



Building  
Nutritious  
FoodBaskets



**Building  
Nutritious Food  
Baskets Project**  
**Insights**  
from the  
**Field**



## **The Building Nutritious Food Baskets Project 'Insights from the Field'**

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The background of the entire image is a repeating pattern of stylized, overlapping leaves in various shades of yellow and gold. The leaves are arranged in a dense, textured manner, creating a vibrant and naturalistic feel.

**Building  
Nutritious Food  
Baskets Project**

A large, dark red speech bubble is centered on the page. The bottom edge of the bubble is decorated with a scalloped border of stylized leaves in shades of teal, light green, and purple. The text is contained within the bubble.

**Insights**  
from the  
**Field**

## Preface

**This booklet is a compilation** of insights and success stories from the field during the implementation of the Building Nutritious Food Baskets (BNFB) project; a three-year project (November 2015 to October 2018) implemented in Nigeria and Tanzania and funded by the Bill & Melinda Gates Foundation. The objective of compiling these insights and success stories is to showcase and highlight BNFB's experiences and interactions with various stakeholders during implementation, highlight successful partnerships and to provide a 'human touch' in narrating the process and how the project was able to deliver results, outcomes and the emerging impact of these efforts.

BNFB's goal was to accelerate and support scaling up of biofortified crops for food and nutrition security and to help reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops (Orange-fleshed sweetpotato, Pro vitamin A (orange) maize, high iron and zinc beans and vitamin A (yellow) cassava) at scale. The project was implemented in Nigeria and Tanzania, to demonstrate how biofortified crops can be scaled up through a multi-crop ("food basket") approach. The project aimed to achieve

two objectives: 1) to strengthen the enabling environment for investment and 2) to strengthen institutional and community capabilities. The stories therefore align to the project objectives and cut across advocacy, capacity development and seed systems thematic areas in Nigeria and Tanzania.

Most of the success stories contained in this booklet have been developed and disseminated during the project implementation phase, while others were developed towards the end of the project to capture processes that illustrate best practices in scaling up nutritious biofortified crops. The booklet tells the story of BNFB's successes and emerging impact beyond the project period. The target audience includes policy makers, development partners, project managers, nutritionists and agronomists, extension workers, community development workers, farmers and the general public.

***Dr Hilda Munyua***

*Project Manager - Building Nutritious Food Baskets Project (BNFB),  
International Potato Center - November 2018*

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We would like to sincerely thank all BNFB partners who contributed and supported the development of these stories and insights. They include AFCO Investments Company Ltd, Agricultural and Ru-

ral Management Training Institute (ARMTI), International Maize and Wheat Improvement Center (CIMMYT), International Center for Tropical Agriculture (CIAT), International Institute for Tropical Agriculture (IITA), Meru Agro Seed Company, Ministry of Budget and National planning (MBNP) Nigeria, Prime Ministers' Office in Tanzania, Federal Ministry of Agriculture and Rural Development, Partnership for Nutrition in Tanzania (PANITA), Premier Seed Company Nigeria, Tanzania Agricultural Research Institute - Selian, Tanzania Agricultural Research Institute – Kibaha, Tanzania Food and Nutrition Centre (TFNC), Research, Community and Organizational Development Associates (RECODA) and Wanawake Waumini Wakristo Tanzania among others.

Many thanks to Kellen Kebaara for assisting with the editing of these stories and to the Communications and Public Awareness Department of CIP – Lima for designing the booklet.

## Acronyms

<b>ADP</b>	Agricultural Development Programme
<b>ARD</b>	Agricultural and Rural Development
<b>ARI-Hombolo</b>	Agriculture and Research Institute Hombolo
<b>ARMTI</b>	Agricultural and Rural Management Training Institute
<b>BNFB</b>	Building Nutritious Food Baskets Project
<b>CIAT</b>	International Center for Tropical Agriculture
<b>CIMMYT</b>	International Maize and Wheat Improvement Center

<b>CIP</b>	International Potato Center
<b>CMAM</b>	Community Management of Acute Malnutrition
<b>FAO</b>	Food and Agriculture Organization
<b>FARA</b>	Forum for Agricultural Research in Africa
<b>HKI</b>	Hellen Keller International
<b>IITA</b>	International Institute of Tropical Agriculture
<b>NFFA</b>	National Food Fortification Alliance
<b>NMNAP</b>	National Multisectoral Nutrition Action Plan

<b>OFSP</b>	Orange Fleshed Sweetpotato
<b>PABRA</b>	Pan African Bean Research Alliance
<b>PVA</b>	Pro Vitamin A Maize
<b>RAC</b>	Reaching Agents of Change
<b>RIPAT</b>	Rural Initiatives for Participatory Agricultural Transformation
<b>SRI-Kibaha</b>	Sugar Research Insititute Kibaha
<b>TAG</b>	Tanzania Assemblies of God
<b>TARI-Kibaha</b>	Tanzania Agricultural Research Institute Kibaha

<b>TFNC</b>	Tanzania Food and Nutrition Centre
<b>ToT</b>	Training of Trainers
<b>TZS</b>	Tanzanian Shilling
<b>UNICEF</b>	United Nations International Children's Emergency Fund
<b>USD</b>	United States Dollar
<b>VAD</b>	Vitamin A Deficiency
<b>WWK</b>	Wanawake Waumini wa Kristu

## Partners






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## Strengthening national institutions for a supportive policy environment for biofortification: The case of the Tanzania Food and Nutrition Centre



Since November 2015, the Building Nutritious Food Baskets (BNFB) project has been a partner in changing the lives of rural communities in Tanzania through enabling the implementation of interventions aimed at reducing hidden hunger, also known as micronutrient malnutrition. The project, funded by the Bill & Melinda Gates Foundation, has seen communities in Tanzania adopt and use biofortified crops such as orange-fleshed sweetpotato (OFSP), pro-vitamin A (PVA) maize and high iron and zinc beans. These locally available staple crops are rich in the essential micronutrients that are useful in dealing with micronutrient deficiency problems among the population, particularly adolescent girls, women of childbearing age and young children under five years of age in both rural and urban areas.

In Tanzania, hidden hunger, which is characterized by a chronic deficiency in essential vitamins and minerals, is a major public health concern. Some 42% of all children under the age of five years suffer from stunting associated with long-term nutritional deprivation. Stunting is particularly severe among poor, rural and vulnerable populations.



Dr Elifatio Towo - Director of Food Science and Nutrition Department TFNC. A Biofortification Advocate. (CIP/ R Kasuga)

The Tanzania Demographic Health Survey of 2016 places the prevalence of vitamin A deficiency among children aged 6–59 months at 33% and among women of reproductive age at 42%. Ironically, the regions that produce a lot of food have the highest stunting prevalence, such as Njombe with 49%, Rukwa with 56%, Iringa with 42%, Ruvuma with 44%, Katavi with 39%, Morogoro with 33%, Kigoma with 38% and Mbeya with 38%.

The BNFB project supports initiatives aimed at reducing hidden hunger by catalyzing sustainable investment for the utilization



Dr Hussein Mansoor - Director R & D at the Ministry of Agriculture and Livestock Tanzania.  
A Biofortification Advocate (CIP/ R Kasuga)

of biofortified crops at scale. The project's scaling up model is based on the hypothesis that the scaling up of biofortified crops is dependent on the presence of a supportive policy environment, strong institutional capacities and proven technologies.

In Tanzania, the project has partnered with institutions such as the Tanzania Food and Nutrition Centre (TFNC) to catalyze policy

change in favor of biofortification. TFNC is the technical arm of the government that is responsible for coordination of technical and policy issues and action on nutrition. It 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; therefore, partnering with it and building its institutional capacity on biofortification have helped to advance the biofortification agenda at the highest technical and policy levels of the government. Dr Vincent Assey, the TFNC Chief Executive Officer, says,

**BNFB has developed our capacity to make people understand the difference between biofortified crops and genetically modified crops, and now people can fully understand the difference between PVA maize and the other yellow maize.**

Dr Assey notes that with the capacity that BNFB has provided, TFNC will work towards ensuring that the most vulnerable groups are reached in the fight against hidden hunger in Tanzania:

**We have now seen that biofortification is a sure way of tackling the malnutrition problem in the country. It can reach a lot of people in the rural areas, and that is why with the knowledge, we shall endeavor to ensure that government policies include biofortification not only on paper but also in implementation.**

Prior to the launching of the BNFB project, TFNC concentrated on commercial food

fortification and vitamin A supplementation. Although these strategies have attained commendable results, several challenges limit their reach among people living in rural areas, particularly relating to their need for enhanced infrastructure, critical mass awareness, affordability of the foods enriched with the supplements, availability of a vibrant manufacturing sector and access to markets.

The introduction of biofortification in Tanzania was seen by food and nutrition experts as an innovative and alternative way of delivering essential micronutrients to the rural populations in a cost-effective manner. Tanzania was one of the five countries that implemented the Reaching Agents of Change (RAC) project over 2011–2015 that advocated for increased investment in OFSP to combat vitamin A deficiency among young children and women of reproductive age. The BNFB project builds on the successes of the RAC project by broadening the scope and adopting a food basket approach to provide multiple micronutrients.



Advocacy to Tanzania Parliamentary Committee on Nutrition (PANITA)

BNFB's efforts in advocacy and collaborative capacity building have resulted in biofortification becoming entrenched in TFNC's draft five-year strategic plan for 2018–2022 and the National Multisectoral Nutrition Action Plan (NMNAP), which is Tanzania's five-year strategy for tackling malnutrition. TFNC is the secretariat of the National Food Fortification Alliance (NFFA), which coordinates the issues on vitamin A, iron-folic supplementation, food fortification, salt iodation, and micronutrient powder supplementation for children aged 6–23 months. The rationale for entrenching biofortification in policy documents and strategies is to ensure the adoption of a holistic approach to addressing hidden hunger such that complementary efforts are given equal status and stakeholders continue to speak with one voice. TFNC partnered with BNFB to host a meeting on 29 June 2017 in Dar es Salaam that brought together members of NFFA. The participants, drawn from the public and private sectors, academia, nongovernmental organizations, and multisectoral and bilateral organizations, discussed the revised draft terms of reference for fortification and agreed to incorporate biofortification, in addition to industrial fortification and supplementation, as a key component of NFFA.

One of the immediate achievements of the NFFA event was the inclusion of biofortification as a key agenda item during the National Summit on Food Fortification Summit that took place in Dar es Salaam on 23–24 August 2017 and was attended by among others, Vice President Samia Suluhu Hassan. Her speech singled out biofortification as crucial in addressing nutrition issues and pointed to the strong government commitment to fortification as a sustainable approach to addressing the problem of micronutrient malnutrition in Tanzania. Also present was the Deputy Minister in the President's

Office-Regional Administration and Local Government, who committed to doubling the government's budgetary spending on nutrition from the USD 0.25 per child in the 2016/17 financial year to USD 0.50 in 2017/18, with the aim of gradually moving Tanzania towards achieving the World Bank's goal of USD 8 by 2030.

In collaboration with other nutrition stakeholders, TFNC is developing guidelines on micronutrients and an in-service training curriculum for community health workers. In addition, the center is working with the Ministry of Education in developing school feeding guidelines and reviewing the maternal, infant and adolescent nutrition guidelines. BNFB continues to be a key partner in this agenda to ensure that biofortification is well mainstreamed in those guidelines for the sustainability of the biofortification agenda in Tanzania.

BNFB has partnered with TFNC to train change agents on biofortification, thus improving their knowledge and awareness about biofortification. That kind of partnership enabled TFNC to run its first training on PVA maize in March 2017 in Iringa, where 20 agricultural and nutrition cadres were trained on biofortification. Agricultural staff were considered for the training owing to their first-hand interaction with farmers as well as their role in information and awareness creation. BNFB and TFNC have continued to partner in promoting increased production and use of OFSP to combat vitamin A deficiency in Tanzania alongside the promotion of the production and utilization of high iron and zinc beans. A beneficiary of the training, Celestine Mugoba, who is a senior research scientist at TFNC, had to say:

**I did not know about PVA maize or high iron and zinc rich beans, but through the BNFB project, I came to realize that biofortifica-**



BNFB Advocacy in Tanzania (CIP/ J Maru)

**tion was one of the most affordable and cost-effective ways of delivering micronutrients to the poor population.**

Dr Elifatio Towo, who has worked in the Department of Food Science and Nutrition since 1991 where he coordinates all food science and nutrition programs, says that as the director in the department, he recognizes that the BFNB project has made a big contribution in catalyzing and complementing the government's interventions on combating micronutrient malnutrition among its populations. He had this to say:

**Through the support from BNFB we have been able to mobilize stakeholders and provide them with the capacity to enable them to understand the benefits of locally available biofortified crops. For us at TFNC, BFNB has enabled us to gain wide knowledge and experience on biofortification. Besides strengthening the capacity**

**of TFNC, the project has co-supported initiatives aimed at aligning biofortification with current legislations. We shall work towards ensuring that citizens, especially the rural poor, have access to biofortified foods for better nutrition and health.**

Mr Obey Nkya, the Director of Government Business in the Prime Ministers' Office, admits that there has been some general acceptance of biofortified crops by the government:

**“We have seen acceptance of the biofortification intervention by the government and we have also seen the BNFB project supporting the rollout of PVA maize products through private sector support.”**

According to Mr Obey, the project has been able to create a space for stakeholders to discuss biofortification.



Showcasing Biofortified Food Products (CIP/ R Kasuga)

Through collaborating with TFNC, BNFB is working with relevant institutions such as the Ministry of Agriculture, the Ministry of Education Science and Technology, the Prime Minister's Office, the President's Office, the regional administration and the local government to expedite the implementation of two key result areas in biofortification stipulated in the NMNAP document.

The future of biofortification in Tanzania is bright; however, several challenges need to be addressed as part of the initiatives aimed at facilitating the uptake of biofortified crops. TFNC says that the release of the various varieties of biofortified crops has been a slow process, PVA maize seeds are not yet in the market for farmers' access, and high iron and zinc beans have not reached farmers yet. Moreover, the climbing beans introduced by the BNFB project are a source of extra work and costs for farmers since they need staking poles for support. That is a challenge to farmers accustomed to bush bean varieties.

TFNC recommends that demonstration plots be established in various regions to be managed by biofortification champions and extension agents. This will ensure that farmers get the right information and easy access to seeds of appropriate biofortified varieties. Continuous awareness creation and sensitization are key to reach the target populations and ensure that the biofortification momentum is maintained.

**“We need demonstration plots especially for beans. We also need village based agricultural advisors to be selected to be champions of biofortification,”** says Celestine Mugoba.

## Championing policy change and investment for biofortification in Nigeria

Mrs Roseline Gabriel, Assistant Director of Nutrition at the Federal Minister of Budget and National Planning is a champion for biofortification under the Building Nutritious Food Baskets (BNFB) project. Mrs Gabriel first heard about the project in 2015, when the project team visited her office to introduce it to her ministry:

I was extremely impressed with the project model and goal. The project aims at reducing hidden hunger in Nigeria. Nutrition issues fall under my docket, so the project was a natural fit for me. Later in 2016, BNFB's senior country coordinator approached me with a request to consider a voluntary role as an advocate and champion for biofortification on the project. Some of the tasks for the country advocates were to promote biofortified crops, influence the creation of a conducive policy environment for these crops and foods and assist in fundraising efforts in support of biofortification. Although the mandate was challenging, I accepted the role unreservedly.

### Nigeria National Advocates for Biofortification

Since then, Mrs Gabriel has participated in the project's capacity enhancement retreats organized for all the country advocates to equip them with the skills and tools for advocacy. Among the tools provided were factsheets on biofortification, banners, T-shirts and other promotional merchandise. With her enhanced capacity, Mrs Gabriel has focused as a priority on influencing the inclusion of biofortification in policy documents such as the draft Nigerian Food and Nutrition Strategic Plan of Action 2016. The inclusion of biofortification in the plan was not easily achieved; it entailed a lot of negotiation, education and countless deliberations.





In Nigeria, BNFB is working with 32 advocates as champions for biofortification. Because of their support, the project has influenced the inclusion of biofortification in at least four key policy or strategic documents and a draft policy brief. These documents are 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, and a draft national advocacy policy brief prepared by the Federal Ministry of Budget and National Planning. In addition, biofortified crops such as orange-fleshed sweetpotato (OFSP) were included in the national home-grown school feeding program in Osun, Abia and Cross River states in the first quarter of 2017, and over 5,000 households in Rivers and Abia states are now consuming biofortified crops while other like Oyo states are following suit. Some renowned institutions like the University College Hospital in Ibadan, Oyo state, have adopted OFSP in the menu for inpatients with diabetic or other ailments.

Another of the BNFB project objectives is to strengthen institutional and community capacity to scale up biofortified crops through training of targeted trainers and awareness creation through behavioral change communication. The trained advocates play an important role in ensuring that this objective is achieved. The



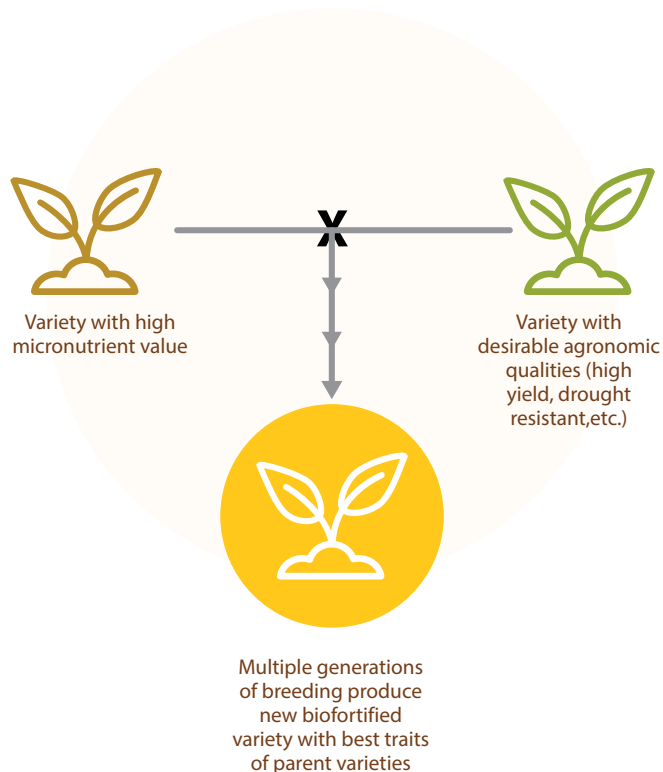
BNFB Advocacy Efforts in Nigeria (Isiaka)

advocates have made tremendous impact in promoting biofortified crops in their various areas of influence and commendable progress has been recorded. Additionally, they have outstanding results in sensitizing key actors, who have been able to raise investments for biofortification in many states of Nigeria. For instance, Mrs Clementina Okoro, the State Nutrition Officer with the Primary Health Care Board of the Federal Capital Territory, has been sensitizing her community and creating awareness among them on biofortification. Her efforts have seen biofortified crops included in the program of the Community Management of Acute Malnutri-


tion (CMAM) centre in Kwali Area Council. After receiving advocacy training from BNFB, Mrs Okoro worked to get the buy-in of relevant decision-makers to include biofortification in CMAM. Mrs Okoro indicates that she took advantage of the establishment of a new CMAM center by UNICEF. She was able to convince the stakeholders to see the complementary nature of the food-based approach in the management of micronutrient malnutrition, emphasizing the need for households, especially for children under five years of age, to access and consume biofortified crops produced in kitchen gardens or for income generation, which requires that they be processed and marketed. Mrs Okoro also got the commitment of UNICEF and her agency to support the sensitization event for relevant stakeholders within the area council, which 69 men and 47 women attended, including traditional leaders and representatives from all the 10 wards in the council.

Through the efforts of such advocates, biofortification is becoming accepted in Nigeria, and biofortified crops have reached about 938,060 rural consumers who otherwise would have had limited access to industrially fortified foods and supplementation interventions.

**Biofortification is the process of increasing the nutritional value of food crops by increasing the density of vitamins and minerals in crops through either conventional plant breeding or biotechnology.**



## Championing vitamin A-rich Orange-Fleshed Sweetpotato in Nigeria



Micronutrient malnutrition is widespread in Nigeria, particularly vitamin A deficiency, which affects at least 30% of the population. Women of reproductive age, infants and young children mostly are vulnerable to micronutrient malnutrition. Many of them suffer multiple deficiencies of essential micronutrients such as vitamin A, iron and zinc, which can result in an array of health problems and even early death. Most of the people affected by micronutrient malnutrition do not show the physical symptoms usually associated with malnourishment, hence the deficiency is commonly referred to as 'hidden hunger'.

Nigeria, together with partners such as the Building Nutritious Food Baskets Project (BNFB), is using innovative approaches to tackle hidden hunger. Gift Buduzhi Oguzor, a community nutritionist, is leading one such effort, championing efforts to scale up nutritious, vitamin A rich orange-fleshed sweetpotato (OFSP) in Rivers state.

Gift was among the beneficiaries of a 10-day training of trainers (ToT) course on 'Everything you ever wanted to know about sweetpotato', supported by BNFB, that occurred in March 2017. The course was organized and hosted by the Agricultural and Rural



Gift during one of his advocacy campaigns in Rivers State

As a community nutritionist and advocate of quality nutrition, I feel that integrating OFSP in my work has really helped me to supply a safe, micronutrient-dense food and to ultimately contribute to reducing hidden hunger in my country. OFSP is a sustainable and cost-effective way of addressing vitamin A deficiency especially in children and women of reproductive age. Working with various stakeholders to develop their capacity and increase nutritional knowledge has helped stimulate action relating to production and consumption of OFSP in Nigeria. (Gift Buduzhi Oguzor)



Gift's work in promoting OFSP in River State is instrumental in fighting micronutrient malnutrition, particularly vitamin A deficiency

Management Training Institute (ARMTI), in Ilorin. ARMTI has partnered with the International Potato Center (CIP) since 2012, first through the Reaching Agents of Change (RAC) Project, then the Jumpstarting OFSP through Diversified Markets in West Africa Project and most recently BNFB.

The course adopts adult learning methodology emphasizing learning by doing and discovery. It covers 14 topics on the sweetpotato value chain, including production, utilization and investment.

Gift's accomplishments in promoting OFSP are facilitated by the model BNFB adopts to reach a critical mass of farmers producing and consuming OFSP. In Nigeria, BNFB's cascading model for capacity development involves having primary facilitators at ARMTI train agricultural, nutrition, health, marketing, and gender experts. These experts then become the secondary facilitators, and they, in turn, facilitate a shorter and contextualized step-down course to different target audiences, and these become the tertiary facilitators. This approach continues until the trainers reach the end-users in their communities.

Gift's training equipped him to be a secondary facilitator and a champion for OFSP in Rivers state. He has shared his skills and knowledge with extension workers, food processors, farmers and other stakeholders in the sweetpotato value chain for wide impact. By March 2018, he had reached more than 275 agents of change with training, with little support from BNFB. Consequently, more than 1500 households are now growing and accessing OFSP. The area covered by OFSP currently is over 7 hectares in Rivers and Bayelsa states. Some of the farmers cultivating it include the special adviser to Rivers state governor, who is growing OFSP on his farm —3 plots of about 100 m by 50 m —and intends to increase this investment.

Gift's other role as one of the national advocates for biofortification has seen him benefit from various capacity strengthening initiatives to enhance his skills in advocacy for policy engagement, in raising new investment for OFSP and in promoting the nutritious food basket of biofortified crops as a solution to hidden hunger. His advocacy and awareness creation efforts have inspired other actors in the OFSP value chain. For example, some retail outlets such as SPAR supermarket and Fruit Garden market in Port Harcourt are stocking and promoting consumption of OFSP. This improved OFSP access has increased its demand and so more of it is being produced. Some actors are processing for sale OFSP products such as juice, bread, doughnuts, cookies, chin-chin (a fried snack made of wheat flour and OFSP puree dough) etc. In addition, biofortification is now included in Rivers state's food and nutrition policy and OFSP has been added to the menu of the Home-Grown School Feeding Program, which is in the process of implementation.

Gift is involved also in organizing and hosting media campaigns. With support from the Director of Extension Services in Agriculture Development Program, Rivers state, he has worked with Rivers State Television to create awareness among households on the

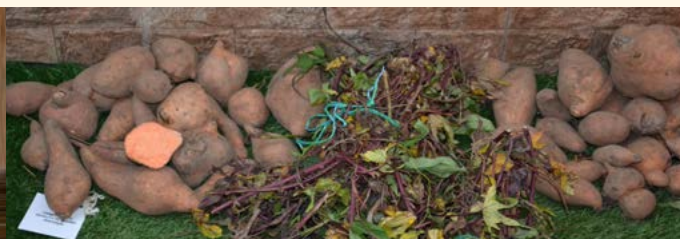
production, processing, utilization and value addition of OFSP, and promoted its adoption, acceptance and consumption.

The huge impact of Gift's work extends beyond his home state of Rivers to other BNFB pilot states like Enugu, Kogi, Ogun and Taraba. His achievements demonstrate the emerging impact and sustainability of RAC and BNFB's objectives. The approach of using national advocates like Gift has been vital in the creation of a favorable policy environment, the raising of new investment to support biofortification programs and initiatives, and the scaling up of biofortification. All these are essential in addressing vitamin A deficiency among young children, women of reproductive age and men.

Gift's efforts demonstrate that institutional and community capabilities have been strengthened for the production and consumption of OFSP. The aim is to ultimately have an adequate number of passionate and committed agents of change who can organize themselves to drive their own agenda, mainstream biofortified crops into their ongoing programs and activities. These agents will also continue to pass down the skills they acquire to the OFSP end-users, who are the smallholder farmers, small and medium processors, and marketers.



Solo Gold - a new OFSP variety recently released in Nigeria (CIP/ J Maru)



## Religious organizations as change agents in catalyzing availability of orange-fleshed sweetpotato in rural Tanzania

Many households in Ihula, Irindi, Mahenge, Mbigili, Mbuyuni and Ruaha villages in Iringa region of Tanzania have been mobilized to produce and consume orange-fleshed sweetpotato (OFSP) for improved health and wealth. These efforts are being championed by a religious women group known as Wanawake Waumini wa Kristu (WWK) under the leadership of Tanzania Assemblies of God (TAG) church.

Iringa is one of Tanzania's regions hardest hit by hidden hunger, which is characterized by chronic deficiency in essential vitamins and minerals. The Tanzania Demographic Health Survey of 2016 indicates that the prevalence of vitamin A deficiency (VAD) is at 33% for children aged 6–59 months and 42% for women of reproductive age. Ironically, the food basket regions of Tanzania, that is where the most food is produced, report the highest levels of stunting and malnutrition. For example stunting prevalence stands at 56% in Rukwa, 49% in Njombe, 44% in Ruvuma, 42% in Iringa, 39% in Katavi, 38% in Kigoma and Mbeya and 33% in Morogoro.

WWK OFSP Farmers  
at SemiArid Mbuyuni -  
Iringa Region Tanzania

The need to tackle these high levels of malnutrition and stunting, which mostly affect vulnerable groups especially women and children, motivated WWK to seek nutrition training and financial support from the Building Nutritious Food Baskets (BNFB) project. These communities in Iringa have consequently benefited from BNFB project's capacity development interventions, resulting in increased OFSP production, consumption and incomes in the region:

**So far we can say that after BNFB's financial and material support, we are on the right track in the implementation of interventions**



**that have seen our communities adopt, produce and consume OFSP (Mrs Margaret Ringo, TAG secretary)**

Through BNFB support, the women groups in Iringa have implemented up to 30 OFSP activities including OFSP production and agronomy, value addition and processing, awareness creation, promotion and community mobilization.

**We have moved from solely depending on maize as a staple food and are now integrating the nutritious OFSP into our diets. We are also accelerating the production of OFSP and ensuring that all women in these villages cultivate OFSP and include it as part of the family meals (Mrs Mrima, a WWK leader)**

The WWK story began in March 2017 when Mrs Ringo attended a BNFB training of trainers event on OFSP in Babati, Tanzania. After the training, which covered OFSP production, value addition and processing, Mrs Ringo was inspired to introduce and mainstream the nutritious crop among the agricultural and nutrition activities of TAG, working through WWK. She felt that it was important for TAG to undertake community development interventions instead of focusing solely on spiritual nourishment of members. There was need for a holistic intervention aiming to transform the communities and church members spiritually, mentally and physically. WWK sought to venture into interventions that would directly impact the larger community in the areas of poverty reduction and food and nutrition security. Mrs Ringo believed that biofortification, using OFSP as an entry point, provided a sustainable and cost-effective opportunity for the rural populations.

Mrs Ringo submitted a concept note to BNFB seeking financial and technical support that would help introduce OFSP incrementally in



**WWK Women Groups -Iringa Tanzani (WWK)**

20 villages in Iringa, starting with 2 villages in the first phase that was to run October 2017–January 2018. These two pilot villages are in Ruaha Mbuyuni and Ilula divisions and are located along the Morogoro–Iringa main trunk road. The areas are mainly semi-arid with unimodal rainfall, are prone to frequent shortages of food and are characterized by severe micronutrient malnutrition, serious stunting and chronic anemia among children under five, pregnant women and women of reproductive age. Ruaha Mbuyuni and Ilula

divisions were selected because with irrigation they had the potential for bumper crop harvests and easy production of sweetpotato vines for planting in the other earmarked project villages. By adopting the rural initiatives for participatory agricultural transformation (RIPAT) extension approach, which has an in-built scaling up mechanism, the first phase established the foundation for scaling up OFSP technologies in the rest of the 20 villages.

**Before I started growing OFSP, I had difficulty reading my bible due to problems with my eyesight. I was surprised when early this year after making OFSP a part of my regular diet, I stopped using spectacles! Better still, I no longer have eye complications! I now believe that OFSP is medicinal. Thanks to BNFB for introducing these nutritious crops to us (WWK member from Irindi village).**

Eighteen months after the WWK project started, there is real impact on the ground, with Ihula, Irindi, Mahenge, Mbigili, Mbuyuni and Ruaha villages well capacitated and now producing OFSP. WWK women leadership in Iringa has focused on orientating and creating awareness among the community, churches, local government and other institutions on the production and consumption of OFSP. They have conducted step-down training on OFSP production and agronomy for more than 300 community members and field days with the objective of facilitating sharing of experiences among group members and other farmers, government officials, extension workers and other stakeholders, thus expanding the reach of their work.

**I received vines during phase 1 of the WWK project in December 2017 and planted them in just a small area. I have since multiplied**

**the vines and sold them to my neighbors, earning TZS 150,000 (about USD 70). I have also harvested OFSP roots, packed them in small lots worth TZS 1,000 (about USD 0.44) and sold them in the local market. I provide my customers with information about the nutritional value of OFSP. I have earned a total amount of TZS 350,000 (about USD 153). In addition to growing onions, we are now relying on OFSP as a source of income and nutritious food for our family. I highly encourage my fellow community members to embark on OFSP production to enable us to fight hidden hunger and increase our incomes (*Agnes Taki from Ruaha Mbuyuni, one of the beneficiaries of WWK work*).**


The BNFB team conducted a monitoring visit to the women groups in Iringa in July 2018. The impact on the ground was impressive:

**We saw a group of women who were highly motivated and ready to learn and implement the knowledge and skills acquired to impact their communities with OFSP. It is amazing to see so much OFSP produced even in semi-arid regions like Mbuyuni village in Iringa. Producing and consuming OFSP will go a long way in reducing hidden hunger levels in Iringa region, especially among women and children (*Ms Joyce Maru, BNFB Communications and Capacity Development specialist*).**

The WWK leaders are ready for the next planting season and for scaling up OFSP to the rest of the 20 villages, but they say that they now want to adopt the 'food basket' approach that includes high iron beans and pro-vitamin A maize so as to reduce hidden hunger in the region with the nutritious staple crops.



## “Take lead – take off” Approach to Capacity Development for Sustainability and Impact: A success story of the Agricultural and Rural Management Training Institute in Nigeria



The Agricultural and Rural Management Training Institute (ARMTI) is a parastatal organization under the Federal Ministry of Agriculture and Rural Development of the Federal Government of Nigeria. ARMTI is situated in Ilorin Kwara State of North Central Nigeria. It is a center of excellence for agricultural and rural development (ARD) management training and ARD manpower development in Nigeria in general. The work of ARMTI serves very well to demonstrate emerging impact and sustainability of the foundation laid by the Reaching Agents of Change (RAC) project's capacity development efforts.

Between 2011 and 2014, the International Potato Center (CIP) and Helen Keller International (HKI) implemented the RAC initiative that advocated for increased investment in orange-fleshed sweetpotato (OFSP), to combat vitamin A deficiency among young children and women of reproductive age and to develop institutional and



ToT training participants at ARMTI

“Agricultural and Rural Management Training Institute (ARMTI) has partnered with International Potato Center (CIP), through the Reaching Agents of Change (RAC) and Jumpstarting Projects. These partnerships have helped to build the capacities of the staff that participated in these projects and helped ARMTI in achieving some of her agricultural and rural development mandates”. *Dr. O. A. Oladunni, Ag. Executive Director, ARMTI, Nigeria*

community capabilities to produce and consume OFSP. To ensure sustainability, RAC strengthened the capacity of national institutions like ARMTI, Sokoine University of Agriculture (Tanzania) and Eduardo Mondlane University (Mozambique), and that of individual change agents. The aim was to enable them self-organize, drive their own agenda, mainstream the OFSP training program into their activities, and pass down the skills acquired to the end-users – the small-scale farmers.

The RAC project worked closely with ARMTI in planning and delivering the Training of Trainers (ToT) courses on “Everything you ever wanted to know about sweetpotato” using adult learning methodologies. This was achieved through a collaborative agreement that was successfully implemented between December 2012 and July 2014. The ToT course is a hands-on course that comprises of fourteen topics on sweetpotato knowledge along the value chain, including production, utilization and investment in sweetpotato.

To reach a critical mass producing and consuming OFSP, RAC applied a “cascading” model for capacity development, where experts (agriculturalists, nutritionists, health, marketing and gender experts) attended a 10-day workshop facilitated by CIP, HKI, ARMTI and other national experts. These experts became the primary facilitators who in turn facilitated shorter and contextualized ToTs to various levels of audiences (secondary and tertiary). This upscaling approach ensured that the training was cascaded down to farmer trainers who finally trained the end users in their communities as illustrated in figure 1.

In the first year (2012); the RAC project specialists (CIP and HKI) led the process of organizing and conducting the ToT course while the national counterparts from ARMTI backstopped the process. In the

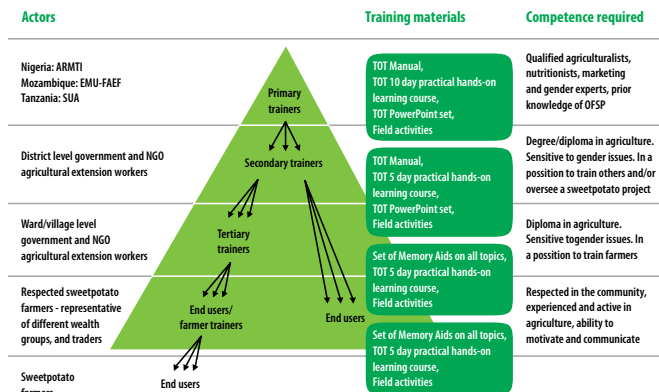


Figure 1. Cascading Approach to Capacity development

second year (2013), the national counterparts from ARMTI took lead in organizing and conducting the training while the RAC project specialists backstopped. By the third year (2014), ARMTI's capacity was developed and they organized and conducted the ToT course on their own with the RAC project team acting as observers and only offering partial financial support as illustrated in figure 2.

### 'Take off' Post RAC

Post RAC project implementation (2014 onwards), ARMTI's capacity was fully developed and the ToT course was domiciled in ARMTI and they now took complete charge of running the course on a full-cost-recovery basis. ARMTI established and maintained demonstration OFSP plots for field practical exercises during the ToT courses. However, this was not without challenges; for exam-



ToT training participants at ARMTI

ple, in the first attempt to run the course in March 2015, there were no applicants (with funding) despite efforts to advertise the course extensively within and outside Nigeria and subsidizing the tuition fee specially to attract national participants. The second attempt in October 2015 yielded some success attracting six participants. This prompted ARMTI to become more innovative in mobilizing resources to support the course and ensure that the OFSP course remained a priority, and was fully integrated into ARMTI's programs.

ARMTI management developed a proposal to mobilize resources to run the course under ARMTI's Human Capacity Development Capital Project and submitted it to the Federal Government of Nigeria. These efforts yielded results and in 2016, when the Federal Ministry of Agriculture and Rural Development approved funding

of 16,500,000 Naira (equivalent to USD 54,635.76 at a rate of \$1 to N302), which was included in the 2016 ARMTI's Human Capacity Development Capital project. Through this support, ARMTI was able to run two more ToT courses – the first in December 2016, and the second in March 2017. In these two courses, ARMTI trained up to 53 (12 female) agents of change on “Everything you ever wanted to know about sweetpotato. This brings to a total 138 (42 female) agents of change (national and international) that have been trained through ARMTI between 2012 and 2017, reaching over 21 states of Nigeria.

The national participants were mainly drawn from six states, which are high producers and consumers of sweetpotato i.e. Kwara, Osun, Ebonyi, Kaduna, Benue and Nasarawa. The first cohort of ToTs trained in December 2016 included four new States i.e. Kogi, Oyo, Abia and Kano States as well as Capital Territory; while the second cohort trained in April 2017 included Bauchi, Gombe, Plateau, Niger, Taraba, Anambra, Delta, Rivers, Akwa Ibom, Ekiti, and Ogun States. These new states have great potential for sweetpotato production and consumption and it is expected that more states will be included in subsequent courses to eventually cover all the states in Nigeria.

ARMTI plans to continue with this sustainable capacity development initiative and to attract more funding from the Federal Government of Nigeria; this way reaching more agents of change; impacting on local institutions and farmers to produce and consume the vitamin A-rich OFSP. Catalyzing demand and investment for OFSP while strengthening institutional and community capacities, is critical to addressing hidden hunger by reaching more households in Nigeria to produce and consume biofortified crops.

## Four Orange-Fleshed Sweetpotato (OFSP) Vines of Gold (Capacity Development for Impact)

Orange-Fleshed Sweetpotato (OFSP) multiplication fields at Ilindi village are impressive and inspirational. The fields, managed by very committed OFSP growers, using irrigation from the nearby Lake Manyara. The proximity of the land to the lake makes the water table very high allowing the farmers to dig up wells to irrigate their crops.

Ilindi village is administratively located in a semi-arid area in the Bahi District of Dodoma - Tanzania. From the main road, one does not expect to see anything green and productive growing here; until you come across these evergreen and beautiful OFSP vine multiplication fields.

Julius Kayongola (pictured left), a farmer from Ilindi village – shared his journey to becoming a seasoned OFSP vine multiplier and root grower. In December 2015, he was one of the beneficiaries of the OFSP seed production and multiplication training course organized by Sugar Research Institute (SRI-Kibaha) Tanzania, with funding from the Food and Agriculture Organization (FAO).



Semi-Arid Ilindi Village at a glance

**“I’m now able to generate income through multiplying and selling OFSP vines, and as a result, I pay school fees for my children and our families have sufficient and nutritious food”.**  
*Farmer Julius Kayongola*

Julius explained that after the training, he received a sample of four cuttings of multiplier vines that he has since multiplied to cover a 0.5-acre piece of land with the aid of irrigation. He also shared the vines with his family members and neighbors and as a result, many

members of Ilindi community now produce and consume OFSP throughout the year. The OFSP farmers multiply various varieties OFSP vines and sell them at the local market and generate income as a result.

The 'Ejumula' variety of OFSP is one of the most popular with the Ilindi farmers. It grows impressively in semi-arid conditions and produces gigantic roots. These roots make the perfect nutritious staple food that is widely consumed at Ilindi.

Julius's story is a good example of the impact and sustainability of the Reaching Agents of Change (RAC) project's capacity development efforts. Between 2011 and 2014, the International Potato Centre (CIP) and Helen Keller International implemented RAC; an initiative that advocated for increased investment in Orange-fleshed sweetpotato (OFSP) to combat vitamin A deficiency among young children and women of reproductive age. RAC developed capacity of national partners like Sugar Research Institute (SRI-Kibaha) in Tanzania and other key beneficiaries to enable them self-organize, drive their own agenda, take ownership, and pass down the skills acquired to the end-user – the farmer

In this case, SRI-Kibaha received a grant of US\$20,000 from the Food and Agriculture Organization (FAO) in 2015. This was one of the outcomes of RAC's advocacy efforts that raised more than more US \$21.6 million in the target countries (Nigeria, Tanzania, Mozambique, Ghana and Burkina Faso) for OFSP initiatives and food-based approaches. SRI-Kibaha and Hombolo Agriculture Research Institute (ARI - Hombolo) are some of the institutions whose capacity was strengthened by RAC to deliver Training of Trainer (ToT) courses on "Everything you ever wanted to know about sweetpotato." They are now cascading this knowledge and expertise to extension



Farmer Julius Kanyongola's 0.5 Acre OFSP multiplication site (CIP/ J Maru)

workers, farmers and other stakeholders along the sweetpotato value chain to ensure for impact at scale.

SRI-Kibaha and ARI-Hombolo were able to use Julius story to capacitate and inspire other OFSP farmers through a field visit which was part of a 2-day training on agronomy and seed production conducted on 26-27 September 2016. The training targeted agriculture extension workers and vine multipliers from 6 districts in Singida and 6 districts in Dodoma districts. The objective of the training was to equip the participants with knowledge, skills, and technical understanding of OFSP seed production.

#### **Ilindi's 4 year OFSP Initiative is launched**

Consequently, Ilindi village recently launched a 4-year OFSP growing initiative that will ensure that all the twenty-two thousand households grow and consume OFSP by 2020. This initiative aims



Lindi Community Launch 4-year OFSP Plan (CIP/ N Luambano)

to increase food and nutrition security for the Lindi community and generate wealth for families.

This project is spearheaded by Mr. Anthony Sahali, the Ward agriculture extension officer with support from other OFSP champions among them Ms. Tina Suday Mbassa – the Ward councilor.


The success realized as well as the achievements and lessons learnt from the RAC project led to the development of a follow-up project known as Building Nutritious Food Baskets (BNFB). The BNFB explores a scaling-up model through a multi-crop (food basket) approach to addressing hidden hunger by catalyzing sustainable investments for the production and utilization of biofortified crops that are ready for scaling up, viz.: OFSP; vitamin A (yellow) cassava, vitamin A (orange) maize and high iron/zinc beans.

RAC and BNFB projects are funded and supported by the Bill & Melinda Gates Foundation.



OFSP Varieties grown at Lindi Village (CIP/ J Maru)

## Vitamin A-rich orange-fleshed sweetpotato adoption is taking shape in Tanzania's Dodoma and Singida regions



Many households in the Dodoma and Singida regions of Tanzania can hardly afford nutritious foods or the high quality seeds required to grow such crops for consumption and sale for income to support their families. This situation is slowly changing, however, as many households are now growing vitamin A-rich orange-fleshed sweetpotato (OFSP). OFSP has been hailed as an innovative and alternative way of delivering essential micronutrients to the rural populations in a cost-effective manner. The crop, which is fully packed with important micronutrients, is affordable to grow and easy to maintain. A 100-g serving of boiled OFSP roots or about half a cup can supply the daily vitamin A requirements of a young child – which is 400 retinol activity equivalents – and thereby help to fight hidden hunger, particularly vitamin A deficiency (VAD). Vitamin A helps to improve resistance to infectious diseases and to decrease morbidity, as well as to reduce mortality in pregnant and lactating mothers and their children.

Hidden hunger is widespread in Tanzania, and particularly VAD. It is characterized by chronic deficiency in essential vitamins and



BNFB Seed Multiplication Training Morogoro Tanzania (CIP/ J Maru)

minerals. According to the Tanzania Demographic Health Survey of 2010, the prevalence of VAD is 33% among children aged 6–59 months and 42% among women of reproductive age. VAD is particularly severe among poor, rural and vulnerable populations. In Dodoma and Singida regions, VAD prevalence is 30% among children aged 6–59 and 21% among women of reproductive age. Therefore, the effort to scale up OFSP dissemination in these two regions by the Building Nutritious Food Baskets (BNFB) project is timely, as 45-year-old Simon Yohana, an OFSP farmer in Dodoma



BNFB Seed Multiplication Training Morogoro Tanzania (CIP/ J Maru)

region, reckons. The BNFB project is promoting the production and consumption of biofortified crops such as OFSP in Tanzania.

Mr Yohana is physically challenged and has only one functional hand. He is among the direct beneficiaries who received OFSP vines from the BNFB vine multiplier in Ilindi village of Bahi district. Mr Yohana, a father of three, believes that living with a disability is not inability. He says that his family has benefited through consum-

ing OFSP and earning an income from selling it. "Many families in this village are facing problems because they grow crops that don't help them. I have grown OSFP since 2016 and I am happy that my family is healthy."

Yohana says that through the sale of OFSP he has been able to educate his children and that he wants to be a role model in his village. "I am expecting a bumper harvest this season, and I want people to know that even though I have only one good hand, I can make a difference."

In the same village, the Mwangaza women group is leading a campaign promoting the consumption of OFSP for its nutritional value. The chair of the 32-member group, 63-year-old Suzana Kawea, is working towards ensuring that every woman in Ilindi village plants OFSP during this planting season. "We have received a lot of information from our leader who was trained by the BNFB project. This information and knowledge are what she provides to us and we in turn use it to reach out to other women," says Ms Kawea. She further remarks that they are aware that consuming OFSP will help prevent a number of diseases and reduce stunted growth among children, which is a serious problem in the region.

In the Masigati village of Manyoni district, the Juhudi agricultural group, which consists both men and women, is reaching out to farmers with information on OFSP. Their chair, Azizah Saidi, who is a BNFB vine multiplier, provides them with information on OFSP during their weekly meetings every Wednesday. At one point the group organized an OFSP promotional event for the entire village.





OFSP Farmers from Babati Tanzania during a field visit March 2017 (CIP/ J Maru)

“The first time we cooked the sweetpotatoes, we invited all the villagers to taste and appreciate the sweetness of the crop. They confirmed that OFSP was sweet, its color attractive and that our children would love it,” says Ms Saidi.


At least 11 districts, five of which are in Singida and six in Dodoma, are growing OFSP. The dissemination efforts in these two regions are being led by the Tanzania Agricultural Research Institute Kibaha, a national partner on the BNFB project. In just under two years the institute has reached 20,936 households with OFSP, 3346 of them directly, including the 1,200 reached through schools, and 17,590 indirectly. BNFB intends to reach 200,000 households in these two regions by 2022.

In spite of these successes there are still challenges in the dissemination and adoption of OFSP, such as the overreliance on seasonality to grow OFSP in an environment where the rainy seasons have become unpredictable due to climate change and the lack of access to markets in the areas producing high volumes of OFSP. Despite the challenges, the farmers believe that OFSP will go a long way in complementing the government’s efforts to provide vitamin A supplements to children under 5 years of age. They advocate for concerted efforts of all stakeholders to ensure more sensitization and information sharing about the nutritional value of OFSP in order to increase its production and consumption to fight VAD in Tanzania.

## Catalyzing processing and marketing of nutritious biofortified foods in Tanzania: The case of AFCO Investments Company Ltd

One year since receiving a grant from the Building Nutritious Food Baskets (BNFB) project, AFCO Investments Company Ltd, a processing firm based in Dar es Salaam, Tanzania, has become an important contributor in improving the nutrition status of the Dar es Salaam urban population by supplying biofortified food products to the market. Ms Fortunatha Mmari, the firm's Managing Director, says that the demand for biofortified maize flour and fresh orange-fleshed sweetpotato (OFSP) roots is higher than what the company can supply.

The new chapter in AFCO's story began in 2017 when the company was approached by BNFB to pilot pro-vitamin A (PVA) maize flour in the market. AFCO was awarded a modest grant for the work, which involved piloting processed PVA maize, marketing biofortified products, training the community on nutritional value of PVA maize, and promoting and distributing the processed products. The funds allowed the company to buy a milling machine and packaging bags and to import PVA maize grain. Working in three sub-regions in Dar es Salaam, AFCO targeted the main retail shops,



Ms Fortunatha Mmari - AFCO Managing Director (FCO)

hospitals, secondary schools and the general public. The BNFB team further encouraged AFCO to explore market opportunities for OFSP fresh roots.

The pilot period opened Ms Mmari's eyes to the untapped opportunity and existing demand for OFSP and PVA maize. Using BNFB's training and promotional materials, AFCO initiated vigorous efforts to carry out nutrition education to the target communities through sensitization workshops and market fairs. With time these activities helped push up the demand for PVA maize flour and OFSP roots. For instance, in 2017 AFCO processed about 3.5 tons of PVA maize

flour and sold 2.8 tons within just 3 months through 14 retail shops and one wholesaler in Dar es Salaam. Over a period of 5 months (December to April 2018), AFCO supplied 500 kg OFSP fresh roots to Food Lovers Supermarket and Shoppers Supermarket, a volume that fell far short of the estimated demand of 1.04 t per month.

Ms Mmari believes that the products have become popular among those who have consumed them and are aware of their nutritional benefits. And she states, “Consumers prefer PVA maize flour products over those of regular white maize flour. This provides evidence that OFSP and PVA maize have been good vehicles to deliver vitamin A, a critical micronutrient for good health, growth and development.” She believes that her company’s results provide evidence on how consumers can evaluate their food consumption and nutritional patterns and choose to adopt healthier alternatives.

Ms Mmari credits the growth of her company and its diversified portfolio to BNFB support, which credits for opening a new world for her company. She considers AFCO’s journey to get where it is

today to have been fun and challenging: “AFCO is on the right path to success.”

AFCO believes that more work needs to be done to reach the vulnerable virgin market – comprising the low, middle and high-income populations in the urban and rural areas – with nutritious biofortified foods.



Ms Fortunatha Mmari - AFCO Managing Director (AFCO)



AFCO OFSP Composite Flour (AFCO)

## Strengthening private sector capacity to scale up pro-vitamin A maize production and consumption in Nigeria

Incorporated in 1994, Premier Seed Company Ltd. is one of the four private seed companies in Nigeria that are partnering with the Building Nutritious Food Baskets (BNFB) project to research and disseminate biofortified maize varieties in Nigeria. According to the Managing Director, Professor Ibrahim Ogungbite, the investment by the company in pro-vitamin A (PVA) maize value chain has been one of the most rewarding in the recent past. "The entire 395 tons of the PVA certified maize seed that we produced last year was been mopped up," observes Dr Afolabi Samson, the Research Manager.

PVA maize is a special type of maize that is rich in beta-carotene. Beta-carotene is an organic, strongly colored, red-orange pigment abundant in plants and fruits. Beta-carotene is what gives PVA maize an orange color and is converted into vitamin A in the body after consumption. PVA maize is in many ways the same as white, yellow or other maize, but the big difference is that it provides an additional nutritional benefit of vitamin A, which other types do not have.



PVA Maize (CIP/ J Maru)

BNFB is a three-year project funded by the Bill & Melinda Gates Foundation that seeks to reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops (vitamin A cassava, vitamin A maize, vitamin A sweetpotato and iron rich beans) at scale. The project is implemented in Nigeria and Tanzania to demonstrate how multiple biofortified crops can be scaled up together at the country level. The project is led by CIP and is implemented by a consortium partnership of six core partners – the International Center for Tropical Agriculture (CIAT), the International Maize and Wheat Improvement Center (CIMMYT), the International

**Potato Center (CIP), the International Institute of Tropical Agriculture (IITA), HarvestPlus and the Forum for Agricultural Research in Africa (FARA) together with national implementing partners.**

PVA maize was first introduced in Nigeria through the efforts of the International Institute of Tropical Agriculture (IITA) in collaboration with HarvestPlus and other partners. It was developed through a conventional plant breeding process that exploits natural variations existing within crops.

Consumption of PVA maize complements other food-based strategies in the fight against vitamin A deficiency (VAD) in Nigeria. VAD, or hidden hunger, is recognized as one of the most serious micronutrient deficiencies affecting many people, but the most vulnerable are children under five years of age, pregnant women and lactating mothers. VAD causes morbidity, nutritional blindness and even death in some cases.

The launch of the BNFB project in November 2015 strengthened the adoption of PVA maize in Nigeria by fast-tracking the release of PVA varieties Sammaz 49 and Sammaz 52, and hence significantly contributed to widening the area growing PVA maize. The two varieties are high in beta-carotene, with levels of 9–11 ppm, and highly productive, yielding more than 5 tons per hectare. The two varieties were developed by IITA under the HarvestPlus Challenge Program. The BNFB project contributed to the fast-tracking of their release and to capacity development initiatives targeting seed companies and outgrower farmers for their large-scale production.

Dr Afolabi speaks highly concerning the capacity development training received from the BNFB project. The relationship between Premier Seed Company Ltd and the project began in 2016 when

the company and its farmers were invited to attend a course on PVA maize production. The partnership continued with mentorship activities, especially from the PVA maize platform in Nigeria, which was launched with support from BNFB. Moreover, sensitization events involving BNFB and Premier Seed Company were held in the maize growing corridor. BNFB further conducted a sensitization meeting for stakeholders on PVA maize in 2017 in Jos and a step-down training event in Kaduna in 2017, as well as working through seed companies to train processors and marketers of PVA maize in Lafia in 2017.

Dr Afolabi underscored the important value arising from the capacity enhancement programs for the seed company as an institution and for farmers and seed growers, whose ability to produce PVA maize was improved greatly:

**The training events have been very beneficial to us as participants in terms of increasing our knowledge and understanding on PVA maize. The demonstration plots that were established by the BNFB**



Youth engaging in Production of PVA Maize (CIP Nigeria)

**project helped to showcase the practical cultivation of these varieties of maize.**

BNFB project also provided seed companies with breeder seed. In 2016/17 Premier Seed Company received 1 ton out of the 2.4 tons of the breeder seed produced by BNFB and IITA, while in 2017/18 the company received 2 tons out of the 7.8 tons produced. IITA has set aside close to 5 hectares of land for PVA seed production during 2018/2019 season. Once ready, the seed will then be made available to Premier Seed Company for further multiplication.

Dr Afolabi is highly appreciative of the support that Premier Seed Company has received from BNFB.

**About 14,763 farmers were reached with the certified seed in the last year. There is a target to increase seed production to about 1,500 metric tons in 2018 to reach 3,000 outgrowers in three zones. About 80 farmers have already received the seed, each of whom will grow a minimum of two hectares. This would not have been possible without the support of the BNFB project.**

“The future of PVA Maize in Nigeria is very bright,” says Professor Ogungbite, who also indicates that processors have begun showing keen interest in PVA maize over the white variety. Among these processors are Grand Cereals Mills and Nestle, which are willing to introduce the PVA maize varieties in their complement of products. Dr Afolabi indicates that discussions are at an advanced stage to link Nestle with Premier Seed Company aggregators so that Nestle can get PVA maize of high quality and in the right quantities.

Dr Afolabi observes that there is increased awareness on and demand for PVA maize with many farmers requesting for seeds from these varieties. He cites a women’s group that planted PVA maize


on a 3-acre piece of land in the Awe Local Council in the Nasarawa Agricultural Development Programme (ADP) and says that the company is also raising awareness on the need for seed multiplication. The emir of Keana local council and farmers in his area also planted a large area of PVA maize in May 2018 with the support of the SMILE awareness and dissemination program.

Dr Wende Mengesha, the IITA PVA maize breeder on the BNFB project, states that by working with national partners the project will see at least 50,000 households growing PVA maize in Nigeria by March 2019 and two major processors producing PVA maize products, to reach as many Nigerian households as possible. “This is the vision of the BNFB project. The long-term goal is to greatly contribute to ending VAD in Nigeria through widespread consumption of PVA maize,” says Dr Mengesha.



Dr Wende Mengesha IITA (CIP Nigeria/ Isiaka)

## Fighting iron deficiency through scaling up high iron and zinc beans in Tanzania



The International Centre for Tropical Agriculture (CIAT) has for the last two-and-half years collaborated with the Building Nutritious Food Baskets (BNFB) project, national research institutions such as the Agriculture Research Institute (ARI) Maruku, ARI-Seliani and ARTI-Uyole and other development partners to expedite the evaluation and release of biofortified high iron and zinc bean varieties in Tanzania. The drive to release these varieties is fueled by the high prevalence of anemia in Tanzania, especially among children under 5 years of age, adolescent girls and expectant women.

The Tanzania Demographic Health Survey, Malaria Survey Indicators for 2015–16 estimates anemia prevalence in children aged 6–59 months to be 58%, and it goes as high as 71% in Shinyanga district, where prevalence among women of reproductive age is 45%. Dr Jean Claude Rubyogo, a seed systems specialist at CIAT, believes that concerted efforts and a holistic approach are necessary to address these alarming anemia rates. There is evidence that consuming beans that contain high levels of iron reduces iron deficiency and enhances cognitive performance of iron-deficient women and children.



Seeds systems specialist Dr Jean Claude Rubyogo touring a demonstration farm for climbing bean varieties

In Tanzania, the BNFB project is partnering with a number of institutions to reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops that include vitamin A and high iron and zinc. In just under two-and-half years the project has helped to accelerate the release of two new high iron bean varieties, MAC44 (Seliani 14) and RVW1129 (Seliani 15), opening a new chapter in the fight against iron deficiency in Tanzania. The new varieties will complement already released varieties and the local non-biofortified beans available in the country and provide

flexibility to both smallholder and commercial farmers in selecting biofortified varieties to address iron and zinc deficiency among vulnerable groups, which comprise children under 5 and women of reproductive age, as well as provide income to bean value chain actors.

Working through CIAT, BNFB mobilized three national institutions – ARI–Selian, ARI–Maruku and ARI–Uyole – to conduct several multi-locational trials, which were crucial in ensuring that farmers and other stakeholders fully participated in the evaluation process, expediting research on these varieties. The project leveraged the East African Seed Protocol, working through the Pan African Bean Research Alliance (PABRA), to transfer promising bean genotypes of the biofortified varieties that had been released in Burundi, Rwanda and Uganda. That protocol facilitates for fast-tracking of variety release by allowing evaluation data for a variety officially released in one of the East African countries to be accepted in other member countries after one season of testing in that country. “If we had started by making crosses, it would have taken us 8–12 years to have the new varieties released. Through the partnership with PABRA, BNFB was able to easily and quickly acquire these materials to fast-track their release,” notes Dr Rubyogo.

Funding support was critical in the success of the variety release, according to Dr Rubyogo:

**It is amazing what the right partnerships and small grants can achieve. With a USD 394,000 sub-grant from the International Potato Center, CIAT and the implementing national partners were able to undertake a number of activities, including seed production and testing and multi-locational trials. Without the project support, we would only have done one trial in the northern**



Ms Mary Mdachi is leading the school feeding program initiative

**zone. With this support we ended up having 10 sites with several multi-locational trials spread across different agroecologies.**

Dr Rubyogo estimates that at least 15,000 households will have accessed seed of the new high iron and zinc climbing bean varieties by the end of 2018 and that 600,000 households countrywide will be growing these nutritious bean varieties by 2021. “This will go a long way in complementing the government’s efforts in the fight against iron deficiency and hidden hunger in the country,” he adds. The BNFB project has supported capacity building and seed production to ensure the released varieties reach farmers and consumers on time. An estimated 7,000 agricultural and nutrition





Multiplication of high-iron bean varieties seed, MAC44 (Seliani 14) and RVW1129 (Seliani 15), in Tanzania

stakeholders, including change agents, farmer groups, village extension officers, district agricultural officers, district nutrition officers and school headmasters, have been trained and sensitized on the crop value chain. Awareness creation has been carried out in the five districts of Hai, Mbulu, Moshi, Hanang and Babati.

The BNFB project has been instrumental in the introduction of nutritious biofortified crops in the school feeding programs in Kilimanjaro, Arusha and Manyara regions. Mary Mdachi, a nutritionist working with the post-harvest nutrition unit at ARI–Selian in Arusha, is passionate about the school feeding program. “All our efforts geared towards the school feeding program have been supported by the BNFB project,” she notes.


Schools have been mobilized to introduce biofortified beans and biofortified maize in their menus to help deal with micronutrient malnutrition. Ms Mdachi says the introduction of

biofortified maize flour and high iron and zinc beans in lunch meals for pupils is a strategy that will greatly contribute to dealing with hidden hunger among children in the targeted regions. “That is why we are targeting nutritious staple foods, because we know that out of 10 households in Tanzania, at least 8 consume beans and maize.”

In order to engage with stakeholders and get them to adopt high iron and zinc beans in the food system, BNFB has had several engagements in the form of capacity building workshops targeting heads of schools, district nutrition officers, district policy-makers and parents of school children, among other stakeholders in the districts of Monduli, Babati, Mbulu, Hanang, Karatu, Meru, Hai and Moshi rural. Ms Mdachi states that:

**As a result of the trainings and sensitization at least 30 schools in Kilimanjaro, Arusha and Manyara regions have each set aside 0.25 acres of land for planting the new bean varieties for their own consumption. BNFB complements the support we receive from the government. We are grateful to BNFB. Without their support, we wouldn't have achieved all these good results.**

## Partnering with the private sector to catalyze the availability of pro-vitamin A maize in Tanzania



Tanzanians will soon start benefiting from the large-scale production of the nutritious pro-vitamin A (PVA) maize with the release of two new varieties and accelerated seed production to cater for the anticipated demand. These gains have been made over the last three years following the launch of the Building Nutritious Food Baskets (BNFB) project in the country. PVA maize is special in that it is rich in beta-carotene – an organic, strong colored, red-orange pigment also abundant in plants and fruits. Beta-carotene is what gives PVA maize its orange color and is converted into vitamin A in the body after consumption.

BNFB is a three-year project funded by the Bill & Melinda Gates Foundation that seeks to reduce hidden hunger by catalyzing sustainable investment for the utilization of biofortified crops such as PVA maize at scale. The project is led by the International Potato Center (CIP) and is implemented by a consortium partnership of six core partners including the International Maize and Wheat Improvement Center (CIMMYT), national governments and local partners such as Meru Agro Tours and Consultants Ltd in Tanzania.



Meru Agro PVA Demonstration Site in Arusha Tanzania (CIP/ J Maru)

In November 2015, when the BNFB project implementation efforts started in Tanzania, there were no PVA maize varieties in the country. In a country where, according to the 2010 Tanzania Demographic and Health Survey, the prevalence of vitamin A deficiency (VAD) is 33% among children aged 6–59 months and 42% among women of reproductive age, the introduction of PVA maize was considered a critical complementary food-based approach to addressing VAD. Therefore, working through CIMMYT and Meru Agro Tours and Consultants Ltd, BNFB facilitated the fast-tracking of the release of two PVA maize varieties in 2016, namely Meru VAH517

and Meru VAH519. Mr Watanga Chacha, the Managing Director of Meru Agro Tours and Consultants Ltd, notes:

**Prior to 2015, we did not know anything about PVA maize and neither did we have any interest in it, but when BNFB educated us about this nutritious type of maize, we developed the interest and realized that it had nutrition benefits for us. It is at that time that we embraced PVA maize.**

Meru Agro Tours and Consultants Ltd is one of the seed companies partnering with CIMMYT. Through BNFB's support the company has been able to expedite the release of the two PVA maize varieties. CIMMYT provided breeder seed for testing and provided resources to Meru Agro Tours and Consultants Ltd for conducting on-farm trials and multiple location testing. According to Mr Chacha the new certified seeds will be available to farmers during the October–December 2018 rainy season, and at least 2,600 farmers will be able to access PVA maize seed by the end 2018, while this will be 56,000 in 2019. "We are expecting at least 20 metric tons of seeds by October this year (2018), so we shall have enough seeds for farmers from January 2019," he says.

In addition to supporting the evaluation of the two released varieties, BNFB granted USD 61,000 to Meru Agro Tours and Consultants Ltd, which enabled the company to undertake a number of activities, including the production of parent line seeds and basic seed production, technical capacity building, evaluation of more PVA maize varieties, scaling up of the production of breeder seeds, and promotional events.

Part of the grant from BNFB was used to purchase an estimated 1,000 kg of Meru VAH 517 seeds from Zimbabwe that was used for



Meru Agro PVA Seed multiplication sites in Arusha - Tanzania (CIP/ J Gethi)

promotional purposes, trials, farmers' assessments and national performance trials for the release of additional pro-vitamin A maize varieties in Tanzania. "Through this support, we have been able to establish at least 15 demonstration plots spread across Arusha, Meru and Kilimanjaro regions for purposes of educating farmers about the new seeds and varieties. This really made our work easier because we were spread all over," says Mr Chacha.

BNFB support has also enabled Meru Agro Tours and Consultants Ltd to participate in a number of agricultural shows, including the country's famous nane nane shows in Arusha, Morogoro and Mbeya, where the company has exhibited and showcased the new

seeds and distributed a number of information, education and communication materials, attracting a lot of interest and creating demand from farmers. Besides, the company has conducted field days in selected demonstration plots, where farmers and other stakeholders in the maize value chain have participated.

**CIMMYT's principal investigator, Dr James Gethi, states that the BNFB project has gone a long way in supporting the release of biofortified crop varieties in Tanzania. "Without the BNFB project, there would be no PVA maize in Tanzania, the time it has taken us from its release to its availability in market has been relatively short! It's unheard of. It's through the BNFB project that we have been able to do this," he declares. Under normal circumstances, Dr Gethi admits, it would have taken at least over five years to develop a variety or a single maize seed, and even longer to conclude all the processes involved, including testing and evaluation and the other steps to seed release.**

According to Dr Gethi, BNFB has been able to develop the capacity of a number of partners, focusing on skills in quality control and assurance for biofortified products, maize included. The project has been able to provide a number of opportunities for farmers, processors and breeders among other benefits. "The future of biofortification in Tanzania is bright, especially after BNFB has put a face to it and proven that there is a complementary solution to the country's hidden hunger, and in particular the VAD problem," adds Dr Gethi.

Dr Gethi's sentiments are well shared by his counterpart at CIMMYT, Dr Thokozile Ndhlela, who is also a breeder. She admits that BNFB has contributed significantly towards the breeding efforts for PVA maize in Tanzania. The project has enabled activities such




PVA Maize Ugali (A local delicacy in Tanzania) (CIP/ J Maru)

as scaling up of the production of seeds, supplying seed companies with breeder seeds and bringing together a number of seed companies for a close and organized working relationship, training and capacity building. Dr Ndhlela admits that BNFB has pioneered the introduction of PVA maize in Tanzania, that biofortification has enormous potential in Tanzania, and that it is only through scaling up biofortification interventions that the country will be able to deal with the existing high levels of VAD: "If we don't scale up the biofortification interventions in the country, people will continue living with VAD, which poses a serious health risk to a country's population."

The BNFB project has seen communities in Tanzania adopt and use biofortified crops such as the orange-fleshed sweetpotato and has been working towards scaling up the production of PVA maize and high iron and zinc beans. These locally available crops are rich in the essential vitamins and minerals that are useful in dealing with micronutrient deficiency problems among vulnerable populations, especially Tanzania's rural poor.

## School children as change agents for catalyzing production and consumption of orange-fleshed sweetpotato in Dodoma and Singida regions, Tanzania



Through an initiative to tackle micronutrient deficiencies – also commonly known as hidden hunger – in the rural settings, the Building Nutritious Food Baskets (BNFB) project in Tanzania has been using schools and school children as agents of change in catalyzing the production of orange-fleshed sweetpotato (OFSP). OFSP, a nutritious, vitamin A-rich crop, is currently being used to tackle vitamin A deficiency in Tanzania. The BNFB project has been working towards the reduction of hidden hunger in Tanzania by catalyzing sustainable investment for the production and utilization of biofortified crops, including OFSP.

It is 3 p.m. at Tambi primary school in Mpwapwa district of Dodoma region. The bell rings and all the students assemble at the school's parade grounds to receive the day's instructions before they break for the day. Officials from the BNFB project are also at the assembly with a truck loaded with OFSP vines to distribute to the children. The children are encouraged to take the vines home to their parents for planting at the onset of the rains.

The production and dissemination of OFSP vines in Tanzania under the BNFB project are being led by the Tanzania Agricultural



School children in Dodoma Tanzania as Change Agents (SRI-Kibaha)

Research Institute Kibaha (TARI-Kibaha). According to Dr Kiddo Mtunda, the then Director of the institute, the use of schools as an avenue for reaching parents and the wider community was considered due to their neutrality and convenience. "The school is believed to be a neutral ground for parents and therefore it becomes a convenient place to send vines for distribution through pupils. We wanted wide coverage using the shortest time possible," he remarks. Dr Mtunda believes that because pupils are future parents, becoming aware of OFSP and getting to learn about the crop and



Young children enjoying the nutritious OFSP (CIP/ HKI/RAC)

its nutritional benefits in their early age is key to sustainable nutrition education because they are likely to carry these values into their adulthood.

The TARI–Kibaha team camped in schools within Dodoma during the month of April to conduct sensitization exercises. The aim was to ensure that before the end of the rainy season most households within the region would have planted the crop. “We are targeting at least four schools in every district. In each school at least 200 pupils received the vines. At the end of each growing season surplus vines are shared with neighboring families, spreading the benefits,” says Mary Yongolo, a scientist from TARI–Kibaha.

Pupils from Mlembule and Itambi primary schools in Mpwapwa district are the latest beneficiaries of OFSP vines. Mr Gideon Bakuza, one of the district extension officers present during the vine distribution exercise, says his office has established proper monitoring mechanisms that ensure that all the vines distributed through the schools are planted. He says that already parents have been sensitized and have information about OFSP. “Through the BNFB project, we have been trained and educated them about OFSP. My role, therefore, is to follow up with farmers and to train them on how to grow the new crop.” He adds that he has seen families improve economically through the sale of OFSP vines and roots, and that this has motivated him to continue educating people on the benefits of the crop.

At Tambi primary school, the head teacher, Mr Egidi Mwachari, says that parents understand that consuming OFSP will provide the daily requirements of vitamin A. He hails the school distribution process as an easier avenue for reaching parents. “We have a register of all the beneficiaries including all the children who received

the vines and their parents. This is important when doing our follow-up,” says Mr Mwachari.

For Tambi primary school, a committee comprising village executive officers, the school head teacher and community leaders keeps watch over the progress of the exercise while ensuring that everyone plants all the vines he or she has received.

Mr Bilauli Kulwa, one of the parents who have received vines, says that he now understands the benefits of consuming OFSP following training from his local village elder. He admits that he had never seen OFSP vines before that and had been longing to see them. “I



School children enjoy OFSP through home grown school feeding program (CIP Nigeria)

will plant the vines immediately so that I can benefit from its nutritional value,” he says.

Highly rich in vitamin A, OFSP is an optimal food choice for pregnant and lactating women and children under 2 years of age. Consumption of OFSP can help prevent night-blindness, susceptibility to infections, reduced growth and mental development, and high mortality rates among children and adults, providing a cost-effective, local solution and a sustainable nutrition intervention.

The cultivation of OFSP has also been economically empowering for many households in 11 districts of Dodoma region. One of the prominent OFSP farmers in Mkalama district, Mr Abnery Kusui, notes that the cultivation of the OFSP has been tremendously beneficial to him: “Not only do I have access to a highly nutritious food, but I have also made significant financial gain from selling the roots.

There are many other farmers like Mr Kisui who are growing OFSP for small-scale commercial production and for household consumption who believe that OFSP is an ideal nutritious crop and that the time has come for people to embrace it by investing in the production and consumption of its roots and products.

The vines that are being provided to schools through the BNFB project are part of an initiative to encourage local farmers to grow more nutritious varieties of sweetpotatoes, which, apart from being rich in vitamin A, are rich in vitamins C and E, several B vitamins, magnesium, zinc and other minerals. They are also high yielding and tolerant to diseases, pests and drought. Ultimately, the BNFB project hopes to reach at least 100,000 households in Singida and Dodoma regions with OFSP by 2019 for health and wealth.











## 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.

