

The Journey of Scaling Vitamin A Maize in Nigeria

A summary of the strategy and activities implemented to introduce and scale the production and consumption of nutrient-enriched vitamin A maize in Nigeria.

October 2024



50 Million+ People Are Eating Vitamin A Maize in Nigeria

Over two billion people—one quarter of the world’s population—do not get enough essential vitamins and minerals in their diets. This “hidden hunger” causes serious health and developmental problems and costs billions of dollars in lost productivity and economic potential, primarily in low- and middle-income countries including Nigeria.

In response to this global challenge, HarvestPlus, a program of the International Food Policy Research Institute (IFPRI), has led an effort to develop and promote micronutrient-enriched (biofortified) varieties of staple food crops. In collaboration with CGIAR Centers, national agricultural research systems, and country partners, 443 varieties of conventionally bred, nutrient-enriched crop varieties have been released in more than 40 countries. Sixteen of these have been vitamin A maize varieties released in Nigeria, where the World Health Organization rates the prevalence of vitamin A deficiency as severe, affecting as many as 40% of women in some regions. It’s estimated that as of 2023 approximately 400 million people were eating biofortified crops around the world.

In Nigeria, more than two million farmers grew vitamin A maize varieties in 2023, producing an estimated 1.3 million metric tons (MT) of vitamin A maize grain—only 7 years since active promotion of the crop began. This production level translates to more than 50 million people eating vitamin A maize: 10 million people eating the vitamin A maize grown on their own farms and at least 40 million more eating foods purchased from markets that were prepared using vitamin A maize.

This shift in maize production is adding much needed vitamin A into diets using a scientifically proven approach to improve children’s and women’s vitamin A status and health.

Nigeria is the 11th biggest producer of maize in the world, and the second largest producer in Africa. Maize is important for smallholder farmers who grow it for home consumption as well as for income-generation through market sales. Alongside important efforts to improve access to diverse diets, there is an imperative and opportunity to enrich maize—the most readily available and widely eaten staple food in Nigeria—to sustainably add needed nutrients into the food system, at no extra cost to consumers.

The scaling journey of vitamin A maize in Nigeria provides an illustrative example of how HarvestPlus and its national partners applied a time-tested delivery and scaling model for rapid impact.



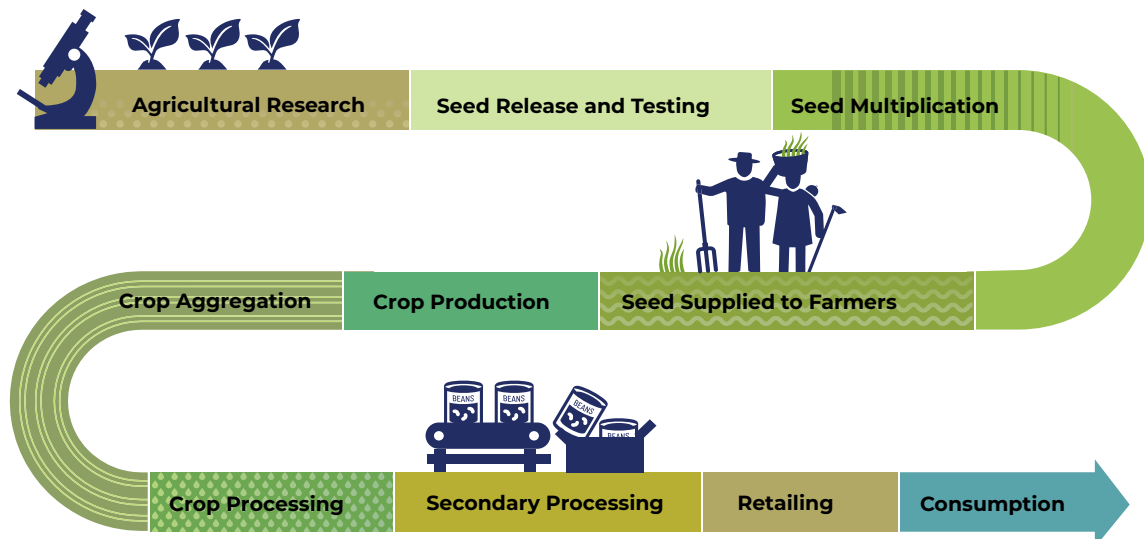
The HarvestPlus Delivery Model

HarvestPlus developed a ‘go to market’ ten-point delivery model that outlines the required steps to take newly released crop varieties into sustainable, commercial commodities in seed, grain, and food systems. The model encompasses a range of activities and tools that build an enabling environment, such as novel and digital technologies, food standards and regulations, and incentives to stimulate commercial adoption. The end-to-end supply chain approach includes food product development, which is critical for building a more nutritious food system.

The HarvestPlus Nigeria program was integral to the development of the global delivery model, and first to establish commercial supply chains for nutrient-enriched seeds, grains, and foods. Nigeria has the most small-, medium- and large-scale food businesses actively producing biofortified commodities in the world.

The Scaling Pathway Through the Delivery Model

HarvestPlus took actions along every step of the vitamin A maize value chain and applied country-specific strategies to stimulate seed production and drive farmer and food producer demand.





Seed Release & Multiplication

The Nigeria maize market features both open pollinated varieties (OPVs) and newly developed hybrids. Although OPVs are cheaper and more easily obtained, the ability to use farm-saved seed from OPVs makes these varieties hugely attractive to farmers and their return on investment is recognised; it is therefore essential to offer both OPV and hybrid vitamin A varieties to meet farmers preferences, and to provide seed sovereignty, especially in the wake of major seed supply disruptions like the COVID-19 pandemic.

Prior to the HarvestPlus biofortification program, only OPVs and old varieties dominated the market. The first four vitamin A maize varieties were released in Nigeria in 2012 and 2013—two hybrid varieties and two OPVs. By 2023, 16 vitamin A maize varieties (OPVs and hybrids) had been released and commercially scaled through a network of seed companies and agro-dealers. Vitamin A maize seed varieties were also integrated into the product lines of more than 100 seed companies who marketed them through their networks of agro-dealers.

For multiplication of vitamin A seed in the years following its introduction, a community-based system was facilitated by HarvestPlus—a step critical to getting seeds into the hands of farmers. First, to ensure an adequate seed supply, HarvestPlus provided seed companies with an initial stock of early generation seed (EGS; a genetically pure seed class) for multiplication into high-quality certified commercial seed for farmers.

Seed companies were in turn supported to develop their networks of local growers, for example by enabling contracted out-growers to receive EGS and other inputs on credit, strengthening the overall production pathway. These mostly small- and medium-holder farmers produced vitamin A maize seed based on the specification required of the seed companies.

Seed companies were connected to agro-dealers to ensure farmers could access certified seeds in the communities where they live. Farmers, in turn, were provided with technical training so they could optimize the yield potential of the vitamin A maize seed they purchased.

Today, over 100 seed companies and more than 800 agro-dealers are participating in the vitamin A maize value chain, provide wide coverage across Nigeria for vitamin A maize seed production, processing, and marketing.





Igniting Farmer Demand & Crop Production

To supply seed to farmers and stimulate wide-scale production, processing, and eating or selling of vitamin A maize, several activities were undertaken including:

- Distribution of free farmer seed test packs to smallholder farmers in maize-eating geographies where vitamin A deficiencies were prevalent. Farmers were encouraged to produce vitamin A maize through a series of extension activities.
- A “pass-on” seed program to accelerate adoption, whereby farmers that received test packs passed-on a portion of their subsequent harvest to a prescribed number of neighbors, resulting in rapid seed diffusion and multiplication. Whilst this diffusion of seed is noncommercial, the subsequently grown grain becomes a commercial commodity.
- Demonstration plots and extension service activities by agronomists to “show and tell” the agronomic performance and highlight the value proposition of vitamin A maize from a yield, nutrition, and health perspective. Raising farmer awareness of the new varieties was the biggest challenge to overcome during the early stage of delivering vitamin A maize in the country.
- Seed fairs and field days, to stimulate demand among farmers and advocate to government to integrate vitamin A maize into national programs.
- Communications campaigns, including farmer radio programs (in local languages) that disseminated key messages to farmers on the benefits of vitamin A maize seed and point-of-sale posters at agro-dealers.
- Activities to link and incentivize agro-dealers and seed companies, such as the selling of vitamin A maize to partnering agrodealers at a 10% discount.
- Work with the National Agricultural Seed Council, the regulator of the seed sector in Nigeria, to ensure adherence to seed quality and standards by seed companies, a process that demonstrates to farmers that biofortified products are genuine.



The Color Orange: Social Acceptance of a New Color

Maize is a very traditional Nigerian food, often eaten roasted on the cob or in other commonly prepared dishes. White and yellow varieties are preferred by most people, depending on the region. Vitamin A maize is orange in color, owing to its vitamin A carotenoid content that has a naturally orange-colored pigment. It was introduced to the market with accompanying public health messages that linked the orange color to its nutritional value and built excitement around its novelty. As yellow maize was already familiar in Nigeria, the transition to vitamin A (orange) maize was readily accepted, more quickly than in other countries in Africa where white maize is predominantly traded or grown.

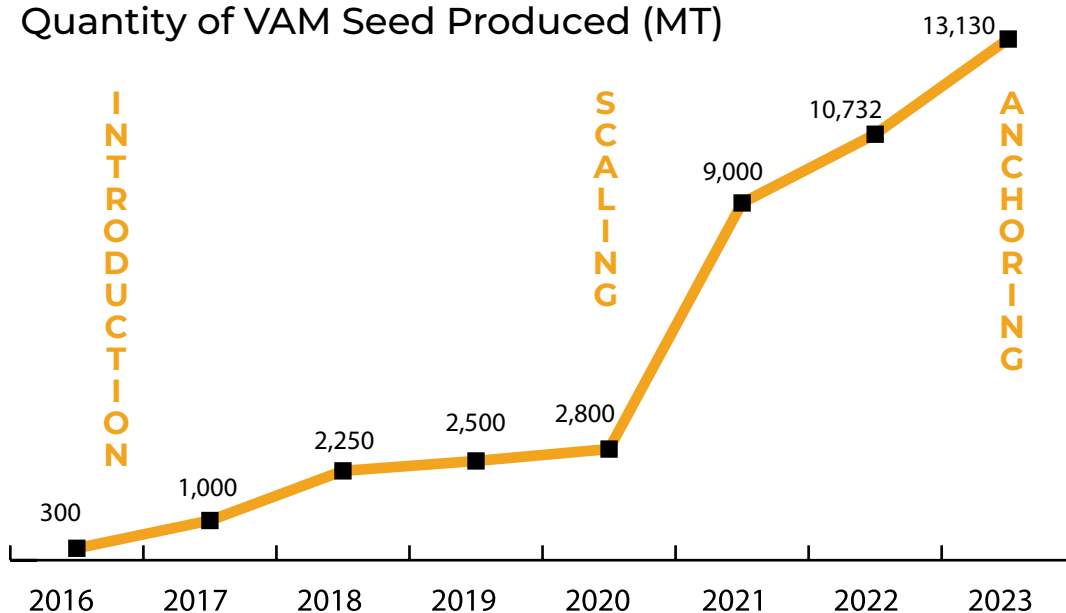
Socioeconomic farmer adoption and consumer acceptance research shows that farmers and consumers like the production and consumption characteristics of vitamin A maize as much as (if not more than) popular conventional varieties, even in the absence of nutritional information.

Food businesses have embraced the orange color. It is used as a value-added headline for marketing campaigns to promote biofortified crops, not only for vitamin A maize but also orange fleshed sweet potatoes.

Rapid Growth

Between 2019 and 2020, the production and delivery of certified vitamin A maize seed went through a rapid phase of growth that has continued at a pace. The volume of vitamin A maize seed delivered reached a record 13,130 metric tons in 2023.

Quantity of VAM Seed Produced (MT)



	2016	2017	2018	2019	2020	2021	2022	2023
# of Households Growing VAM	60,000	255,000	530,000	730,000	756,000	1,570,000	1,752,529	1,962,832

What is Biofortification?

The World Health Organization defines biofortification as “the process by which the nutritional quality of food crops is improved through agronomic practices, conventional plant breeding, or modern biotechnology. Biofortification differs from conventional fortification in that biofortification aims to increase nutrient levels in crops during plant growth rather than through manual means during processing of the crops. Biofortification may therefore present a way to reach populations where supplementation and conventional fortification activities may be difficult to implement and/or limited”.

HarvestPlus works on staple food crops biofortified with added nutrients through conventional plant breeding and agronomic practices. However, the theory of biofortification can be applied to any food crop pre-harvest and can utilize plant breeding, agronomic practices, regenerative agriculture, animal feed, or other techniques such as UV light.

Scaling to Reach 50 million

This timeline displays the key activities used to drive scale in Nigeria. Since 2013, 16 varieties of VAM have been released into the market.

INTRODUCTION

2003 - Basic and initial screening initiated. HarvestPlus established VAM breeding with IITA, Institute of Agricultural Research (IAR-Zaria), and CIMMYT

2006 - National School Health Policy recommends biofortified inputs for school meals under the Home Grown School Meal Feeding Program

2012 - First VAM varieties released to the market (*Ife Hyb 3* & *Ife Hyb 4*)

Government policy published and farm demonstrations conducted

Integration of seed companies in VAM value chain

2013 - Additional VAM varieties released to the market (*Sammaz 38* & *Sammaz 39*)

2014 - BMGF and FCDO (formally DFID) funding for the Nigeria program – Nigeria HarvestPlus office opens

SCALING

2015 - 2017 Five more *Sammaz* VAM varieties released. Annual Nutritious Food Fair organized by HarvestPlus (2017)

2019 - MacArthur Foundation provides funding for HarvestPlus Nigeria program

2020 - HarvestPlus-GAIN partnership – Commercialization of Biofortified Crops (CBC) Nigeria program begins

2021 - BETA campaign launched. Food companies to improve mainstreaming into manufactured foods

Scaling project with AGRA to reach 50,000 small holder farmers with vitamin A maize and cassava starts

2022 - VAM scaling project with FCDO to reach 3.79 million people in Nigeria with climate smart crops starts

Partnership with Oyo state government for Home Grown School Feeding Programme

National Agency for Food and Drugs gives accreditation for food labelling guidelines for biofortified foods

ANCHORING

2023 - *Oba Super 8* VAM variety released to the market

Adoption of biofortification by the Federal Ministry of Agriculture and Food Security

43 demonstration sites established across 4 states: Jigawa, Gombe, Kaduna, and Kano

Partnership with Green Sahel to reach 200 community-based seed producers

HarvestPlus Solutions Nigeria opens its doors for business



Driving Downstream Demand with Food Businesses

Nigeria was one of the first countries in the world to manufacture commercial food products made with biofortified crops. Nigeria also hosts several international food companies who manage globally recognized brands. These businesses are procuring biofortified inputs regularly using the nutrient targets in the Publicly Available Specifications for biofortified grains. HarvestPlus works directly with over 100 food businesses, providing post-harvest handling, processing, procurement, and marketing training, and to facilitate linkages to farmers who grow biofortified crops.

Biofortified grains and roots are entering the commercial food supply organically as crop production scales up and awareness of biofortification increases. Orange-colored vitamin A maize allows food businesses to refresh (and nutritionally improve) their existing food products (such as garri, fufu, and maize flour) and stimulates new food innovations.

Communication of the availability of nutritious foods to consumers is essential to guide consumers to better choices and create markets for businesses. HarvestPlus has initiated and supported several consumer campaigns using digital media, point of sale promotions, and on-pack claims. A great example of this was the “Beta Campaign” from 2021 in partnership with the Global Alliance for Improved Nutrition (GAIN) and led by WandieVille media.

Convening the Entire Supply Chain

Delivering vitamin A maize to consumers depends on activating the entire maize value chain. Since 2016, HarvestPlus and its partners have organized an annual “Nutritious Food Fair” (NFF) in Nigeria to convene stakeholders who share the goal of eliminating malnutrition and transforming the food system. As a commercial platform, the NFF brings together the public and private sector to promote the production, processing, marketing, and consumption of nutritious foods among Nigerians. Over 4,000 people participated in the 9th annual NFF in 2023—farmer producers, consumers, seed and food processing companies, development partners, government officials, and more.





Creating an Enabling Environment for Scaling

Policy support accelerates commercial adoption:

Nigeria has more than ten national and subnational policies that endorse, support, and promote biofortification as an approach to reduce micronutrient deficiencies. With these policies (which span agricultural, school feeding, nutrition, and public health), governments can plan and budget for the acceleration of biofortification in Nigeria, and private sector investment is encouraged. Policies also add credibility in the minds of value chain actors who bring interventions to life in food systems.

Standards and regulations for trade: Nigeria uses Publicly Available Specifications to standardize and define the requirements for grain trade and food labelling, including for biofortification products. These standards can be used in procurement whereby off-takers and food businesses demand inputs that conform to the standards. This action by the private sector stimulates production from farmers and demonstrates that clear standards exist that differentiate biofortified varieties from standard.

The Cost of Scaling

To catalyze the reach of vitamin A maize seed to more farmers requires a range of activities, each at its own cost. The cost of scaling can be calculated annually based on expenditure on advertising, educational and promotional materials, sales and marketing efforts, stakeholder training, free goods and incentives, seed production, field expenses (labor, travel, supplies, etc.), staff salaries, office supplies, vehicles, local transport, and other necessary tools.

HarvestPlus estimates the cost to reach one farmer fell from \$6.61 in 2015 to \$0.05 in 2020 as vitamin A maize was scaled up in Nigeria.

Elements to Sustain Success

- 1. Government policy adoption of vitamin A maize and other biofortified crops.** Nigeria has included biofortification in sub-national Home Grown School Feeding policies and recommendations since 2006, the first country to foresee the benefits of biofortification for school children and their communities. Endorsement of biofortification in all aspects of policy and programs from agricultural breeding standards, school feeding, institutional procurement, and nutrition and public health practices is essential instigate formulaic use of biofortified inputs.
- 2. An adequate pipeline of nutrient-dense, agronomically superior seed.** Sufficient EGS production (and management of its dissemination to community seed producers and seed companies) is essential to meet and sustain demand. There is need to develop and release competitive nutrient-enriched varieties of vitamin A maize that are adapted to climate change, high yielding, and disease and pest resistant.
- 3. Farmer (customer) satisfaction.** The collection of farmer feedback and dissemination of farmer testimonials for advertisements and promotion of vitamin A maize varieties drives repeat purchases of vitamin A maize seed and foods.
- 4. High-quality food products.** The grain produced from high quality seed must have a high milling ratio that produces flour that is accepted—or ideally, preferred—by the major food processing industries.
- 5. Continual engagement with food processors to promote the use of standards in procurement.** Mass demand can be achieved through precompetitive action through organizations such as the State Chambers of Commerce and Industry, and other food business collaborations.

Lessons Learned

- 1. Identify bottlenecks and constraints to inform strategic entry points.** For vitamin A maize, the supply of EGS was identified as a critical bottleneck, so actions were taken to increase production by seed companies.
- 2. Support the development of seed distribution infrastructure.** Decentralized seed distribution depots were supported and linked to a network of last-mile agro-dealer clusters to ensure increased access by seed farmers.
- 3. Develop effective value propositions for competitive varieties.** The introduction of vitamin A maize OPVs in Nigeria was a game-changing strategy; OPVs like *Samaz-52* compete with hybrids. This was the primary reason why vitamin A maize succeeded rapidly in Nigeria compared to other countries where hybrids are widely promoted.
- 4. Incentivize early adoption.** Short-term incentives such as test seed packs and agronomic training for farmers helped introduce new varieties to farmers and stimulate production.
- 5. Embrace technology.** Digital messaging helped build demand and supported ‘no-contact’ delivery programs, an important innovation during the COVID-19 pandemic. Crowd in donors, investors, and partners who can bring digital tools and technologies such as digitized agronomy services utilizing artificial intelligence, digital marketplaces, digital traceability, and predictive demand planning.
- 6. Develop sustainable commercial pathways.** Marshalling a commercially driven vitamin A maize seed system created strong, lasting business linkages between the national agricultural research system and seed companies.

Next Steps: Growing the Market Share of Vitamin A Maize

- 1. Commit to, and invest in, breeding for nutrition.** Nutrition traits should be prioritized alongside yield and other farmer-preferred and market-driven characteristics by plant breeders, a process known as ‘mainstreaming’.
- 2. Adopt traceability.** The value of vitamin A carotenoids in vitamin A maize can be protected through full supply chain traceability. Lack of traceability is endemic in the Nigerian food system but biofortification actors can lead the way. Value chain actors can be trained to follow basic paper-based systems with the potential to streamline and digitize traceability using QR codes and commercial supply chain management systems.
- 3. Track and monitor grain sales.** A monitoring and evaluation system that tracks the number of farmers growing vitamin A maize and can estimate the area planted, quantity harvested, and what is sold to the market can estimate the value of sales and growth in the market share of vitamin A maize as a way to estimate population-wide impact.
- 4. Build large-scale food industry demand.** Consumer demand for individual products and food categories is a major driver for scale. Industry alliances can make non-competitive and collective commitments to procure biofortified commodities. Using biofortified crops in Corporate Social Responsibility, Environmental and Social Governance, and programs such as the Access to Nutrition Initiative will drive higher demand.
- 5. Integrate vitamin A maize into government seed and food distribution programs.** State and federal governments can increase the demand for vitamin A maize by putting policies in place and allocating resources to fund the integration of vitamin A maize into seed and food distribution programs, creating demand for vitamin A maize seed and grain.

Acronyms List

AGRA – Africa Green Revolution Forum

BMGF – Bill and Melinda Gates Foundation (Now Gates Foundation)

CGIAR – CGIAR (formerly the Consultative Group for International Agricultural Research) now known just as the CGIAR

EGS – Early Generation Seed

FCDO – UK Foreign, Commonwealth & Development Office (formally DFID – Department for International Development)

FMAFS – Federal Ministry of Agriculture and Food Security

HGSF – Home Grown School Feeding

IFPRI – International Food Policy Research Institute

IITA – The International Institute of Tropical Agriculture

CIMMYT – International Maize and Wheat Improvement Center

NARC – National Agricultural Seed Council,

NFF – Nutritious Food Fair

OPVs – Open Pollinated Varieties

PAS – Publicly Available Specifications

VAM – Vitamin A Maize

WHO – World Health Organization



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For more information about how you can be part of this important work, please [contact us](#).

HarvestPlus improves nutrition and public health by developing and promoting biofortified food crops that are rich in vitamins and minerals, and providing global leadership on biofortification evidence and technology. HarvestPlus is a part of IFPRI and works with CGIAR centers, National Agricultural Research and Extension Systems, and public, private, and civil society partners to facilitate the development and dissemination of these nutrient-enriched crops.

www.HarvestPlus.org

HarvestPlus Solutions was established as a catalytic scaling partner to complement HarvestPlus and increase the uptake of nutritious crops. It shares our vision of a world free of hidden hunger and will enhance demand and supply for biofortified crops and foods by building partnerships with the private sector and commercializing nutrient-enriched products. HarvestPlus Solutions Nigeria is available to support value chain actors procure and sell vitamin A maize along with other products and services to support the acceleration of nutritious food systems.

www.harvestplus.solutions