

MAINSTREAMING SCALING INITIATIVE CASE STUDIES

HarvestPlus

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MAINSTREAMING SCALING

The HarvestPlus Scaling Journey: Scaling agricultural Innovation
for Global Nutrition Impact:

From Zero to 100 Million People in 20 years

by

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A Case Study for the Initiative on
Mainstreaming Scaling in Funder Organizations

For the Scaling Community of Practice

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Preface

The **Scaling Community of Practice** (CoP) launched an action research initiative on mainstreaming scaling in funder organizations in January 2023. This initiative has three purposes: to inform the CoP members and the wider development community of the current state of support for and operationalization of scaling in a broad range of development funding agencies; to draw lessons for future efforts to mainstream the scaling agenda in the development funding community; and to promote more effective funder support for scaling by stakeholders in developing countries. (For further details about the Mainstreaming Initiative, see the **Concept Note** on the COP website).

The Mainstreaming Initiative is jointly supported by Agence Française de Développement (AFD) and the Scaling Community of Practice (CoP). The study team consists of Richard Kohl (Lead Consultant and Project Co-Leader), Johannes Linn (Co-Chair of the Scaling CoP and Project Co-Leader), Larry Cooley (Co-Chair of the Scaling CoP), and Ezgi Yilmaz (Junior Consultant). MSI staff provide administrative and communications support, in particular Leah Sly and Gaby Montalvo.

The principal component of this research is a set of case studies of the efforts to mainstream scaling by selected funder organizations. These studies explore the extent and manner in which scaling has been mainstreamed, and the major drivers and obstacles. The case studies also aim to derive lessons to be learned from each donor's experience, and, where they exist, their plans and/or recommendations for further strengthening the scaling focus.

The present case study focuses on the HarvestPlus. It was prepared by Jenny Walton, Benjamin Uchitelle-Pierce, Katharina Diehl and Lynn Brown of HarvestPlus (Innovation, Policy and Scaling Unit of the International Food Policy Research Institute). Johannes Linn and Richard Kohl provided comments and editorial support.

Introduction and Executive Summary

The genesis of the HarvestPlus program was the insight that everyone on the planet consumes one or more of the seven basic staple foods, in significant quantities, on a daily basis. (What the World Eats | National Geographic, n.d.) These staple foods can be improved with more micronutrients, by agronomic practices and nutritionally enriching the seeds. When implemented at scale, a revolution in food systems is ignited that will go a long way towards the eradication of hidden hunger.

Hidden hunger and the societal effects of being micronutrient malnourished is damaging to people and economies, the World Bank estimates costs of US\$3 trillion a year, in the form of productivity loss, ranging from 3 to 16% (or more) of GDP in low-income settings (The World Bank and Nutrition. Nutrition Overview (Nutrition Overview (worldbank.org)). The triple burden of malnutrition, micronutrient malnutrition, underweight and overweight/obesity can lead to non-communicable diseases, including diabetes and cardio-vascular disease. These diseases are costly to people and costly to society in terms of health care costs. Obesity and hidden hunger can occur at the same time, micronutrient malnutrition is not just a problem for low-income settings, the problem of suboptimal nutrition status could be far worse than initially calculated.

Far more people are likely affected by hidden hunger than was previously thought. 1 in 2 children and 2 in 3 women worldwide likely have at least one micronutrient deficiency; many suffer from more than one. In some countries in Africa and Asia, 9 in 10 women are affected. 75% of all the preschool children affected live in Sub-Saharan Africa or east Asia and the Pacific (Beal et al., 2022). The prevalence of hidden hunger and micronutrient deficiencies worldwide, particularly in low- and middle-income countries (LMICs), has created a pressing need for effective solutions, such as biofortification.



Biofortification, in the context of the HarvestPlus program, is a process that enriches everyday staple food crops with essential micronutrients such as iron, zinc, and vitamin A, through conventional breeding techniques or agronomic practices.

Hidden hunger co-exists in people who are overweight or obese. India now has more than 100 million people with diabetes (Anjana et al., 2023). A recent zinc study indicates a possible role for biofortification, specifically zinc, in addressing non-Communicable Diseases (Pompano & Boy, 2021). Hidden hunger is preventable. An integrated approach is needed that promotes diversified diets, behavior change where appropriate and other evidence-based actions like biofortification. The Copenhagen Consensus (Horton, Alderman, & Rivera 2008), a leading global development think tank, ranks biofortification (and other interventions that reduce micronutrient deficiencies) among the highest value-for-money investments for economic development: For every USD invested in biofortification, they estimate as much as 17 USD of benefits gained. Biofortification is aimed to switch the current staples that people eat with nutrient enriched varieties, reducing the need for behavior change communication. Biofortification can address multiple deficiencies within the same population. As of 2021, over six million farming households were consuming more of at least two priority nutrients, through a biofortified food basket approach (e.g., eating more iron and zinc, or more vitamin A and iron). By the end of 2023, the HarvestPlus program will have reached 100 million people in farming households and an additional 400 million in commercial markets. (HarvestPlus program monitoring and evaluation data 2023. [Enriching 100 Million Lives - HarvestPlus](#))

Global nutrition challenges have driven the requirement to mainstream biofortification as one key viable solution to hidden hunger, given all populations eat staple foods and they are a significant component even of diversified healthy diets. These nutrient enriched crops make the food system more nutritionally resilient, with low fragility and long shelf lives. They also make people more nutritionally resilient. When shocks occur, incomes are reduced and consumers switch to low-cost staple foods, increasing the dominance of these foods in their diets. At the beginning of the HarvestPlus program in 2003 the mission was set to reach 1 billion people by 2030 with improved nutrient enriched foods, through increased biofortified planting materials and resulting crops, thus focusing on “scaling” as a strategic mission, long before it became a topic of the development community. (Table 1)

Table 1. HarvestPlus: Combining invention, innovation and intention to reach 1 billion consumers

Invention	Innovation	Goal
Nutrient Enriched Crops through genetic biofortification	Multi point commercial and non-commercial delivery model with multiple innovations and technologies implemented at each step of the supply chain	1 billion consumers by 2030

The primary funding partners of the HarvestPlus program, the UK’s FCDO (formally DFID) and the Bill and Melinda Gates Foundation (BMGF) shared the commitment to improve the nutrient content of staple foods to reduce the underlying causes of malnutrition. The donors recognized the potential scale of the approach and that it was most effective at reaching the poorest farmers who are difficult to reach with industrial fortification, given they do not purchase staple crops/foods. HarvestPlus funding partners also recognized that once these new staple crop varieties were bred and delivered it was largely self-sustaining, unlike industrial fortification and supplementation which have higher recurrent costs. The primary partners saw the vision of the HarvestPlus founder, Dr. Howarth Bouis, to make the plants do the work and improve the nutritional content of the food from agriculture, rather than processed food production.



The HarvestPlus program's success is the combination of (1) high quality and market competitive biofortified planting materials (seeds/vines); (2) the development and execution of an effective delivery model; and (3) a clear strategy to scale and mainstream. Historically many agricultural interventions and new crop varieties have failed to achieve significant uptake. The programmatic approach of HarvestPlus considers the entire value chain, from plant breeding to seed production to crop production to food products to consumers, with a set of activities that stimulate and fulfil demand at each link in the supply chain. These activities, while largely commercial in nature, take into consideration non-commercial activities such as seed sharing, recycling of seed and delivery to consumers through institutional settings, such as social protection programs like school feeding. Partnerships at every step of the value chain, from policy makers to consumers, have contributed to the creation of a full food systems approach.

In 2023, the HarvestPlus project celebrates the 20th anniversary with the milestone achievement of reaching 100 million on farm consumers world-wide. This paper reviews the 20-year journey from the initial idea, the evolution, development and continual improvement of delivery and scaling models that will take the biofortification of staple foods to 1 billion consumers by 2030. With this aim in view, this paper will focus on achieving reach and scale, rather than the nutrition evidence of impact, which is published in separate papers [Marshalling Evidence - HarvestPlus](#)

Brief history of the HarvestPlus program – The genesis of scaling and evolution to mainstreaming

The HarvestPlus project is part of the Consultative Group of International Agricultural Research (CGIAR). Based from the Innovation, Policy and Scaling unit of the International Food Policy Research Institute (IFPRI). The head office is in Washington DC, with many country programs and offices across Africa and Asia.

Howarth Bouis, the founder of the program, played a crucial role in presenting the vision for biofortification. He championed the mission of addressing global hidden hunger through biofortification. His leadership and dedication were instrumental in raising awareness and support for biofortification with the vision of scale. The concept was 10 years in the making before it secured funding and became an official program. After receiving initial skepticism from the public health and agricultural communities, Bouis partnered with Dr. Ross Welch from the United States Department of Agriculture's Plant, Soil, and Nutrition Laboratory (PSNL) at Cornell University and Dr. Robin Graham of the University of Adelaide and IFPRI's Biofortification Challenge Project was formed in 1993, then renamed HarvestPlus in 2003.

The program began from IFPRI with global coordination from Washington DC, with country programs hosted in countries by IFPRI, CIAT and other CGIAR partners. The challenge ahead was the realization of the vision through the development of the path, strategy and operational plan to achieve the HarvestPlus goal. In the early days of the program, alongside the breeding work, program leadership and the donors were guided by the need to prove the concept that consuming biofortified crops would lead to actual nutrition and health outcomes.

Dr. Wolfgang Pfeiffer spearheaded the crucial aspect of crop development. Working with the CGIAR Centers HarvestPlus achieved remarkable strides in coordinating the development of biofortified crop varieties through partnerships with numerous CGIAR centers and National Agriculture Research Systems (NARS) partners. One of the key success factors in HarvestPlus' approach was its foundation as a program within the CGIAR, hosted by multiple CGIAR centers, and direct collaboration with specific CGIAR breeding centers, which allowed HarvestPlus to partner with centers that had access to a rich pool of genetic resources, research facilities and operational infrastructure. By working together, they bred parental materials that formed the basis for biofortified varieties. These varieties were not only rich in essential micronutrients but also met the specific preferences of local farmers, markets and consumers.



Through close partnerships with National Agricultural Research and Extension Systems (NARES), HarvestPlus ensured that these biofortified varieties were locally adapted, considering factors like yield, disease resistance, pest tolerance, cooking characteristics, and taste preferences. HarvestPlus worked with CGIAR, NARES, and the private sector to ensure that developed varieties were released and scaled through both informal and formal seed systems. This comprehensive approach not only addressed nutritional challenges but also empowered farming communities with crop varieties that suited their specific conditions and demands.

The HarvestPlus Impact and Nutrition teams completed and published a host of studies as summarized in [Marshalling Evidence - HarvestPlus](#). The concept of biofortification won the World Food Prize in 2016, which was awarded to Dr. Dr. Howarth Bouis, Dr. Jan Low, Dr. Maria Andrade and Dr. Robert Mwangi for their work to develop and scale up the production and consumption of biofortified crops. This reflected the consensus, endorsed by government, scientists and economists, that biofortification was a cost effective and efficient means to tackle micronutrient deficiencies on a wide scale.

Investment in research to demonstrate the cost effectiveness of biofortification was required which led to the “Copenhagen Consensus”. A panel of top economists, including Nobel laureates, were commissioned by the Copenhagen Consensus Center to identify the most effective investments to tackle micronutrient malnutrition. The Panel endorsed biofortification as a key intervention to impact at a global scale (Meenakshi, n.d.). This initial focus on establishing a robust evidence base of published research had to occur before the case for scaling could be taken to donors, since donors need evidence that their investments will result in impact. The advocacy work, to engage and encourage governments to support biofortification through policy, was also a key factor to demonstrate to donors. Donors need to know that their investments are supported at the government level.

The research demonstrated that plants can do the work on delivering nutrition at scale globally. It confirmed that developing the seeds and putting the technology in the hands of farmers gave them tools to provide more nutritious local food systems in rural areas, that biofortified food, once consumed, makes a difference to health, that governments support the idea, and that there is a positive return on investment. The next challenge was to scale up impact in each region and scale out to new countries. The mission was on to understand how to achieve this sustainably. Knowing that biofortification has commercial value in the supply chain and independent food systems rely on commercial market factors, the question then was how the ecosystem could be arranged so that the delivery model would stand alone in the market, for generations to come without reliance on sponsorship, donors and subsidies. The first and primary beneficiaries of the HarvestPlus program are the smallholder farmers, therefore the initial work on the ground for distributing and scaling seeds was with smallholder farmers and less with commercial systems. As planting materials scaled then the work on food systems and commercial food systems could begin.

In 2017, again funded through FCDO, a systematic stakeholder review was conducted to understand the barriers to scale and opportunities for commercialization. Interviewing over 250 private sector food businesses and government procurement agencies, 3 major barriers to scale were uncovered:

1. Lack of a defined value proposition for different actors in the value chain;
2. Misunderstanding, and/or lack of awareness and/or lack of standards for biofortified seeds, grains and foods.
3. Inability to trace the value of biofortified commodities through the supply chain from seed to plate, further exacerbated by a lack of recognized standards at grain level – how could the food industry or consumers know that what they purchased was biofortified?

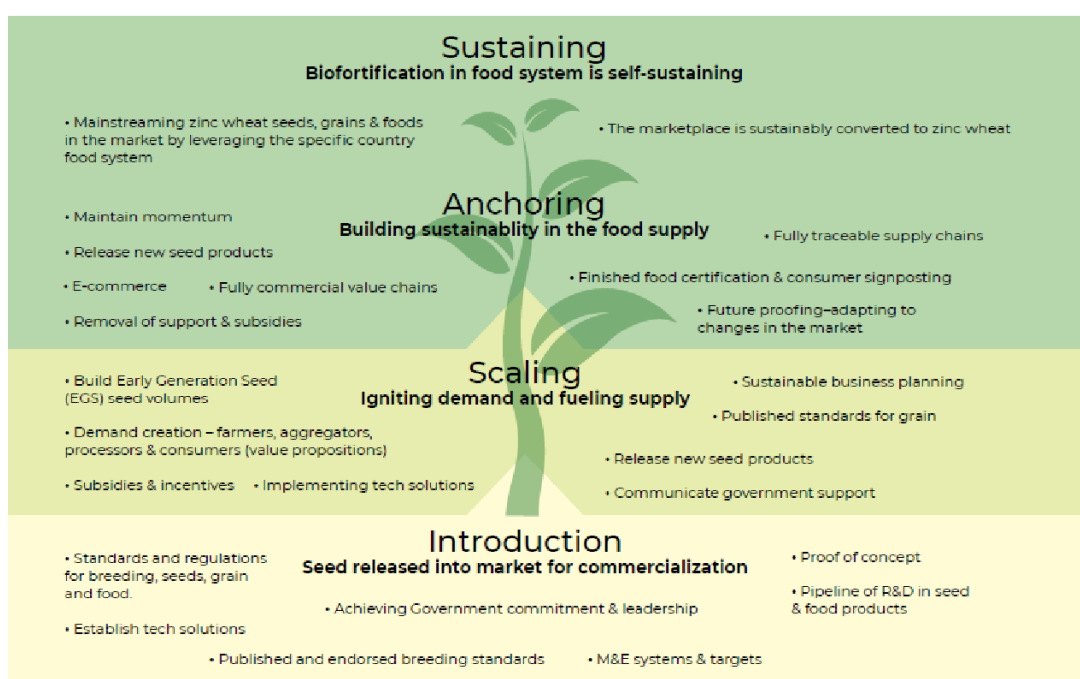
Based on this much deeper insight into the scaling challenges for commercialization, HarvestPlus published a 5-year strategy for 2018-2022: [HarvestPlus Global Meeting to discuss the Program Strategy 2018 -2022 | Alliance Bioversity International - CIAT \(alliancebioversityciat.org\)](#). This strategy with 5 key



pillars of activities included more emphasis on the development of sustainable value chains and the need to create the standards and tools required to commercialize biofortified seeds, grains, and foods. During this 5-year period, the delivery model was honed and published ([HarvestPlus Delivery Model Charts the Path to Better Nutrition for Millions - HarvestPlus](#)) and the scaling strategy implemented with thought leadership input from the Scaling Community of Practice (see [The-Journey-of-Scaling-in-Pakistan.pdf \(harvestplus.org\)](#))

Once the biofortified varieties had been released in multiple countries, the program transitioned to the introductory scaling phase (Figure 1), where focus shifted towards multiplying the certified seeds for sale and dissemination. This was a crucial step in preparing for the scaling phase, ensuring that enough biofortified seeds were available for farmers and markets.

Figure 1. The scaling model for biofortified staple commodities



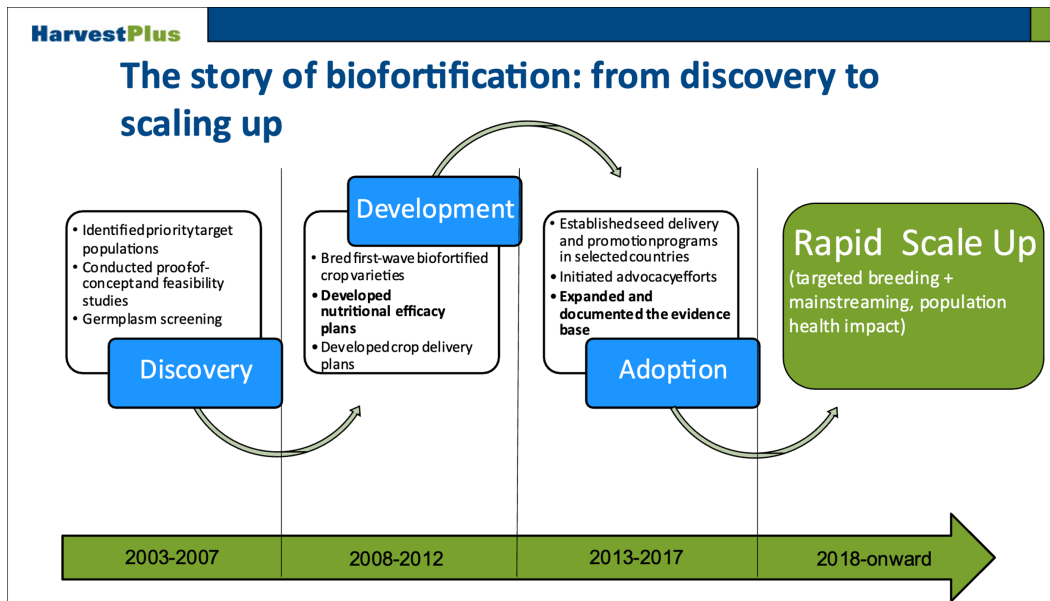
Source: The Journey of Scaling in Pakistan (2022) [HarvestPlus Brief Unpacks Rapid Scaling Effort for Zinc Wheat in Pakistan - HarvestPlus](#)

The evolution of the scaling goals involved a sequential progression from crop development to introduction and scaling. The program aimed to overcome the challenges of R&D, regulatory approval, and seed multiplication to successfully reach farmers and consumers at scale. The goal of reaching 1 billion people by 2030 remained a guiding principle throughout this evolution, emphasizing the long-term vision of improving global nutrition and addressing hidden hunger through biofortification.

From 2022, with the 5-year program strategy delivered, primary donor deliverables met, and the development of the newly reformed One CGIAR, it was time for HarvestPlus to enter a new phase of anchoring biofortified crops sustainably in the food system to continue to have impact for generations to come, summarized in Figure 2.



Figure 2. Summary of the HarvestPlus scaling journey



Source: HarvestPlus 2023 - unpublished

Mainstreaming biofortified seeds, grains and foods: Form followed function

Scaling overview

From 2017, The HarvestPlus leadership team created a new organizational structure, with layered management consisting of a CEO, centralized administrative, communication and cross functionals based at IFPRI in Washington DC, and country offices. This structural framework enabled efficient management and coordination of activities spanning various regions and nations. The organization's structure was intentionally designed to harness its extensive network and partnerships, engaging stakeholders and heightening awareness regarding biofortification. Country managers, initially designated as Product Development and Delivery Managers for specific regions or countries, played pivotal roles within this organizational framework. They served as innovation brokers and facilitators for all scaling endeavors, collaborating closely with local partners, stakeholders, and governmental bodies. Their mission was to drive the adoption and scaling of biofortification interventions, and they provided invaluable feedback on the effectiveness of ground-level activities. These managers acted as the linchpins connecting strategy to real-world impact, ensuring that HarvestPlus' goals translated into tangible results on the ground. The results and reach of the country teams prompted the global program to review the existing delivery methodology, review the most cost effective delivery methods and formalize the delivery model. Until 2017 scale had largely occurred organically with an open strategy of "let 1000 flowers bloom".

The program is now guided by 2 strategic documents:

The delivery model is a sequence of activities to make seeds, grains, and foods available and accessible to beneficiaries through existing and new market channels. Established from the results of the country programs, the model outlines all the steps and actors in the value chain and the most effective ways to



make a change. This delivery model, also referred to as the commercialization model or implementation plan, is a sequence of activities that take place at specific points in the value chain.

HarvestPlus recognized the importance of commercial demand creation throughout the value chain. This shift was particularly relevant in countries where biofortified crops had gained acceptance as normative options by public or private seed multipliers. By expanding activities to include food processing, distribution, and marketing, HarvestPlus began to work to ensure that biofortified crops reached a larger population through a wider consumer base and became more integrated into local food systems. This more commercial approach did cause confusion and headwinds discussed in the next section. The time to work on food also coincided with the global trend in development to talk a more “food systems language” the divide between nutrition and agriculture was shrinking.

The scaling model is a strategic description of the summation of activities and with specific phases of growth within the market system, and the activities that happen in the specific phase. It is not a linear process, it is cyclical, reliant on investment in R&D in seed release and like any other commercial function continual promotion and marketing related activities.

Prior to the advancements in the science of scaling, the HarvestPlus project was faced with the question of scale up, scale out or both. According to the Scaling Community of Practice *“we define scale as large scale; otherwise, any reach, coverage or numbers of beneficiaries can be considered scale. The size relative to the denominator is key; reaching two million people with incomes under \$2 per day in a nutrition program in India is not large or significant scale as it is equivalent to 1/10th of a percent of the population; in Mali it would be scale as equivalent to 10 percent of the population”*. (Mainstreaming Scaling: A Case study of GIZ)

In the race to achieve its target of one billion consumers, HarvestPlus realized that scale would come faster by targeting the biggest crops in the most densely populous countries, but impact could be achieved quicker in smaller countries with less fragmented seed systems. This conundrum led to the development of the Biofortification Priority Index, a composite crop-specific index. This tool accounts for the degree of production and consumption of each potential biofortified crop in a given country and the deficiency level for the micronutrient with which the specific crop can be enriched (<https://bpi.harvestplus.org/>). This enables donors and sponsors to make investment decisions based on their desire for scale and their own donor strategies based on political or economic reasons. To attract a wide range of donors and investors, the HarvestPlus program had to be in a position to scale both out and up and implement in countries with the ability to reach less than a million with orange fleshed sweet potato in Uganda versus 100 million wheat consumers in India.

In 2017, if funding had been unlimited, a more strategic approach to country operations would have ideally led the spend in each country. The donors that supported HarvestPlus at the time had specific countries they wished to focus and did not want to focus. The country-based activities were donor driven. If the program team wished to expand to new countries, this had to be done country by country with a donor by donor process – creating opportunities for a disjointed program which had to be tightly managed. To go to new donors, new communication tools were required to show donors how biofortification programs should be implemented. The delivery model and the scaling model were developed and published due to donor demand, to answer the question “how have you achieved scale?”. This involved a substantial team effort for advocacy for the program’s continuance and prospects for investment.

The results on scale were happening, and the documentation of the delivery model and the scaling strategy reflected the function on the ground, formalized into a methodology and way to replicate in the future. Substantial evidence on activities on the ground that were cost effective and led to scale was captured in the methodological approach. Economic experts within the team created accurate calculations on the cost of reach per person and the ex-ante return on investment of activities. It was clear to see that some crops were much more expensive to deliver than others, such as some



vegetatively propagated crops that were as high as \$28 per person, versus the cost of a few cents to reach 1 person in Pakistan with zinc wheat. These cost of reach calculations were essential to the formulation of the delivery model. The program used the DALY (Disability Adjusted Life Years), but it was difficult to sell this to agriculture experts in donor organizations who didn't use DALYs largely. Scaling may have been quicker had both the return on investment been calculated on both agronomic performance (yield for example), and a metric with respect to nutrition, such as the DALY.

Financing scale – Donor and funding impacts on scaling strategies

The two major donors of the HarvestPlus program took the idea of biofortification to prove that it works by investment in human studies. It is not the norm in international development for donors to provide continual, long term, core or unspecified project funding. Other donors had to be brought on board and prizes won, since for mass scale to happen, sufficient financing was not going to come from one or two donors alone.

By engaging with the private sector and leveraging market dynamics, HarvestPlus not only increased the reach and impact of biofortification but opened new opportunities for revenue generation and sustainability. Early on the mission to combat hidden hunger through biofortification was significantly reliant on two major donors for core funding. This reliance was understandable given the novelty of the approach and the need to establish a strong foundation of evidence. These initial donors provided essential support, enabling crucial foundational research, developing biofortified crop varieties, and pilot delivery models. As HarvestPlus progressed and sought to expand its impact, HarvestPlus recognized the importance of diversifying funding sources. Relying heavily on one or two donors for core funding posed a risk to sustainability and growth. There was a need to broaden the support base to ensure the long-term success of the mission.

To address this challenge, HarvestPlus strategically shifted its resource mobilization efforts and transitioned towards a more diversified funding approach that encompassed various dimensions. This included seeking funding at the country level, embarking on project-based fundraising initiatives, and engaging in issue-based campaigns. This not only mitigated financial risk but also allowed HarvestPlus to tailor initiatives to specific geographic regions, projects, and areas of concern. This enabled HarvestPlus to harness a broader array of resources, expertise, and partnerships, ultimately strengthening capacity to scale up biofortification efforts. The impact of scaling efforts can be seen in the growing adoption and utilization of biofortified crops in various regions globally. By expanding operational activities beyond seed multiplication, HarvestPlus has been able to address critical gaps in the value chain and strengthen the market for biofortified crops. By diversifying donor relations from donors willing to fund broad scale building of biofortified value chains, HarvestPlus subsequently engaged donors to partner and engage in solving distinct gaps, either in the value chain, in the seed or food system or in the enabling environment.

This need for diversified fundraising brings threats to the delivery of the program, time spent looking for resource is time that could be spent on scaling activities. Moreover, the program, activities and countries had to be broken up into composite parts to be funded by different donors, but they still had to function together as one value chain. For example, one donor may fund a specific wheat breeding project, while a second donor would subsidize the seed distribution to vulnerable population groups and a third donor would invest in the commercialization of the food product – different donors, same supply chain. The logistical and funding challenges of this reality are substantial.

Internal drivers to scale

HarvestPlus' core mandate to scale up biofortification globally, as outlined in its founding documents, has served as a primary internal driver. The organization's mission to combat hidden hunger and its commitment to reaching vulnerable populations have provided a strong impetus for mainstreaming efforts.



Internal pressure and initiatives from staff members have played a vital role in driving mainstreaming efforts. Employees at various levels of the organization, including researchers, program managers, and field staff, have contributed their expertise, ideas, and passion to push for scaling biofortification activities beyond traditional approaches. Staff members with a commercial background saw the need to collaborate more with the food industry and private seed companies.

Researchers may naturally focus on the evidence and scientific aspects of their work, but those with a commercial mindset complement this by bridging the gap between research and implementation, ensuring that promising biofortified crop varieties not only get developed but also effectively reach farmers and consumers. Staff members with a commercial background understand the significance of aligning biofortified crops with market demand. This approach, in essence, combines scientific excellence with market-oriented strategies to address hidden hunger effectively, reflecting the holistic approach that is central to HarvestPlus' mission.

External drivers to scale

External pressure from funders, including governments, philanthropic organizations, and development agencies, has influenced HarvestPlus' scaling efforts. The expectations of funders regarding scalability, sustainability, and impact have prompted the organization to adopt a more systematic and sustainable practice became more important in recent years as research strategies became more impact oriented. HarvestPlus with its pivot towards processing, distribution, marketing, and market development already expanded the reach and impact of biofortification resulting in a demonstrable adoption, utilization, and sustainability of biofortified crops.

The governance function (called the HarvestPlus Program Advisory Committee) played another pivotal role in driving scaling efforts. Their oversight, guidance, and strategic decision-making have provided direction and support to the organization's scaling initiatives.

External factors such as global opportunities and challenges, including the Sustainable Development Goals (SDGs) and climate change, have influenced HarvestPlus' scaling efforts in that they added leverage at national and governmental levels to achieve results towards global goals, as well as meaning to the internal conceptualization within HarvestPlus. The alignment of biofortification initiatives with the SDGs and the recognition of the role of nutritious crops in building climate-resilient food systems have provided impetus for scaling and expanding the organization's impact.

Vision and goals for mainstreaming scaling

HarvestPlus had a clear vision of introducing biofortification into agriculture and nutrition systems widely and at scale, recognizing that it could transform all crops into more nutritious varieties over time, similar to how the dwarfing gene was successfully mainstreamed during the Green Revolution. The organization's primary objective was to overcome barriers to adoption by switching to biofortified varieties, and to do this by laying strategic foundations to scalability, i.e., to think scaling in all activities.

With the HarvestPlus program emanating from breeding research, activities also first addressed the "beginning" of the value chain. The basis for any mainstreaming at later stages of the value chain is to integrate nutritional traits into the majority of varieties that are developed by the CGIAR and NARES partners, to ensure that over time all released varieties have higher nutritional density than compared to older varieties. By incorporating enhanced nutritional traits into staple crop varieties, HarvestPlus aimed to develop a diverse range of biofortified seed products suitable for different regions and markets.

A second strategic decision to lay the foundation to mainstreaming is the effort to use the crops already grown and consumed in each region. This would later be relevant to minimizing behavioral change, consumer preferences, etc. Experiences during this approach are also an important input to user-oriented breeding that looped back into research strategies in One CGIAR. Each development stage of scaling presented a unique opportunity of integrating biofortification into the food system. The



organization started with breeding, ensuring a robust supply of biofortified crops. Once a sufficient level of supply was established, HarvestPlus integrated biofortification into development programs. Only when the supply and development components were well-established could mainstreaming take place and efforts be expanded to encompass social safety net programs and large-scale commercial value chains.

Sustainability is an integral part of the definition of scale within HarvestPlus. Scale should not only focus on short-term expansion but also ensure the long-term viability and continued impact of biofortification. Sustainability is defined as the ability to maintain and enhance the adoption, production, and consumption of biofortified crops beyond the initial intervention phase. It encompasses factors such as market demand, policy support, stakeholder engagement, and the development of self-sustaining value chains.

Monitoring and evaluating mainstreaming of scaling

Successful impact at scale was initially measured by the number of farmers adopting and cultivating biofortified crops and the number of consumers benefiting from improved availability of nutritionally enriched staple crops. However, the understanding of success evolved to include broader indicators such as changes in dietary practices, improvements in nutritional outcomes, and the integration of biofortification into policies and strategies at national and international levels, to facilitate mainstreaming as a path to scaling. Monitoring and evaluation frameworks were developed to measure indicators that show the increased adoption, growth and consumption of nutrients enriched crops and assess the progress of scaling efforts. Important to note, whilst proof of concept studies have demonstrated impact in controlled situations, nutrition outcomes at scale within populations are yet to be measured with indicators such as increased seed availability and adoption, and potential increased consumption of the crop. Such studies are expensive but ultimately are important to establish what is the impact at scale.

The process of mainstreaming scaling into HarvestPlus' activities necessitated significant changes in the organization's monitoring and evaluation (M&E) systems and indicators. These changes were vital to align M&E with the evolving definitions and objectives of scaling within the organization. The shift towards mainstreaming scaling brought about several modifications. To align with mainstreaming scaling, HarvestPlus redefined its understanding of scale. Initially, scale was primarily about expanding the production and dissemination of biofortified crops. However, it now encompasses a broader perspective that includes integrating biofortified crops into various sectors, such as development programs, social safety nets, and commercial value chains. This change required a shift in mindset and a more comprehensive approach to scale.

HarvestPlus expanded its indicators to assess the integration of biofortification across multiple domains. This involved not only measuring the number of farmers adopting biofortified crops but also evaluating changes in dietary practices, nutritional outcomes, and the integration of biofortification into policies and strategies at national and international levels. HarvestPlus introduced new indicators to capture the multifaceted impact of mainstreaming scaling. These additions were essential to assess the broader impact of biofortification on nutrition and food systems. The mainstreaming approach required greater attention to the sustainability of scaling efforts. As a result, indicators related to the long-term sustainability of biofortification interventions and their incorporation into existing systems were integrated into the M&E framework.

To gather data for these revised indicators, HarvestPlus had to adapt its data collection procedures. This often meant employing different data sources, survey instruments, and research methodologies to capture the diverse aspects of scaling. The expanded M&E framework demanded a more diverse skill set among M&E staff. It necessitated expertise in areas beyond traditional M&E, such as nutrition, policy analysis, and systems thinking. HarvestPlus made efforts to recruit or train staff with these capabilities. Mainstreaming scaling also required adjustments in budget allocation. This involved allocating resources



for the collection of additional data, investing in capacity building for staff, and supporting new research initiatives aligned with the evolving indicators.

Mainstreaming scaling as a continuous effort that spans multiple projects and initiatives

HarvestPlus follows a cyclical phased approach to scaling, which involves systematically expanding the reach and scope of biofortification initiatives. In each phase, scaling considerations play a crucial role in decision-making and planning. The organization understands that scalability is not an afterthought but a fundamental aspect that needs to be addressed from the outset.

During the initial designs and pilot phases, HarvestPlus focuses on testing and refining the biofortification interventions with consumers, framers and value chain actors, while simultaneously assessing their potential for scalability. This allows for the identification of critical success factors, resource requirements, and potential challenges that may arise during scaling.

As the organization progressed through subsequent phases, such as integrating biofortified crops into NGO programming, social safety net programming, and commercial value chains, scaling considerations remained at the forefront. HarvestPlus ensures that the initiatives are designed to fit within the funding, resource, and implementation capacity constraints at large scale. The organization also works on building the capacity of local actors, including innovators, social entrepreneurs, and implementers, so that they can effectively resource and implement biofortification interventions at scale.

Overall, scaling is not seen as a one-off event or a sequence of individual projects or grants, but rather as an ongoing and iterative and cyclical process within HarvestPlus. It involves a series of strategic interventions and activities aimed at expanding the reach and impact of biofortification over time. Scaling is a continuous effort that spans multiple projects and initiatives, with each project building iteratively upon the previous ones.

While specific projects or grants may have defined timelines, the scaling process extends beyond individual initiatives. It encompasses the collective efforts and coordination of various stakeholders, including HarvestPlus, partners, governments, NGOs, private sector actors, and communities, working together to drive the mainstreaming of biofortification into both breeding programs and commercial food systems.

Roles in scaling

Delivery, scaling and mainstreaming is a true team effort, which could not be achieved without each of the players in the team. In HarvestPlus, scaling efforts are not limited to a specific unit or department but are embraced by the entire organization, with each division and team working towards mainstreaming within their respective disciplines. (Table 2) The organization as a whole recognizes the importance of scaling biofortification and has aligned its efforts to integrate nutritious crops into global value chains. This is different to other One CGIAR groups and teams.

Each division within HarvestPlus has distinct roles and responsibilities in advancing scaling within their areas of expertise. The breeding and research teams focus on developing biofortified crop varieties that meet the needs of farmers and consumers. The program implementation teams work on integrating biofortification into NGO programming and social safety net initiatives. The policy and advocacy teams strive to ensure policy integration and create an enabling environment for mainstreaming. Additionally, the marketing and commercialization teams collaborate with partners to expand the presence of biofortified products in commercial value chains.



Table 2: Roles in scaling for different actors in HarvestPlus

Function	Role in scaling
Founders and Visionaries	The founders of HarvestPlus, such as the International Food Policy Research Institute (IFPRI) and the Consultative Group for International Agricultural Research (CGIAR), have been instrumental in setting the vision for mainstreaming biofortification. Their motivation stems from a deep commitment to addressing malnutrition and improving global food security through innovative approaches.
Executive Leadership	The executive leadership of HarvestPlus, including the CEO, directors, and senior management, have played crucial roles as champions of scaling. Their motivation lies in realizing the organization’s mission to scale up biofortification globally and make it an integral part of agricultural and nutrition systems.
Country Managers and Implementation Teams	The program managers and teams responsible for implementing biofortification activities on the ground have been leaders in driving scaling efforts. Their motivation comes from witnessing the positive impact of biofortification in improving nutrition and the lives of vulnerable populations. They are driven by a sense of urgency and a desire to reach more people with biofortified crops
Technical Experts – Crop Scientists, nutritionists and food science working together	The technical experts and scientists within HarvestPlus, including plant breeders, agronomists, nutritionists and food scientists have been leaders in developing and advancing biofortification technologies. Their motivation stems from a passion for research and innovation, as well as a commitment to leveraging science to address malnutrition and improve human health.
Scaling experts	Individuals with knowledge of the principles of scaling. Using the theoretical and academic principles of scaling and how that can be applied in the context of biofortification. Using the results from the success of the program to develop the methodology and delivery models which guide the future strategy
External champions	Individuals and groups outside the organization, including advocates, researchers, policymakers, and civil society organizations, have also played a crucial role as champions of scaling. Their motivation lies in recognizing the potential of biofortification to contribute to sustainable development goals, improve nutrition outcomes, and reduce micronutrient deficiencies globally.
Private sector and commercial seed, grain and food businesses – private sector engagement	Given the volume of staple foods procured by the private sector, we can’t scale in food systems without them, they are essential in the demand creation and partnership to build strong and sustainable value chains. Staff with experience in the private sector who understand commercial language, drivers and can create shared value between the goals of the program and the needs of business.
M&E	The development of number-based targets, per country and crop. Understanding the reach each potential crop has in country and communicating those numbers to the teams.
Finance, economic modelling and return on investment calculations	Experts who monitor the spend and costs of the program then use they M&E data to establish value on future costs required.

The organizational changes undertaken by HarvestPlus reflected its commitment to scaling and adapting to the evolving needs of each phase. By aligning its structure, functions, and capacities with the specific

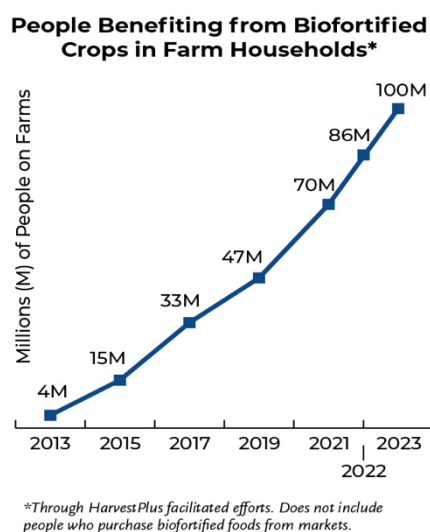


requirements of research, development, and scaling, HarvestPlus positioned itself as a dynamic and agile organization capable of driving sustained impact in addressing malnutrition through biofortification.

What have been the results of HarvestPlus' efforts of mainstreaming scaling to date

In this 20th year of HarvestPlus operations, monitoring and evaluation data for 2022 show that over 100 million people in farming families are eating nutrient-enriched foods. Millions more benefit from biofortified foods bought from markets. (Figure 3)

Figure 3



Source: Twenty Years of Enriching Diets with Biofortification. [Twenty Years of Enriching Diets with Biofortification - HarvestPlus](#)

This is a conservative figure which covers the reach in farming households. The early program factored farming households in the primary monitoring and evaluation targets. The actual reach to consumers through markets and commercialized/packaged foods is in the region of an additional four hundred million in 12 countries where data is systematically collected. Investment in research to collect quantitative market and consumer data is required. Investment in this area would be learnings to accelerate the current program and case studies for future markets to scale. Data on processed products is collected with businesses who partner with HarvestPlus officially through the program, examples of over 200 commercial packaged products have been collected in 8 countries, but this is just a fraction of the number of commercial, packaged products on the market made from biofortified staples – the mission of sustainable commercialization is happening, stimulated by the HarvestPlus program.



Lessons learned

Supply chain issues and bridging demand and supply – difficulties to scale in challenging market environments.

Supply chain challenges

Regulatory approvals for crop release and multiplication of certified seeds were an early barrier to scale. To address these challenges, HarvestPlus collaborated closely with national agricultural research and extension systems (NARES) to navigate regulatory processes and gain approvals. They also established partnerships with seed companies, farmer cooperatives, and other market actors to facilitate seed multiplication and ensure market availability. Consumer awareness campaigns and behavior change communication strategies were employed to promote the acceptance and demand for biofortified crops.

The crop research and development team played a pivotal role in bringing together breeders, technical experts, and business-oriented staff from both the public and private sectors. With a focus on the realities of both formal/commercial and informal seed systems and the involvement of farmers and seed businesses facilitated the commercialization of biofortified seed, grains, and foods. The initial focus of the program was on establishing the breeding or research and development (R&D) process within the CGIAR and collaborating with country-based academic breeding institutions. This phase involved carrying out the crop development work, ensuring the crops met the required standards, and obtaining approval for release from the NARES. This process took time and created a lag before the initiation of the scaling strategy.

Bridging demand and supply – seeds, grains and foods

The establishment of a delivery model based on real life experience in the field was critical. A Commercialization and Scaling Team was integrated at the headquarters and regional levels, to develop the commercialization and scaling aspects of the program strategy. The team focused on integrating biofortification into the food system, addressing market dynamics, and facilitating the distribution and availability of biofortified products. Seed fairs and seed marketing to farmers had to continue and now link to a new way of talking to commercial food businesses. A sequence of global and country food events was held to bring the food sector together.

This approach required building new partnerships, enhancing technical expertise in food supply chains, food product formation, marketing, and communication, and adapting organizational structures and processes to effectively engage in systemic interventions.

To overcome these challenges and resistance, it was crucial to foster collaboration, build trust, and engage both nutrition and agriculture experts. The HarvestPlus program employed several strategies to address these issues:

1. Be creative in the way the mission is sold, understand the different languages of different sectors, donors and country. What makes scale for the HarvestPlus program can be viewed as improving the living income of smallholder farmer, each partner receives the end goal they need.
2. Partnership and collaboration: build trusted partnerships at each step in the value chain, regularly review partners and change if it does not work but aim for long term commitment.
3. Value chain optimization – demand and supply, not supply and demand: HarvestPlus could identify and address gaps in the production, processing, distribution, and marketing of biofortified crops. By analyzing crop-country profiles and systematically approaching different nodes of the value chain, HarvestPlus was able to strengthen market linkages and overcome



barriers to commercialization. This underscores the significance of optimizing the entire value chain to ensure efficient and effective scaling of agricultural innovations.

4. Focus on demand creation at each segment – each stakeholder needs their own value proposition: By promoting the nutritional benefits and value of biofortified foods, HarvestPlus stimulated consumer interest and increased acceptance. This demand-driven approach helped generate market pull, thereby incentivizing production and driving scalability. The emphasis on demand creation underscores the need to align innovations with consumer needs and preferences.
5. Alternative revenue sources: HarvestPlus recognized the importance of diversifying funding sources and revenue streams to ensure long-term sustainability. By exploring fee-for-service arrangements, commercial partnerships, and revenue generation models, HarvestPlus is expanding its financial base beyond traditional donor funding. This approach enhances the organization's ability to sustain its mission-driven work and achieve scalability even in changing funding landscapes.
6. Ensure all projects ladder up to the same goal. Multiple countries, donors, and endpoints can cause silos and chaos. Resources and people must be mapped to specific deliverables and projects, but a cohesive team is not negotiable. Efficiencies can be made, lessons and tools shared across different countries and markets. Reuse marketing assets in the same way the commercial sector does in different regions.
7. Continuous learning and adaptation: Throughout its scaling journey, HarvestPlus has demonstrated a commitment to continuous learning and adaptation. By conducting internal evaluations, reviewing results, and responding to challenges and opportunities, HarvestPlus has been able to refine its strategies and improve its impact. This emphasis on learning and adaptive management allows organizations to stay responsive, innovative, and effective in their scaling efforts.
8. Data-Driven Decision-Making: HarvestPlus recognized the pivotal role of data in the scaling process. In addition to monitoring and evaluation, the organization prioritized Data-Driven decision-making at all levels. By collecting and analyzing data on crop adoption rates, nutritional impact, and feedback from stakeholders, HarvestPlus gained valuable insights into the effectiveness of its strategies. This approach enabled the organization to make informed adjustments, allocate resources efficiently, and focus efforts on interventions that yielded the highest impact. The emphasis on Data-Driven decision-making underscores the significance of using evidence to guide scaling efforts and maximize outcomes.

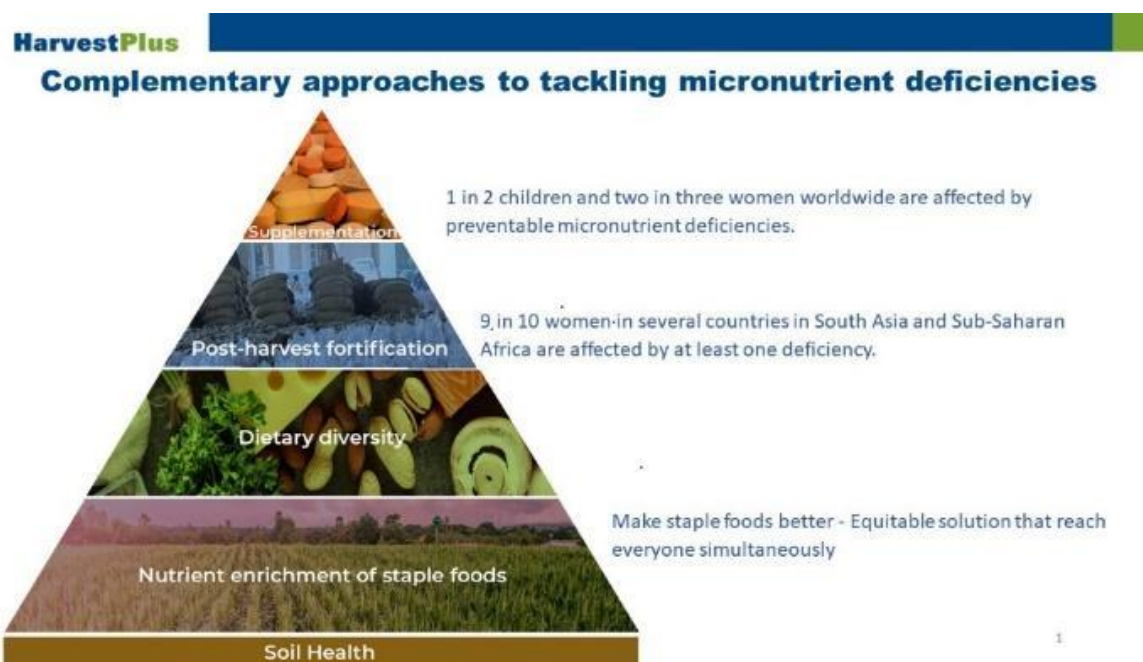
Systemic and cultural issues in a development setting

HarvestPlus had to address a number of systemic and cultural issues in pursuing its mainstreaming strategy. The following were the principal ones:

1. A sentiment in some areas that addressing micronutrient deficiencies with different interventions is competitive rather than complementary. Tackling micronutrient deficiencies requires multiple interventions described in the pyramid below. (Figure 4) The HarvestPlus program remains supportive of all interventions and includes the promotion of dietary diversity, post-harvest fortification and partnerships with supplementation programs, efforts have been made to educate and inform other NGOs, nutritionists, and governments that each part of the pyramid has a place.



Figure 4



Source: Scaling nutrient-enriched staple crops with the HarvestPlus program: Reaching 100 million people in 20 years | IFPRI : International Food Policy Research Institute

2. The inclusion of micronutrient targets into breeding is a continuous activity. The difference in targeted breeding for specific regions has to continue and the CGIAR must include nutrition indicators in all breeding activities. The mainstreaming strategy consists in having biofortification streamed and in replacing the varieties currently grown in the breeding centers with climate and disease-resilient, higher-yielding and more nutritious varieties. There is a lag in the initiation of the mainstreaming strategy and the current targeted varieties in the market. The CGIAR may have committed to nutrition but CGIAR products are not available in every country. Pakistan, for example, relies heavily on locally developed varieties. Genetic gains are a function of investment, and greater investment is needed to mainstream biofortification into CGIAR breeding platforms.¹
3. The importance of not offering singular commercial businesses with the benefits of publicly funded goods. The CGIAR and HarvestPlus breeding program has been funded with public and Government funding. The scaling initiatives involve commercialization at the heart of the strategy, and it is important that not just one private sector organization receives the benefits.
4. Partnerships with food businesses. A sentiment within the public sector is that some large food businesses have contributed to the global health challenges such as overweight/obesity and non-communicable diseases, and partnership with businesses could compromise the reputation of public sector actors. The HarvestPlus program conducts exhaustive risk management exercises before deciding to partner with businesses. The biofortified commodities must enter the entire food system and not just foods that are already perceived as healthy.

¹ See <https://storage.googleapis.com/cgiarorg/2018/09/SMB10-BP1b-%E2%80%93-Biofortification-Strategy.pdf>



5. A perception that biofortification is only for smallholder farmers. The primary and initial beneficiaries are very low income, smallholder families. Donors have expressed concern that commercialization could divert the higher value food to higher income consumers and businesses. HarvestPlus had to demonstrate that food systems are not contained and highly interlinked (Fig reference could go here). Expanding the use and reach of biofortified commodities creates access to markets. The perception that biofortification is only for “poor people” would be counterproductive to scale and potentially marginalize the products. Creating a demand in food systems and products with higher margins stimulates utilization. The program ensures that the basic commodity (grain or flour) remains at the same price, if not lower than the standard in the market. The diagram below shows the interactions between smallholder farmers and mass scale food production.
6. Quantity/scale versus quality or impact: There was a potential tradeoff between scaling up the quantity of interventions or reaching a larger number of beneficiaries on the one hand and ensuring the quality and impact of those interventions on the other. To address this, HarvestPlus emphasized a phased approach to scaling, ensuring that quality standards were maintained at each stage of expansion. Impact assessments and monitoring systems were put in place to measure the effectiveness of scaling efforts and identify areas for improvement.
7. Equity considerations and cross-cutting issues: Mainstreaming scaling in a development context also required careful consideration of equity considerations, such as ensuring that no one was left behind and addressing last-mile challenges. While scaling efforts aimed to reach a larger population, there was a risk of unintentionally excluding vulnerable or marginalized groups. HarvestPlus incorporated equity considerations into its scaling strategies by actively engaging with local communities, conducting needs assessments, and tailoring interventions to specific contexts. Partnerships with local organizations and stakeholders were also established to enhance inclusivity and ensure that the benefits of scaling reached all segments of the population. Rather than seeing these considerations as distractions, the approach was to understand that there are societal issues to tackle these cross-cutting themes – Scaling strategies must be gender equitable, it would be fundamentally wrong to consider that ensuring a program includes women would slow progress. Unfortunately, it is a current fact that men have more access to technologies, mechanization such as tractors, better access to the internet and technology but women are often the drivers behind food consumed at home. It is essential to create better access for these tools for women in agriculture and understand women’s current role in food systems. Tackling the big global issues such as gender and climate only goes to accelerate our goals and adopt a systems approach. Cross cutting themes are not a sidenote to have at the bottom of proposals, they are integrated at the outset.

The next steps: How to reach a billion by 2030

As of June 2023, HarvestPlus works as an integrated part of the [Innovation Policy and Scaling Unit in IFPRI’s Transformation Strategies Department](#), and collaborates across CGIAR, with a collective aim of securing a food-secure future for all. At that time, HarvestPlus also established its non-profit wing, HarvestPlus Solutions. HarvestPlus Solutions was established as a catalytic scaling partner to complement HarvestPlus and increase the uptake of nutritious crops. Its goal is to support the scaling efforts by entering the agricultural business sector with a more commercially oriented organization and structure. Recognizing the need to act as a market participant itself, to bridge gaps in the value chain, engagement as a buyer or seller (aggregator) of seed or crop, and service provider for distinct services required by potential clients – activities all of which are to agile and often in different ranges of valuation to generate grants. In these ways, HarvestPlus Solutions can support the overall acceleration of biofortification mainstreamed by HarvestPlus.



HarvestPlus Solutions plays a crucial role in integrating scaling strategies into both legacy and new initiatives. HarvestPlus Solutions collaborates closely with HarvestPlus to assess existing interventions and identify opportunities for scaling. By leveraging its expertise in scaling methodologies and extensive network of partners, HarvestPlus Solutions helps to identify and address challenges associated with mainstreaming scaling into pre-existing efforts. This collaborative approach ensures that lessons learned from legacy projects are effectively applied and informs the design of future initiatives.

HarvestPlus Solutions and its network entities will lead the delivery and distribution of biofortified seeds, crops, and foods to farmers and consumers using proven strategies and innovative approaches and applying them as commercial entities and acting within the agricultural business sector. They will work with private sector partners to commercialize nutrient-enriched products and address value chain gaps, aiming to recover costs and seek new donor funding. The network aims to also serve as a scaling partner for other CGIAR technologies, exploring opportunities to scale and commercialize other technologies developed by CGIAR to diversify diets and enrich food systems.

As HarvestPlus continues its scaling journey, the organization envisions several crucial next steps to further advance the mainstreaming of biofortification and achieve greater impact. These steps are rooted in the dynamic landscape of nutrition, agriculture, and sustainable development.

HarvestPlus recognizes the vital role of strategic partnerships and collaborations in scaling up biofortification. The organization aims to deepen its alliances with governments, donors, research institutions, civil society organizations, and the private sector. By forging strong partnerships, HarvestPlus can leverage resources, expertise, and networks to accelerate the adoption and integration of biofortified crops into mainstream agricultural and nutrition systems.

HarvestPlus seeks to expand the reach of biofortification across various sectors, value chains and food systems. This involves working closely with food processors, retailers, and consumers to increase the demand, availability, and accessibility of biofortified foods. By integrating biofortification throughout food systems, from production to consumption, HarvestPlus can create sustainable market opportunities and drive widespread adoption.

With the 20th anniversary of HarvestPlus, the milestone of 100 million consumers reached and the finalization of the One CGIAR reform process, this is the perfect time to reflect upon the process that led us to this point.

At the Micro Nutrient Forum in the Hague, October 2023 Howdy Bouis predicted that “we are 20 years into a 40 year process” but that estimation is heavily dependent on many moving factors.

1. “Mainstreaming nutrition into all breeding programs” – this means that government funded agricultural research, private sector and the CGIAR all must commit to make nutrition as important as yield. If only this were to happen then biofortification would be into the system as a default. Without investments in breeding biofortification will go backwards. Like any sector, continual investment in R&D/product innovation has to happen.
2. For point 1 to happen faster, the food industry of all shapes and sizes, around the globe have to include micronutrient parameters in all of their procurement of raw materials. Organizations such as Access to Nutrition Index could be instrumental in making that happen. Private sector demand is much faster, cheaper and more sustainable than Government policy, especially in LMIC.

The end goal of a billion was always present but the scaling strategy and delivery model has only recently been formalized and published. The HarvestPlus team members and program have had to behave like a start-up business which has its challenges in the confines of a major global organization of the CGIAR. Difficult because HarvestPlus program within the CGIAR was the only program completely



dedicated to scaling. To get to this point of 100 million people reached, it is point proven that CGIAR can deliver at scale.

The organization is radically different from the one started 20 years ago, many staff and experts have played critical roles over the years that were required in the scaling journey for certain points of that journey.

