1.16 Scale up biofortified crops

The Solution: Biofortified crops, naturally bred[1] staple crops that have higher vitamin and mineral content than standard staples, are good for humans and good for the planet. Biofortified crops are a subsistence commodity with potential to nourish the world. This three-pronged solution to kick-start a sustainable market for biofortified crops. The solution will connect a stable supply of quality-assured biofortified staple crops from farmers to aggregators, who will in turn meet the demand of institutions that provide biofortified foods to low-income consumers. The three aspects of this approach are:

a) **Verified Sourcing Areas**[2] **(VSAs)** for biofortified crops. Within each VSA, farmers collectively agree to adhere to a set of production practices. When compliance of the entire group is verified, all farmers from the area can sell their produce as VSA-verified. Within VSAs for biofortification, farmers will agree to produce biofortified varieties. The process of verification and certification of farmers collectively, rather than individually, aids simplicity.
b) **Volume guarantee scheme**. Grain dealers will be assured of guaranteed offtake of large volumes of biofortified grain. Dealers will in turn establish purchase contracts with farmers. Farmers, knowing that they will be able to sell what they produce, will invest in biofortified seeds. Once the seed and grain are produced, these will enter local supply chains and can be taken up by customers. After farmers profit from biofortified crops, they will continue to invest in planting biofortified varieties.
c) **Publicly available standards**. The micronutrient content in biofortified varieties can vary due to genetic changes or product mixing. Publicly available standards will establish an acceptable range of micronutrient content required for biofortified crops and food products. Standards will initially apply within VSAs and eventually, through government policies, to the mainstream market.

Source of the Solution: This solution emerged from programmatic learnings between GAIN, HarvestPlus, and other partners.

Problem addressed within food systems: Too many people, especially among the poor, consume diets that are overly reliant on staple foods. Such diets are low in micronutrients. Biofortified crops can improve the supply of micronutrients within a food system. By switching from normal to biofortified varieties, micronutrient intake of poor consumers can be increased, without major behavioural changes or additional expenditure on food. Biofortified crops thus have an unrealised potential to improve nutrition outcomes for lower-income consumers.

For this potential to be realised, each actor must profit from their participation in the value chain for biofortified crops and foods. Therefore, we will address a series of constraints:

- Limited uptake of biofortified crops by farmers who are unsure of their market potential.
- A lack of guaranteed off-taker demand for biofortified grain, which limits farmers' desire to produce biofortified crops.
- Insufficient demand for biofortified varieties of seed, which stems from farmers' uncertainty.
- The fact that the term 'biofortified' does not have a universally accepted meaning or range of acceptable micronutrient content.

How this solution will address that problem: The Volume Guarantee Scheme will assure crop merchants that they can sell the biofortified products that they aggregate. The scheme will offer forward contracts, subsidised by donor funding, to aggregators. The aggregators who accept forward contracts will source

[1] Biofortified crops are not genetically modified organisms.
[2] https://www.idhsustainabletrade.com/publication/what-are-verified-sourcing-areas-vsas/

biofortified crops from VSAs. Farmers within the areas will apply for certification that their crops are biofortified, or that farmers are collectively making acceptable progress toward increased cultivation of biofortified varieties. Once an acceptable amount of an area's crops is biofortified, the crop from that area will be considered—and certified as—biofortified.

Simultaneously, we will develop Publicly Available Standards for biofortified crops. These international standards will allow producers of biofortified crops and foods to operate with a universal understanding of the level of micronutrient content that is required for the crop or food to be considered biofortified.

As a result of these interventions, farmers will produce more biofortified foods. The quality and purity of biofortified crops and foods throughout the supply chain will be ensured. This intervention will increase production and marketing of biofortified crops. Producers and consumers will know which products are biofortified. As more biofortified products are consumed, diets will improve, resulting in improved micronutrient intake among poor consumers. We assume that all phases of the supply chain will be profitable for value chain actors and that our interventions will not distort local markets for inputs or food.

Solution's alignment to the 'game changing and systemic solution' criteria: Market forces will be harnessed and leveraged ensure the sustainability and success of this intervention. Once the proof of concept of this three-pronged approach is demonstrated, the intervention can be scaled up to new crops and other geographies. To ensure the intervention is actionable in the initial stages, we propose to pilot this eventually global intervention in India, where institutional demand for biofortified crops already exists. India's Public Distribution Scheme has already committed to purchasing biofortified products. As the market ecosystem for biofortified crops develops, continued demand for foods will drive more supply, ensuring sustainability.

Existing evidence: The efficacy of biofortified staple crops in reducing micronutrient deficiencies has been demonstrated for iron biofortified beans[3] and pearl millet[4], as well as for vitamin A biofortified cassava [5], maize [6] and sweet potato[7]. Studies have demonstrated impacts of the consumption of these crops on functional, cognitive, and health outcomes and work efficiency. Our solution can cost-effectively[8] prevent micronutrient malnutrition. Today, varieties of 11 staple crops have been formally released for production in over 40 LMICs and there are biofortification programmes in 41 countries across Africa, Asia and Latin America. The effectiveness of volume guarantees, in the form of advance purchase commitments, has also been documented[9]. Combining volume guarantees with VSAs will connect a guaranteed market with a reliable supply of biofortified products.

The success of volume guarantees in scaling up availability and uptake and reducing prices of global health commodities such as contraceptives and anti-retroviral drugs for HIV/AIDS has been well documented.[10] We will replicate this success to biofortified crops by working with philanthropies, impact financiers, and donors to provide guarantees for farmers to produce biofortified crops.

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[3] Haas, J. D. et al. 2016. Consuming Iron Biofortified Beans Increases Iron Status in Rwandan Women after 128 Days in a Randomized Controlled Feeding Trial. J Nutr 146:1586–92.

[4] Finkelstein, J. L. et al. 2019. Iron biofortification interventions to improve iron status and functional outcomes. Proc Nutr Soc 78:197–207

[5] Talsma, E. F. et al. 2013. Biofortified Cassava with Pro-Vitamin A Is Sensory and Culturally Acceptable for Consumption by Primary Schoolchildren in Kenya. PLoS ONE. 8 (8): e73433, doi: 0.1371/journal.pone.0073433.

[6] Gannon, B. C. et al. 2014. Biofortified orange maize is as efficacious as a vitamin A supplement in Zambian children even in the presence of high liver reserves of vitamin A: A community-based, randomized placebo-controlled trial. Am J Clin Nutr 100:1541–50.

[7] Low, J. W. 2007. A food-based approach introducing orange-fleshed sweet potatoes increased vitamin A intake and serum retinol concentrations in young children in rural Mozambique. J Nutr 137:1320–7.

[8] CAST Task Force., 2020. Food Biofortification—Reaping the Benefits of Science to Overcome Hidden Hunger A paper in the series on The Need for Agricultural Innovation to Sustainably Feed the World by 2050. Council for Agricultural Science and Technology (CAST).

[9] https://www.who.int/intellectualproperty/submissions/MichealKremerKTW_CIPIH_submit_2.pdf?ua=1

[10] https://ssir.org/articles/entry/guaranteed_impact

Current/likely political support: Governments in India, Tanzania, and elsewhere have demonstrated their interest in procuring biofortified foods for their public distribution and school feeding programmes, respectively.

Contexts where this is well/not well suited: This solution is suited to contexts where there is institutional demand—for example, as mentioned above, India and Tanzania. In contexts where demand would be less predictable, the interventions would need to be complemented by demand-side interventions (like marketing or new product development).