient supplementation. BNFB will consolidate and strengthen the research to support biofortification efforts in Tanzania. This strategy identifies the priority focus areas and will guide the efforts and resource utilization to promote the production, processing and utilization of biofortified food crops and products to alleviate micronutrient deficiencies among vulnerable groups in Tanzania. Fig. 2 shows the BNFB results framework, depicting how the project is conceptualized to address these issues.

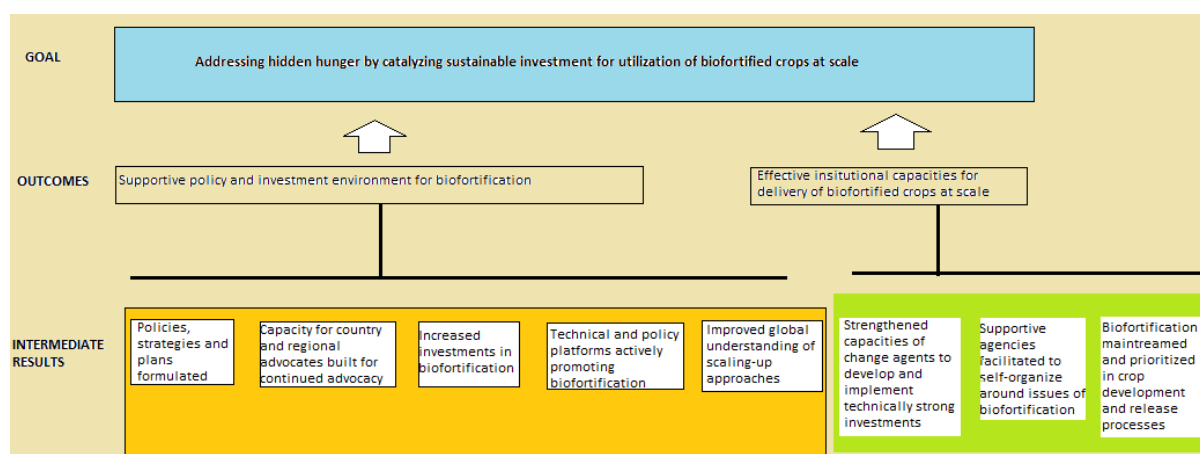


Figure 2: BNFB results framework

2.1 The strategy's focus areas

Based on the strategic issues identified in the situation analysis report, the strategy will focus on four main areas:

- Influence to improve demand for and awareness on biofortified crops and products;
- Advocate to influence increased investments for the utilization of biofortified crops at scale in Tanzania;
- Influence mainstreaming of biofortification in relevant policies, strategies and intervention programs;
- Strengthen institutional capacities, seed systems and value chains to scale up biofortification.

2.2 Targets of the national advocacy efforts

This strategy seeks to engage and influence policy-makers, development partners, value chain actors, research institutions, seed and food certification agencies and the media for the benefit of biofortified crops.

2.2.1 Decision-makers and development partners

The Government of Tanzania is committed to improving the nutrition situation in the country and to addressing micronutrient malnutrition in particular. Through the Prime Minister's Office, several strategies and initiatives have been implemented successfully, including the development of the National Multi-sectoral Nutrition Action Plan, the improvement of the nutrition human resources, and budget allocation for nutrition. The situation analysis found that the share of the government's total expenditure budget allocated to the nutrition sector has been going up, standing at 0.15% in 2010/11, 0.2% in 2011/2012 and 0.22% in 2012/13. But the allocation is still too low to implement nutrition plans. BNFB will partner with government institutions and other partners to support a multisectoral initiative to address micronutrient malnutrition, particularly through biofortification. The project will advocate for a comprehensive approach to address micronutrient deficiencies and for inclusion of biofortification in ongoing efforts to prioritize resources for nutrition.

BNFB will collaborate also with the Prime Minister's Office, TFNC, the Ministry of Agriculture, Livestock and Fisheries and development partners to advocate for the improvement of the policy environment through various political engagement processes. The situation analysis showed that few policies, including those related to health, food and nutrition, agriculture, and child and community development, incorporated biofortification. But even where it was included, biofortification was given low priority compared to other interventions.

The National Agricultural Policy of 2013, the National Multi-sectoral Nutrition Action Plan for July 2016–June 2021 and the draft TFNC strategic plan all mention biofortification. The last two documents are fairly recent and benefitted from BNFB input. Consultation with TFNC revealed that efforts were under way to review the Tanzania Food and Nutrition Policy of 1992, where inputs to accommodate biofortification had been proposed. Others include the five-year (2016–2020) strategy of the Ministry of Agriculture, Livestock and Fisheries. A review of the Agricultural Sector Development Program Phase Two (ASDP II) of 2016 and consultations with the Ministry of Agriculture, Livestock and Fisheries showed that ASDP II mentions biofortification, albeit giving it low priority. BNFB will advocate for prioritization of biofortification in the program. Discussions with the Ministry of Education and document review showed that biofortification was not entrenched in the national curriculum for basic education. There is therefore need to engage the Ministry of Education actors to mainstream biofortification in the education system through the curriculum and associated programs.

The important partners to work with to achieve the policy change and increase investments in biofortification include AFRICARE, the Department for International Development of the United Kingdom (DFID), the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), LGAs, the Ministry of Agriculture Livestock and Fisheries, the Ministry of Health, the Ministry of Industries and Trade, the Prime Minister's Office, the President's Office Regional Administration and Local Government, the United Nations Children's Fund (UNICEF), USAID and the World Food Programme (WFP).

2.2.2 Value chain actors

Crop-specific strategies should be designed to address the biofortified crops' value chain and seed system gaps highlighted by the situation analysis. The scope of this advocacy strategy, however, does not allow for comprehensive recommendations to address such gaps. This strategy focuses only on the extreme node of the value chain that is the seed companies and processors.

The processors and related companies targeted include industries like AFICO Investments, Bakhresa, CRISPO, Matoborwa Company, Nurti Products Ltd, SUGECO and Viazi Lishe Company. These were selected bearing in mind that biofortified products largely were consumed unprocessed. Moreover, for maize, the hesitation by traders and farmers to invest in PVA maize because it has little differentiation from yellow, cream or orange maize is a potential challenge. Apart from this there are historical misconceptions surrounding the targeted crops. For instance, sweetpotatoes are mostly considered as food for the poor and women, beans are regarded a woman's crop and colored maize is associated with relief food and animal feed. To change this mindset for fast adoption of biofortification, BNFB should conduct awareness and demand-creating campaigns and engage stakeholders through the national platforms. Seed companies are important, particularly for maize, whose seed system is strictly commercial. Additionally, there are limited suppliers of clean seed for OFSP. Apart from the dedicated vine multipliers dealing with OFSP no major seed companies have invested in OFSP or vegetative crops in general. To address some of the gender-related constraints in OFSP production it is important to explore introducing business and market training for women farmers as potential practical strategies. Strategies that adopt household approaches to farming as a business are recommended to increase women and men's participation at that level.

2.2.3 Seed and food certification institutions

Local institutions that are key in scaling up biofortification in Tanzania include the agricultural research institutes (ARIs), TBS, TFDA, TFNC, TOSCI, seed producers and training institutions.

The situation analysis showed that the ARIs working on high iron/zinc beans were constrained by funding, especially for field evaluation of new varieties. BNFB will engage with ARIs to facilitate the improvement of their capacity to design, fundraise for, implement and monitor projects, which will expedite the release of the materials in the advanced stages of the research pipeline.

TOSCI is responsible for the verification of new seed varieties for official release and for certification of seed. However, it is faced with constraints in human resources, information and communication technology, and budget allocation, which is inadequate and inconsistent. BNFB, working through local researchers, should assist in fast tracking the release of new varieties by engaging with TOSCI to allow the use of distinctness, uniformity and stability (DUS) testing and national performance trial (NPT) reports from any member state of the East African Community and Southern African Development Community.

The situation analysis found that standards existed for fortified maize flour but not for products made from PVA maize, OFSP or high iron and zinc beans. Both TBS and TFDA are responsible for product certification and market monitoring and have clear mandates and are well equipped in terms of infrastructure. However, they lack protocols for laboratory analysis of micronutrients. Their staff also need training in laboratory testing. Declared standards of quality issued by TBS and TFDA

would increase confidence among processors, traders and consumers on the quality and safety of biofortified products. Other challenges include the lack of a high performance liquid chromatography (HPLC) machine at TOSCI and TFNC, low capacity for speeding up the release of biofortified crop varieties, and duplication of food safety inspection protocols by TBS and TFDA. It is recommended that BNFB, through its affiliate laboratories such as those of HarvestPlus, should support local institutions such as TFDA, SUA and TBS to develop standards and controls for biofortified crops, set standard levels for various micronutrients such as beta-carotene, iron and zinc, and develop protocols for laboratory analysis of micronutrients. Fundraising for the acquisition of HPLC machines for TOSCI and TFNC is also recommended. Moreover, BNFB should provide assistance in the training of technical staff in these areas as well as in the provision of laboratory equipment for analysis of micronutrients locally.

2.2.4 Food and nutrition advocacy platforms

Several platforms relevant to BNFB work were identified through the situation analysis. Given the project's timeline, the high priority and strategic platforms for BNFB identified for this strategy include NFFA, the Multi-sectoral Nutrition Technical Working Group, the Partnership for Nutrition in Tanzania (PANITA), the Agricultural Non-State Actors Forum (ANSAF) and the Tanzania Agricultural Partnerships and Agriculture Coalition. BNFB will engage and work with the Multi-sectoral Nutrition Technical Working group to advocate for investment and policy actions that favor biofortification. Moreover, it will strengthen NFFA by integrating biofortification in its program. NFFA will provide a forum to discuss and advance technical developments related to biofortification in Tanzania. Apart from these two platforms, BNFB will collaborate with PANITA and ANSAF to provide information and technical materials for activities in biofortification.

3. Strategy implementation

Appendix 1 shows the strategy implementation plan specific to BNFB project. The strategy plan will be implemented through coalitions and collaboration with institutions in related food and nutrition arenas to enable the alignment of their current and ongoing efforts with those on biofortification. Additionally, BNFB will work through champions and advocates of biofortification in identified institutions who will help build or improve its synergy with partners and sustainability during and after its existence. The broad strategies identified to scale-up biofortification in Tanzania by 2010 include the following:

- **Capacity development for national champions and advocates** from key institutions to promote the biofortification agenda whenever opportunities arise. The team will comprise leaders and influential members from the Tanzania Seed Trade Association to represent seed companies; the Ministry of Agriculture Livestock and Fisheries; the Ministry of Education's Teachers' Professional Board once it is established; the Tanzania Institute of Education; the Prime Minister's Office; TFNC; the Ministry of Industry and Trade; TBS; TFDA; PANITA; ANSAF; MVIWATA; the Comprehensive Africa Agriculture Development Programme country representative; development partners; and representatives of agroprocessors, among others. A detailed list of the names and contacts for these partners is provided in Appendix 3. Tanzania is among the countries fortunate enough to have high level champions for nutrition, such as the former president H.E. Jakaya Kikwete. BNFB should identify and link with such champions to rekindle the national interest in nutrition and raise awareness on micronutrient deficiency and how agriculture, and therefore biofortification, can be a solution.
- **Engagement and encouragement of national and subnational level processing companies** to promote the utilization of raw materials from biofortified crops and the sharing of

products and lessons from other countries that have succeeded in this area. Wherever necessary, champions and advocates shall work with the government so that such biofortified crop companies can get tax breaks on machinery and products that will go directly to support the processing of biofortified products.

- **Strategic capacity improvement for LGA staff** on areas of production and utilization of biofortified crops. BNFB will embrace the available planning and budgeting platform to provide detailed guidance in demand creation, to create awareness on the nutritional benefits of biofortified crops and to build capacity on resource mobilization.
- **Engagement with education sector stakeholders** to facilitate the inclusion of biofortified crops in school feeding programs. BNFB will identify LGAs that are already running school feeding programs and engage with district executive directors and school committees to advocate for the utilization of biofortified crop products in those programs. This initiative targets to increase demand for biofortified crops and therefore improve farmers' interest to grow them. Obviously, BNFB will only reach pilot LGAs. In due course, this school-based program should be adopted across all the LGAs. The important partners under this item will include FAO and WFP.
- **Partnership with institutions that support the multisectoral approach to addressing nutrition**, where the project will foster advocacy for a comprehensive approach to address micronutrient deficiencies, with biofortification as one of the important approaches to address hidden hunger.
- **Strengthening NFFA by reviewing its terms of reference to integrate biofortification.** BNFB will also support its strategic partners to engage in the NFFA platform to provide strategic and technical backstopping on the biofortification agenda at the national level.
- **Capacity development and networking** with affiliates' laboratories such as those of HarvestPlus and Bioscience East and Central Africa. BNFB will work with other partners to facilitate the process for TBS and TFDA to develop standards and protocols for biofortified products and for levels of concentrations of micronutrients in biofortified products. It is anticipated that other partners will come on board to support the training of technical staff on these important areas and mobilize resources to equip local laboratories such as those at TFNC, TBS and TOSCI to be able to effectively test for micronutrients.
- **Playing a facilitating role to fast track the release of new varieties** using DUS testing and NPT reports from any country in the East African Community that has agreements with Tanzania on harmonization of seed policy and legislation and by linking scientists and institutions already engaged in similar work. In the short-term, the project will support on-farm trials and pay the fees (albeit it can afford only modest amounts) to release the advanced materials high iron and zinc beans, OFSP and PVA maize varieties in the pipeline.
- **Strengthening of the national breeding program for biofortified crops** so that appropriate and market-led varieties are developed, released and disseminated expediently. The project will advocate for more investments in breeding work; support the generation of protocols that prioritize the development and release of biofortified crops; develop crop-specific strategies and road maps to guide efforts in biofortification; and support efforts for screening and testing potential promising lines and germplasm. Other partners such as the African Green Revolution Alliance have been supporting capacity building for young scientists on breeding-related technical skills and this support should be sustained, perhaps with more partners joining in. Efforts to influence the introduction of breeding for biofortified crops in university and college curricula should also be prioritized.

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- **Strategic advocacy** to influence the prioritization of biofortification in key policy and strategic documents. The key policies and plans identified for BNFB focus include the Food and Nutrition Policy of 2016 and its implementation plan, the Agriculture Sector Development Plan, and the five-year strategic plan of the Ministry of Agriculture, Livestock and Fisheries. These policies and plans are suggested because they are undergoing review and so they offer an opportunity for BNFB influence, given the project's time frame. It is recommended that other stakeholders support the national INSET framework and the school feeding program proposed under the ESDP (2016/17–2020/21) to incorporate biofortification.
 - **Strategic advocacy and capacity building to encourage processors** to utilize raw materials from biofortified crops. Given the low participation of businesses in agroprocessing, with only Matoborwa, AFCO Investments and Viazi Lishe Company engaged in it so far, stakeholders should build the capacity of the food processors on biofortification, especially on standards for processed biofortified crop products, labeling, and application of protocols for laboratory analysis of micronutrients.
 - **Support of awareness and demand creation by engaging with national media agencies** to trigger the utilization of biofortified crops. BNFB will integrate biofortification content in media messages and provide technical backstopping on biofortification messages, utilizing the available awareness and promotion campaigns and platforms coordinated through TFNC. However, for effective and accurate messaging, BNFB will train media professionals on biofortification.
 - **Engagement in strategic meetings with development partners** and nongovernmental organizations in Tanzania to identify funding opportunities for biofortification and to influence programs to integrate biofortification.
 - **Strategic engagement with the Ministry of Agriculture's training institutes and universities** such as the University of Dar es Salaam, Sokoine University of Agriculture, University of Dodoma and the Nelson Mandela Institute of Science and Technology to mainstream biofortification in their curricula and provide training on biofortification. But, these colleges and universities do not have biofortification in their training curricula. This is potentially a five-year target.
 - **Development of investment guides** for each biofortified crop for each node of its value chain to guide planning and decision-making on investing in biofortification. The investment guides should provide details on what it would take to invest, how much to invest and how to invest in order to fight hidden hunger. Additionally, the investment guides should be able to forecast the seed demand for the biofortified varieties.

4. Coordination, monitoring, learning and evaluation

4.1 Coordination

This strategy will be used as a guide to support the realization of the objectives of BNFB. But this document will be used also by all stakeholders with an interest to raise the biofortification profile in Tanzania. However, the BNFB country coordinator should serve as the coordination link across the biofortification advocates, champions and stakeholders. The country coordinator, through the envisioned national advocacy platform, will update the team on issues pertaining to the strategy

implementation status, help define the direction of biofortification efforts, and ensure the coalescence of the team around mutual synergies to address the gaps and challenges.

4.2 Monitoring and learning

This strategy will not be considered static. Amendments might be necessary to mirror the prevailing circumstances as demonstrated by data. All players will be responsible to track and document the activities they implement, to share information and provide feedback for prompt re-planning, for accountability or for affirmation to forge ahead with the activities based on lessons from the processes. The country coordinator, in consultation with partners from time to time, will review and take stock of the strategy's implementation to understand whether the agenda is on track or if changes are needed. Regular meetings involving the advocates, champions and stakeholders are necessary for technical briefing and consolidation of lessons learned.

4.3 Evaluation

It will be important to understand whether the goals were attained or the extent to which a contribution was made towards attaining them. The strategy evaluation will focus on the impact of the outcomes, thus it will require systematic data collection at defined points in time. The evaluation will assess whether the strategies implemented were effective in bringing the desired changes in the policy environment, investment and capacity strengthening, and therefore the scaling up of the interventions.

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Appendices

Appendix 1: Strategy implementation plan

Objective	Sub-objective	Target	Activities/approach	Allies	Success indicators	Risks and assumptions	Time frame
Influence to improve demand for and awareness on biofortified crops and products	To increase the number of actors working on promotion and those engaged in large-scale agroprocessing and marketing of biofortified products	<ul style="list-style-type: none"> Agroprocessors like Matoborwa Company, SUGECO, CRISPO, Bakhresa, Nurti Products Ltd, AFCO Investments Seed companies Communication companies LGAs TFDA TBS 	<ul style="list-style-type: none"> Meeting with Matoborwa Company, SUGECO, CRISPO and AFCO processing companies to promote utilization of raw materials from biofortified crops Identifying councils with school feeding programs and linking them with district executive directors, school committees, WFP and FAO to influence utilization of biofortified products in schools Working with partners to develop standards, protocols and guideline for biofortification, particularly for levels of micronutrients, and for laboratory analysis of micronutrients Supporting awareness and demand creation by engaging with national media agencies and through technical backstopping and utilizing the available awareness and promotion campaign platforms coordinated through TFNC and the national agricultural shows (nane nane) 	<ul style="list-style-type: none"> Tanzania National Business Council Tanzania Investment Centre Tanzania Private Sector Foundation Tanzania Chamber of Commerce, Industries and Agriculture FAO WFP 	<ul style="list-style-type: none"> Number of private companies involved in biofortification Number of LGAs utilizing biofortified food items in their feeding program Number of biofortification standards and guidelines developed Number of platforms conducting awareness on biofortification Number of nane nane shows at which BNFB promotes biofortification and the number of people reached 	<ul style="list-style-type: none"> Famers will adopt and support biofortified crops to flourish Production of biofortified crops will meet the demand for biofortified items 	April 2017–January 2018

Objective	Sub-objective	Target	Activities/approach	Allies	Success indicators	Risks and assumptions	Time frame
Advocate to influence increased investment allocation to biofortification	Reach out to stakeholders to integrate biofortification to improve – <ul style="list-style-type: none"> • Accessibility of biofortified planting materials • Awareness on nutritional importance of biofortified products • Designing and implementation of programs on biofortification 	<ul style="list-style-type: none"> • UNICEF • DFID • IFAD • WFP • USAID • AFRICARE • FAO • LGAs 	<ul style="list-style-type: none"> • Identify and train advocates from different institutions who can influence decisions in different forums at different levels • Partner with institutions that support multisectoral approaches in order to foster advocacy for a comprehensive approach to addressing micronutrient deficiencies • Fast track the release of new varieties by using DUS testing and NPT reports from any country from eastern and southern Africa • Engage with bilateral donors to fund programs on biofortification • Advocate for increased budgetary allocation to biofortification in both the national and LGA budgets • Mobilize resources to equip local laboratories such as those at TFNC to be able to effectively test crops for micronutrients 	<ul style="list-style-type: none"> • TFNC • Ministry of Agriculture, Livestock and Fisheries • Prime Minister's Office • SUA • ARIs • Development partners 	<ul style="list-style-type: none"> • Number of advocates identified and trained • Number of stakeholders integrating/funding biofortification and amount of funding • Number of newly released varieties • Number of new programs on biofortification designed and implemented • Amount of resources invested in biofortification • Number of crops with comprehensive investment guides • Number of national public laboratories with modern technology and staff to effectively test for micronutrients 	The different committees responsible for variety release will hold meetings in a timely manner as DUS and NPT reports are made available for their review	October 2017–July 2018

Objective	Sub-objective	Target	Activities/approach	Allies	Success indicators	Risks and assumptions	Time frame
Advocate to mainstream biofortification in national platforms	To advocate for, increase awareness on, and initiate development of biofortification standards	<ul style="list-style-type: none"> • TFDA • TBS • NFFA members and institutions • Subgroups dealing with micronutrients at the national level 	<ul style="list-style-type: none"> • Strengthen the NFFA platform by reviewing the terms to integrate biofortification • Support the establishment/ strengthening of a multisectoral policy platform and crop-specific technical platforms • Support strategic partners to engage in the multisectoral policy platform to provide strategic and technical backstopping for the biofortification agenda at the national level • Engage to integrate biofortification messages in available awareness and promotion campaigns' platform coordinated by TFNC 	<ul style="list-style-type: none"> • TFNC • SUA • Selian Agricultural Research Institute • Sugarcane Research Institute, Kibaha • Seed companies • Ministry of Agriculture, Livestock and Fisheries 	<ul style="list-style-type: none"> • Biofortification integrated into NFFA • A multisectoral policy platform formed and crop-specific technical platforms established • Strategic partners identified and engaged in the platform • Number of national campaigns conducted on biofortification 	Founding members of NFFA will accept recommendations on biofortification	April 2017–April 2018
Influence mainstreaming of biofortification in all relevant policies, strategies and intervention programs	To influence inclusion and recognition of biofortification among the national interventions to address micronutrient deficiencies for improved nutrition	<ul style="list-style-type: none"> • Ministry of Agriculture, Livestock and Fisheries • Ministry of Health • Ministry of Industries and Trade • President's Office Regional Administration and Local Government 	<ul style="list-style-type: none"> • Engage and include biofortification as part of national nutrition multisectoral strategy/action plan • Implement strategic advocacy to influence and prioritize biofortification, targeting the food and nutrition policy and its implementation plan, the agriculture sector development plan, and the five-year strategic plan of the Ministry of Agriculture, Livestock and Fisheries • Identify and link previous champions (e.g. former president Honorable J. Kikwete and former prime minister M. Pindar) to rekindle their interest in nutrition and raise awareness on micronutrients and how agriculture, and therefore biofortification, fit in as a solution 	<ul style="list-style-type: none"> • PANITA • TFNC • Prime Minister's Office • Agricultural research institutes • SUA • Seed companies, Policy Analysis Group 	<ul style="list-style-type: none"> • Biofortification included in the Food and Nutrition Policy of 2016, Agriculture Sector Development Plan, and the five-year strategic plan of the Ministry of Agriculture, Livestock and Fisheries • Previous national nutrition champions engaged in advocating for biofortification • Number of national and LGA school feeding programs that include biofortified crops 	<ul style="list-style-type: none"> • Review of identified policy documents and plans will continue as planned • Previous champions are still interested in nutrition 	July 2017–December 2018

Objective	Sub-objective	Target	Activities/approach	Allies	Success indicators	Risks and assumptions	Time frame
Strengthen the capacities to scale up biofortification in Tanzania	Build institutional capacities in critical areas in biofortification to scale up biofortification	<ul style="list-style-type: none"> • TFDA • TBS • TFNC • National and local government officials • Community-based organizations • Faith-based organizations • Universities • Ministry of agriculture training institutes 	<ul style="list-style-type: none"> • Backstop partners to develop standards and protocols for biofortified products and standards for levels of concentrations of micronutrients • Train strategic LGAs on project planning and implementation, resource mobilization, and monitoring and evaluation • Train food processors on standards for processed biofortified crop products' labeling and protocols for laboratory analysis of micronutrients • Train media professionals on effective messaging for biofortification • Support the Ministry of Agriculture, Livestock and Fisheries training institutes and universities such as the University of Dar es Salaam, University of Dodoma and the Nelson Mandela Institute of Science and Technology to mainstream biofortification in their curricula and provide training on biofortification • Develop crop-specific strategies and road maps to guide the efforts under the seed system • Support efforts for screening and testing of promising lines and germplasm 	<ul style="list-style-type: none"> • LGAs • Ministry of Information and Technology • Universities • Tanzania institute of Education • Agricultural research institutes 	<ul style="list-style-type: none"> • Types of standards and protocols for biofortified products • Number of technical staff trained on protocols for biofortified products and standard levels of concentrations of micronutrients • Number of LGAs that obtain funds to invest in biofortification • Number of media professionals trained on effective messaging and are promoting biofortification • Number of tertiary institutions that include biofortification in their curricula • National protocols that prioritize the development and release of biofortified crops • Number of biofortified crops with specific strategies and road maps 	<p>Gender imbalance in the number of change agents trained</p> <p>Pest diseases and natural calamities that can affect seed systems</p>	July 2017–December 2018

Appendix 2: SWOT analysis on biofortification of PVA maize, OFSP and iron beans in Tanzania

Strengths of biofortification	Weakness of biofortification
<ul style="list-style-type: none"> • Availability of five released biofortified varieties for OFSP and two varieties for PVA maize • Beans and sweetpotato are food security crops in Tanzania • Conducive climatic conditions for crop production • High capacity in research on biofortification and development at CIP, CIAT, CIMMYT and zonal agricultural research institutes • Availability of training manuals on OFSP and nutrition and of bean recipes • Available experience from the RAC project on scaling up biofortification in Tanzania 	<ul style="list-style-type: none"> • Lack of released iron-rich bean varieties • Fear in some areas that biofortified crops are GMOs • Inadequate quality and affordable planting materials of the identified biofortified crops, i.e. maize, beans and OFSP • Few actors working on advocacy and awareness creation in the biofortification crops' value chains • Low investments in advocacy and promotion of biofortified crops and products • Relevant national policies and strategies are silent on biofortification • Negligible government budget for biofortification • Limited capacity on biofortification among local regulatory and training institutions • Limited awareness on the nutritional value of biofortified products among communities • Few local agroprocessors of biofortified products
Opportunities for biofortification	Threats to biofortification
<ul style="list-style-type: none"> • High incidence of micronutrient malnutrition • Interest of donors to support biofortification globally and in Tanzania • Availability of local and international civil society organizations, nongovernmental organizations and extension services to support scaling up of biofortification • Presence of national sector and multisectoral advocacy platforms such as PANITA, ANSAF and the Policy Forum • Presence of nutrition commemoration days such as Breastfeeding Day • Commitment of government to international conventions on agriculture and nutrition • Presence of multisectoral planning and implementation platforms • Government commitment to support nutrition • Existence of national policies on agriculture and nutrition that provide broad goals on food-based approaches to nutrition and that open doors for biofortification initiatives 	<ul style="list-style-type: none"> • Occurrence of drought and climatic conditions that may not allow crops to flourish

Appendix 3: Biofortification advocates and champions

Name	Organization	Position
Dr Hussein Mansoor	Ministry of Agriculture Livestock and Fisheries	Director of Research and Development
Mr Patrick Ngwediagi	Tanzania Official Seed Certification Institute	Chief Executive Officer
Dr Firmin Mizambwa	Agricultural Seed Agency	Chief Executive Officer
Mr Bob Shuma	Tanzania Seed Trade Association	Secretary General
Mr Elimpaa Kiranga	Ministry of Agriculture Livestock and Fisheries	Director of National Food Security
Nkuvilwa J. Simkanga	Ministry of Agriculture Livestock and Fisheries	Director of Planning and Policy
Gerald Kitabu	Tanzania Agricultural Journalist Association	Chairman
Mr Musa Twangiro	Tanzania Broadcasting Corporation	Journalist/Reporter
Mr Joseph Mwambiye	Independent Television	Journalist/Reporter
Ms Gaudensia Simwanza	Tanzania Food and Drug Authority	Communication Manager
Mr Geoffrey Kirenga	SAGCOT Center	Chief Executive Officer
Dr Vicent Paul Lukonge	Tanzania Farming Association	Secretary General
Dr Joyceline Kaganda	Tanzania Food and Nutrition Centre	Managing Director
Dr Vincent Assey	Ministry of Health,	Permanent Secretary
Mr John Mwingira	Tanzania Food and Drugs Authority	Director General
Mrs Zena Issa	Tanzania Bureau of Standards	Standards Officer
Mr Abraham Sanga	UNICEF -Tanzania	Country representative
Tiziana Zoccheddu	WFP-Tanzania	Country Representative
Dr. Regina Kapinga	IITA	Head Advocacy & Resource Mobilization
Tumaini Mikindo	Partnership for Nutrition in Tanzania	Director
Mr Obey Assery	Prime Minister's Office	Director of Coordination of Government Business

Building Nutritious Food Baskets

The Building Nutritious Food Baskets: Scaling up Biofortified Crops for Nutrition Security seeks to reduce hidden hunger by catalyzing sustainable investment for the production and utilization of biofortified crops (Orange-fleshed sweetpotato (OFSP); vitamin A (yellow) cassava, vitamin A (orange) maize and high iron/zinc beans) at scale. The project is implemented in **Nigeria** and **Tanzania**, to demonstrate how biofortified crops can be scaled up through a multi-crop ("food basket") approach. BNFB draws on complementary expertise for scaling up through a partnership between CGIAR centers and programs, regional organizations and other public and private sector agencies to create a movement that will eventually reach the target populations. BNFB's hypothesis is that scaling up is dependent on supportive policy environment, strong institutional capacities and availability of proven technologies.

