

Solving nutrition deficiencies with biofortified food

An overview of the CGIAR HarvestPlus program that aims to combat malnutrition in Asia

In Bangladesh, there is public interest in promoting biofortification and in ensuring that there is substantial demand for biofortified foods.

(Photo courtesy: HarvestPlus)

TWO billion people, equal to about 25% of the global population, have diets that are insufficient in vitamins and minerals. This often leads to health and developmental problems, such as anaemia and stunting, especially among the most vulnerable sectors of the population from low- and middle-income countries. Asia's undernutrition seems a difficult one to conquer, but for the last 20 years, the CGIAR HarvestPlus Program has been working on biofortification as part of the solution.



Biofortification, the process of increasing the nutritional value of a food crop through conventional breeding or genetic modification, makes essential vitamins and minerals available in foods that most people can readily afford and access. Examples of biofortified crops are iron-fortified beans, and pearl millet, vitamin-A enriched orange sweet potato, cassava, maize, rice and zinc-fortified wheat, rice and maize. To date, all biofortified crops promoted by HarvestPlus have been conventionally bred.

There is increasing interest for these products in the food industry. According to Ravinder Grover, HarvestPlus Program Lead for the Commercialisation of Biofortified Crops Program, the trends for nutritious, sustainable and eco-friendly food and clean-label ingredients are driving demand. Big players in the cereals and snacks industries, as well as start-ups, are looking at opportunities to use biofortified food ingredients in their products. In India, ready-to-eat food such as pearl millet noodles and pearl millet flakes from biofortified grains are already being marketed. In Pakistan, zinc-biofortified wheat production is rapidly scaling up and accounts for a significant share of the domestic wheat seed market; processed food products made with biofortified wheat, such as packaged flour, bread, noodles and breakfast cereals are already available. In Bangladesh, the government has started to procure zinc rice in various government programmes and there is public interest not only in promoting biofortification but also in ensuring that there is substantial demand for biofortified foods.

There is clearly an opportunity for companies interested in including biofortified food in their portfolios, since studies show that non-farm consumers are willing to pay a premium price for them (one study* for iron-biofortified millet pegged the premium at an average 27% more). "This is an area where they can make substantial amounts of profits because if you see the willingness to pay for premium on these products, it is very encouraging," says Grover. "Many of our surveys indicate that 98% of our consumers are willing to pay premium for biofortified products."

Southeast Asia is behind compared to its South Asian neighbours when it comes to biofortified food, but this does

not mean it is irrelevant. According to one research study in Indonesia, zinc deficiency in the early years of life can increase the risk of stunting by nearly eight times. Efforts are underway to address this issue: in 2021, zinc-biofortified rice was planted to 46,000 hectares of land in Indonesia, and 100,000 hectares are targeted for this year. Peter Goldstein, Head of Strategic Communications in HarvestPlus, says the outlook is promising. "What is happening in Indonesia is a taste of things to come. The Indonesian government is making a strong commitment to scaling up zinc rice to address serious stunting challenges in the country. I think there is potential there to create a kind of biofortification hub for the region."

Challenges

Commercialisation of biofortified crops has its own set of challenges. Grover adds that at first there were no standards for biofortified grains. "We worked with the British Standards Institution to come up with a standard for zinc-, iron- and Vitamin A-biofortified crops. So, there are defined levels now which enable trade and participation of large corporations, particularly for the grain trade."

"One other challenge we are trying to resolve is around traceability...We are looking at various country-specific models for smallholder farmers including out-grower and collectivization models, and some of them rely on digital solutions, to make supply chains visible. We have partnered with leading technology firms who have solutions, particularly digital and traceability solutions."

A multi-sectoral approach is needed to ensure uptake, explains Goldstein. "Awareness raising and educating everyone – all stakeholders, consumers, farmers, and government – about biofortification is very important. Making sure supply is efficient is very important as well, not only in seeds but also in food-based products, so that farmers know how to process the crops into products such as flour. The other thing that is important is that the government is championing it through relevant policies and programmes so that we can ensure that it can scale and reach the most vulnerable people. Trying to plug in biofortified foods into government programmes like food support



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programmes, school feeding, things like that which help increase the market and at the same help reach the target population...integrating it with farmer extension services programmes of governments so that it is part and parcel of what they are promoting to farms."

“Right mix of strategies”

Biofortification offers several advantages as a strategy: it fits the existing food system; it is cost-effective and requires an upfront investment rather than a continuous one which is the case with large-scale food fortification and nutrition supplements; it can also help improve the livelihood of smallholder farmers through the sale of their surplus harvest; and it is staple-based which means it can equally benefit male and female household members given that nutrient-dense foods such as animal products are often prioritised for men and boys.

However, biofortification should be part of an integrated approach that aims to promote a diversified, nutritious diet. “Biofortification is not a silver bullet for malnutrition. The ultimate goal is to be able to ensure that people can access and afford diverse diets that have a mix of nutritious foods, vegetables, fruits, animal sources. Unfortunately for more than three billion people in the world, healthy diets are economically out of reach and will remain so in the foreseeable future,” says Goldstein.

“This is not something which can work on a stand-alone basis...a right mix of strategies are needed,” says Grover. He points out that food systems also need to be more resilient. The current crisis with the Russian-Ukraine war, for example, has highlighted the vulnerability of food systems and the need to strengthen them and focus on locally grown food. Climate change is another issue. According to Grover, Asia is very susceptible to the impact of global warming and there is a projected 3% to 17% drop in zinc, iron and protein levels in foods in the future. “Food

systems need to be preparing for it, and biofortification is one of the solutions.” Apart from offsetting climate-related losses in crop’s nutrient content, many biofortified varieties are also bred for early maturity, are tolerant to drought and heat, and resistant to pests and diseases.

By now, nearly 400 varieties of conventionally bred, biofortified crop varieties have been released in 40 countries throughout Asia, Africa, and Latin America. With help from the food industry, more demand can be created and more biofortified food can be made available to consumers. Mr Grover says that many investors are now becoming more interested in ESG (Environmental, Social and Governance) criteria, social enterprises and profit with purpose.

Grover is optimistic about the future of biofortified crops, “I see all the positives here...There are three enablers pushing the biofortified market. One is from the government side: more and more governments are coming forward to push biofortification in the safety net scheme and public distribution programme, and there is policy support. There are already 24 governments that have integrated biofortification in official policies. Every month we are seeing more and more governments with guidelines for inclusion on biofortification like school feeding programmes and safety net programmes. So, there is a positive push from the government in the biofortification space.

The other factor that is driving demand for biofortified crops is private sector participation which is being primarily driven by increasing health awareness, and more demand for naturally nutritious food.

From an operational perspective, what HarvestPlus has done along with its partners, is a lot of work in the last 10 years strengthening the supply chain. Supply was one of the challenges in the beginning but now we have addressed it to a large extent. There is an adequate number of seeds that’s now available for production. There are country-specific classification models being put in place which are helping us aggregate biofortified grains and make it available to the private sector. So, I think all three parameters—supply, demand and an enabling environment of positive biofortification—give us confidence that there is good outlook for this segment going forward.”

Goldstein adds that there is a growing momentum for biofortification. Despite very heavy challenges due to Covid disruptions and other issues, the number of farmers worldwide growing biofortified crops in 2021 grew by 32% to nearly 13 million. He said that another positive development is the increasing number of high-level endorsements for biofortification. “For example, very recently the African Union had a summit and the head of 55 member states there actually endorsed and encouraged biofortification as a priority strategy for addressing malnutrition, which is a major step forward on that continent. We are seeing the acknowledgement that it should be part of strategies at the national level and at the regional level.” 

References:

Decreasing Zinc Levels in Stunting Toddlers in Lampung Province, Indonesia <https://biomedpharmajournal.org/vol12no1/decreasing-zinc-levels-in-stunting-toddlers-in-lampung-province-indonesia/>
The journey of scaling in Pakistan <https://www.harvestplus.org/wp-content/uploads/2022/03/The-Journey-of-Scaling-in-Pakistan.pdf>

HarvestPlus Partners with Indonesia Govt. to Scale Up Zinc-Biofortified Rice <https://www.harvestplus.org/harvestplus-partners-with-indonesia-govt-to-scale-up-zinc-biofortified-rice/>

Scaling sustainability – 2021 Annual Report <https://www.harvestplus.org/wp-content/uploads/2022/05/HarvestPlus-2021-Annual-Report.pdf>

*<https://www.emerald.com/insight/content/doi/10.1108/JADEE-11-2019-0190/full/html>

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