DEVELOPING STRATEGIES TO COMMERCIALISE BIOFORTIFIED CROPS AND FOODS

IDENTIFYING OPPORTUNITIES AND BARRIERS TO INFORM COUNTRY-LEVEL INTERVENTIONS

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The Global Alliance for Improved Nutrition (GAIN) is a Swiss-based foundation launched at the UN in 2002 to tackle the human suffering caused by malnutrition. Working with governments, businesses and civil society, we aim to transform food systems so that they deliver more nutritious food for all people, especially the most vulnerable.

ABOUT HARVESTPLUS

HarvestPlus is a CGIAR research programme which aims to improve nutrition and public health by developing and promoting biofortified food crops that are enriched with nutrients. Founded in 2003 and hosted by the International Food Policy Research Institute in Washington, DC, HarvestPlus provides global leadership on biofortification evidence, technology, and policy.

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SUMMARY

Biofortification (or nutrient enrichment) of staple crops has the potential to contribute to reducing micronutrient deficiencies by increasing micronutrient intakes. In 2019, GAIN and HarvestPlus entered a partnership to lead the Commercialisation of Biofortified Crops (CBC) Programme, which aims to catalyse commercial markets for biofortified crops in six countries across Africa and Asia. During the CBC programme inception phase, information on the value chains and their challenges and opportunities for commercialisation were collected for each country-crop combination through literature reviews and third party-led commercialisation assessments. In this paper, we summarise the processes undertaken to identify the potential opportunities and barriers for commercialisation and describe how the findings were used to develop commercialisation strategies for nine country-crop combinations.

Common opportunities identified for commercialising biofortified crops and foods included: availability of competitive biofortified seed varieties to increase seed production, potential to strengthen seed production and distribution capacity through financial and/or technical support, opportunities to establish partnerships with processors and retailers and engage with consumers to increase demand for biofortified foods, and presence of (or potential for) an enabling policy environment to support the commercialisation of biofortified crops and foods. Conversely, common barriers identified included: poor communication of the value proposition of biofortified crops and foods, underdeveloped seed systems, lack of segregation of grains, and poor harmonisation of policies. For each country-crop combination, a programme impact pathway was used to interpret and contextualise the findings, identify the most promising commercial pathway and its binding constraint, and develop a detailed commercialisation strategy to address it.

The evidence review, generation, and interpretation activities enabled the development of nine context-specific commercialisation strategies. Evidence-based assessments linked to a programme impact pathway can strengthen programme design and increase potential for impact.

KEY MESSAGES

- Programmes aimed at scaling up production and consumption of biofortified foods can benefit from systematic commercialisation assessments at inception to identify potential opportunities and barriers
- Understanding the opportunities for and barriers to commercialising biofortified crops and foods can ensure strategies are developed that leverage opportunities and unlock barriers.
- Collection of such data as part of an inception phase may be a lengthy process but is a necessary step to ensure programmes are evidence based and have high potential for impact.

BACKGROUND AND OBJECTIVE

Micronutrient deficiencies, defined as inadequate intake, absorption, or utilisation of essential vitamins and minerals, are widespread globally and disproportionately affect women and young children, particularly those in low- and middle-income countries (1,2). The most prevalent deficiencies are for iron, iodine, folate, vitamin A, and zinc, which can contribute to reduced immunity, impaired cognitive function, and increased risk of morbidity and mortality (1). In turn, these deficiencies can lead to reduced productivity and economic development (3).

Biofortification (or nutrient enrichment) is the process of using conventional plant breeding techniques to produce varieties of staple food crops that contain higher amounts of the micronutrients that are commonly lacking in diets. Biofortification began in the 1990s, led by HarvestPlus under the Consultative Group on International Agricultural Research (CGIAR) as a strategy to address micronutrient deficiencies (4). By 2021, 283 biofortified crop varieties had been released by HarvestPlus and CGIAR, and there are an estimated 12.8 million smallholder farming households growing these biofortified crops varieties and 64 million people in those farming households consuming biofortified foods (5). However, the reach of biofortified foods among non-farmer consumers remains limited. Potential reasons for this include undeveloped or underdeveloped value chains for biofortified crops and food products coupled with a lack of awareness on their value proposition among value chain actors and consumers (6,7).

The impact and sustainability of biofortification will ultimately depend on the development of sustainable commercial markets for biofortified seeds, crops, and food products (6). Commercialisation can be defined as the process of introducing a product into commerce or making it available in the market (8). In the context of biofortification, different crops, markets, and settings offer multiple commercial pathways, through which many consumers can be reached with biofortified foods. Thus, understanding the potential opportunities for biofortified foods in the existing markets and unlocking constraints related to both supply and demand that limit greater adoption may strengthen the pathway(s) to consumption through commercial markets (9).

The Commercialisation of Biofortified Crops (CBC) programme, launched in 2019 and jointly led by the Global Alliance for Improved Nutrition (GAIN) and HarvestPlus, aims to significantly expand the reach of biofortified foods by catalysing commercial markets for biofortified crops and foods (9). The initial focus is on biofortified varieties of six highly promising crops (i.e., high iron bean, pro-vitamin A maize, vitamin A cassava, zinc wheat, zinc rice, and iron pearl millet) in six countries with high levels of micronutrient deficiencies (Figure 1). The programme is being conducted in two phases: 1) inception (January-December 2019) and 2) achieving scale (i.e., implementation) (January 2020-December 2022).

As part of the CBC programme's inception phase, a review of the commercialisation landscape for public agricultural technologies and goods was conducted to

understand the characteristics of successful commercialisation strategies that brought products (such as technologies and agricultural goods) to market at scale, which resulted in the development of a commercialisation framework for identifying opportunities for commercialisation interventions (10,11). The authors found that conducting systematic assessments guided by the framework, which includes mapping out the commercialisation process and identifying and evaluating cross-cutting success factors (i.e., opportunities, challenges, and priorities related to supply, demand, policy, finance, and development outcomes) can help lead to the development of commercialisation strategies with high chances of success. In parallel to this work, the CBC programme commissioned commercialisation assessments to collect detailed information on the value chains and success factors for each of the nine country-crop combinations. In this paper, we summarise the processes undertaken to identify the potential opportunities and barriers for commercialisation and describe how the findings were used to develop commercialisation strategies.

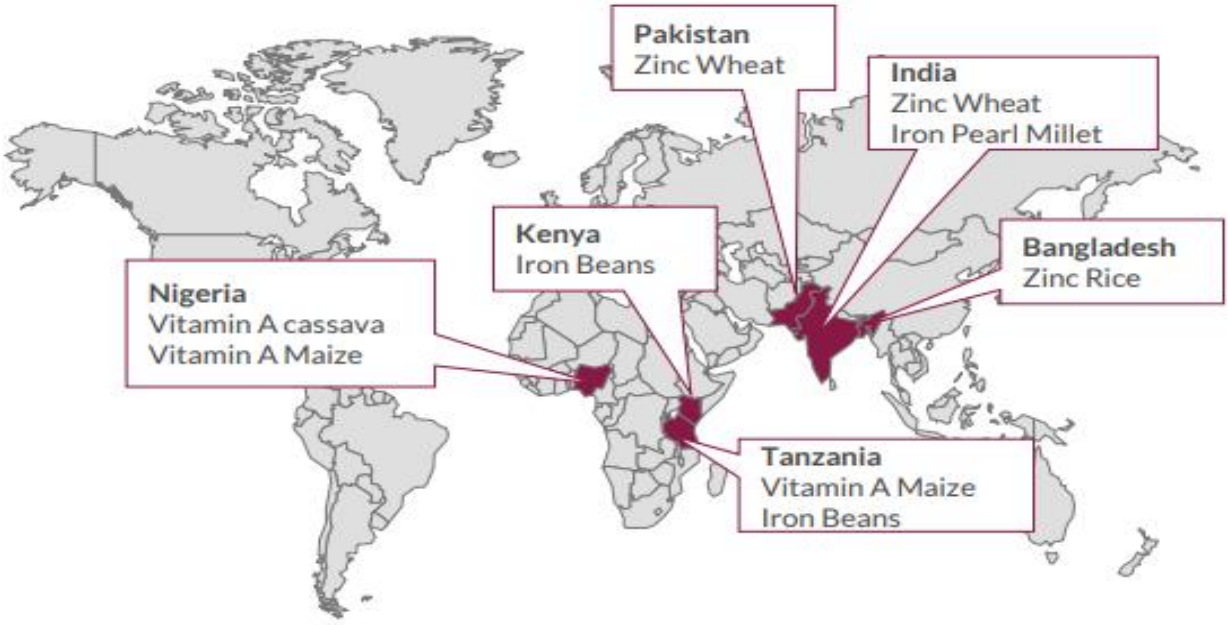


Figure 1. Countries and crops included in the CBC programme (Source: *(9)*)

METHODOLOGY

EVIDENCE REVIEW AND GENERATION

During the CBC programme inception phase, the GAIN and HarvestPlus implementation and technical support teams first carried out a desk review of available evidence on the following topics to gain a greater understanding of the biofortification landscape for each of the nine country-crop combinations:

- Ongoing varietal development and breeding pipelines to incorporate traits preferred by the different value chain actors. For example, producers' preference to for high- yielding, fast- maturing, or pest/disease- resistant varieties among others; processors' preference to for varieties that can be processed into different forms of products or good texture among others; and

for consumers' preferences regarding nutritional content, and organoleptic (e.g., taste, texture/mouthfeel, aroma) properties preferences, among others).
- The existence of competitive varieties that are preferred by farmers and whether seed companies and multipliers have been licensed to supply the developed seeds.
- Ongoing policy dialogues with governments on the inclusion of biofortification in programmes that aim to address micronutrient deficiencies and to develop policies that foster an enabling environment for the production and consumption of biofortified foods.
- Regulations and labelling standards for biofortified crops and foods.
- Existing partnerships with private, public, and civil society players, including those with financing capabilities to fund seed development, crop production, and product innovations and processing.

Then, GAIN and HarvestPlus commissioned Dalberg (an independent consultancy firm) to conduct commercialisation assessments for each of the nine country-crop combinations to generate additional evidence needed to develop detailed commercialisation strategies. The main objectives of the commercialisation assessments were to (1) identify opportunities and barriers to scaling up the production and consumption of biofortified crops and foods, and (2) inform the development of strategies to unlock the barriers and enhance the identified opportunities along each of the CBC programme's impact pathways (PIP) to consumption of biofortified foods, as defined by the CBC programme (12). The focus was on the first three pathways, which are commercial (i.e., biofortified foods are purchased by consumers, biofortified foods are given to consumers in informal settings, and biofortified foods are given to consumers in formal settings), but it was recognised that commercialisation would also naturally increase the consumption of biofortified foods among people in households that grow them (on-farm consumption), as described in the fourth impact pathway (12) .

To inform the design of the assessment, Dalberg conducted a desk review of relevant documents from GAIN and HarvestPlus and other peer-reviewed publications. Then, they conducted country-level interviews with relevant stakeholders including suppliers of inputs for biofortified crops, farmers, aggregators, traders, and processors. Additionally, government officials, CBC programme staff from GAIN and HarvestPlus, and other experts in the agricultural and nutrition sectors were also interviewed (13–21). Data collected were categorised into the following three segments (nodes) of the biofortified crops' value chains, as conceptualised in the CBC PIP (12):

- *Pre-farm:* This node focused on the development of biofortified varieties, seed multiplication, and distribution systems, which aimed to understand existing seed multiplication capacities (production volumes), and gaps in the seed supply chains of the biofortified varieties; whether seed companies and multipliers have the capacity to meet the growing demand for biofortified seeds from farmers; packaging, and branding; and the channels through

which farmers obtained these seeds, either formally through purchasing the seeds or informally through gifts and by re-using use (farmer diffusion).

- *On-farm:* This node focused on the farm level with the aim of understanding current practices and determining farmer perceptions, motivations for shifting to cultivating biofortified crops cultivation, objectives for farming (i.e., whether there is a shift from subsistence to market-oriented farming), and future projections in terms of production volumes.
- *Post-farm (retail and consumption):* This node focused on the post-farm level, which aimed to understand existing aggregation, processing, and retailing systems in terms of current volumes of raw and processed products.

OPPORTUNITIES AND BARRIERS TO COMMERCIALISATION OF BIOFORTIFIED CROPS AND FOODS

The evidence reviews and commercialisation assessments identified potential opportunities and barriers for commercialisation of biofortified crops and foods for the nine country-crop combinations.

Common opportunities for the commercialisation of biofortified crops and foods identified across the nine country-crop combinations that were identified through the evidence reviews and commercialisation assessments included:

- availability of competitive biofortified seed varieties for which production can be scaled
- potential to strengthen seed production and distribution capacity and downstream linkages between seed producers and farmers through financial and/or technical support to ensure consistency in seed supply
- opportunities to establish partnerships with processors and retailers to increase demand for biofortified foods in downstream markets
- a growing and promising segment of consumers who are health conscious for whom demand for biofortified foods at market level can be strengthened; and presence of (or potential for) an enabling policy environment to support the commercialisation of biofortified crops and foods

Conversely, several barriers to the commercialisation of biofortified crops and foods were identified. The barriers common across the nine country-crop combinations included:

- poor communication of the value proposition of biofortified crops and foods (in terms of both the economic and nutritional benefits) to help farmers, processors and consumers decide whether to purchase the biofortified variety
- underdeveloped seed systems in terms of seed multiplication, branding, and distribution, which limits access to the biofortified seed among farmers during planting seasons
- lack of segregation of biofortified grains in the supply chain, particularly for those with invisible traits (i.e., iron bean and millet, and zinc wheat and rice) and challenges associated with developing and promotion of segregation and traceability systems within supply chains

- poor national and regional harmonisation of policies on biofortified crops and foods.

Detailed case studies summarising the results from the commercialisation assessments for each of the nine country-crop combinations are described elsewhere (13–21).

COUNTRY-LEVEL STRATEGY DEVELOPMENT AND APPROVAL PROCESS

Once the background evidence was consolidated, GAIN, HarvestPlus, and Dalberg met to review all the available evidence and provide inputs on the design of the commercialisation assessments being proposed by Dalberg. Following this joint review, the GAIN and HarvestPlus teams attended a series of webinars. The webinars centred around how to design the most effective commercial strategies for each country-crop combination and had two aims. First, they sought to strengthen implementation staff capacity through training on the use of the PIP as the 'centre' of the programme to design robust commercialisation strategies. Second, they aimed to apply the results from the evidence review and commercialisation assessments to inform the design of the country-crop specific strategies designs.

Specifically, implementation teams were guided through the following questions across each commercial pathway:

1. What is known about the context based on the evidence generated?
2. What is needed to achieve the desired results for each selected pathway (i.e., the activities) and to what extent have they already been done?
3. What are the opportunities for innovation?
4. What are the barriers to success?
5. What are the enhancing factors?
6. What are the risks?

Once the teams had thought through these questions, GAIN, HarvestPlus, and Dalberg met again. The aim of this meeting was to review the initial findings from the commercialisation assessments that had been completed thus far (data collection was still ongoing in some countries) and identify the most promising commercial pathway for each country-crop combination. For the selected pathway, the teams then examined its associated binding constraint and developed commercialisation strategies aimed at enabling access, strengthening demand, and creating an enabling environment. Following this meeting, the CBC implementation teams continued to develop their commercialisation strategies, and drafts were reviewed by GAIN, HarvestPlus, and Dalberg staff. The final strategies were submitted for approved by management teams from GAIN and HarvestPlus.

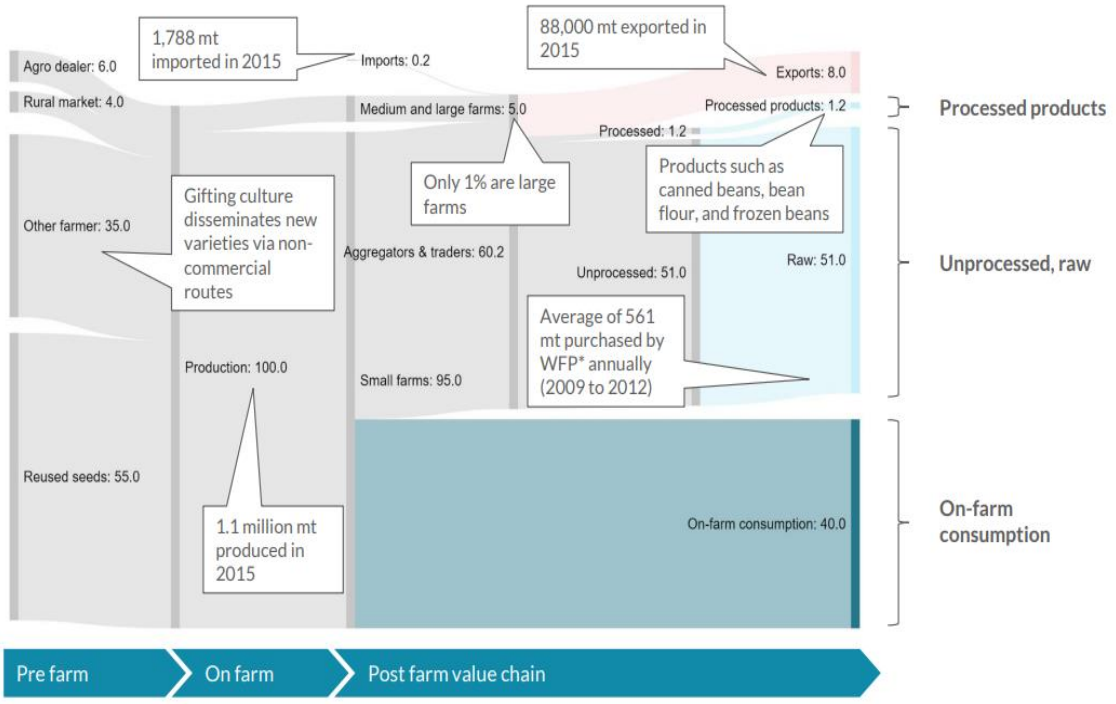
Timelines for country-level strategy approval process varied by country as they were dependent on the level of agreement with the findings and recommendations from the evidence reviews and commercialisation assessments. For all crops in Kenya, Nigeria, and Tanzania, the findings from the commercialisation assessments were validated and the draft strategies were considered to have a high level of readiness. They were thus approved for implementation to begin in January 2020. In India, there

were concerns on about the accuracy of some of the findings from the commercialisation assessments. As a result, additional data sources were used to triangulate the data from the commercialisation assessment to inform the country strategy that was developed. The India country-level strategy was then approved for implementation for both crops. Conversely, for Bangladesh and Pakistan, after reviewing the findings from the commercialisation assessment, evidence gaps related to the feasibility of the recommended commercial pathway remained. As such, prior to being approved for implementation, the two countries carried out additional research to fill identified gaps in the first six months of 2020. The additional evidence was then used to revise the country commercialisation strategies, which were subsequently approved. Bangladesh and Pakistan thus began implementation in September 2021. Illustrative summaries of the results on the commercialisation assessment findings, selected commercial pathways, and positive lessons and areas of improvement for Tanzania and Bangladesh are provided in Box 1 and Box 2.

Once commercialisation strategies were approved, technical support teams from GAIN and HarvestPlus used the PIP to develop corresponding monitoring and evaluation plans. A total of 20 quantitative indicators were prioritised, and a monitoring reference manual (13), template indicator reference sheets, data collection tools, and a results framework were developed. These were adapted by the CBC implementation teams and formed the basis for the monitoring and evaluations plans for each country-crop combination (12).

BOX 1. COMMERCIALISATION OF HIGH IRON BEANS IN TANZANIA

Commercialisation assessment findings:



Main **commercial pathway** selected: Institutional pathway through school meal programmes.

Positive lessons from Tanzania's strategy:

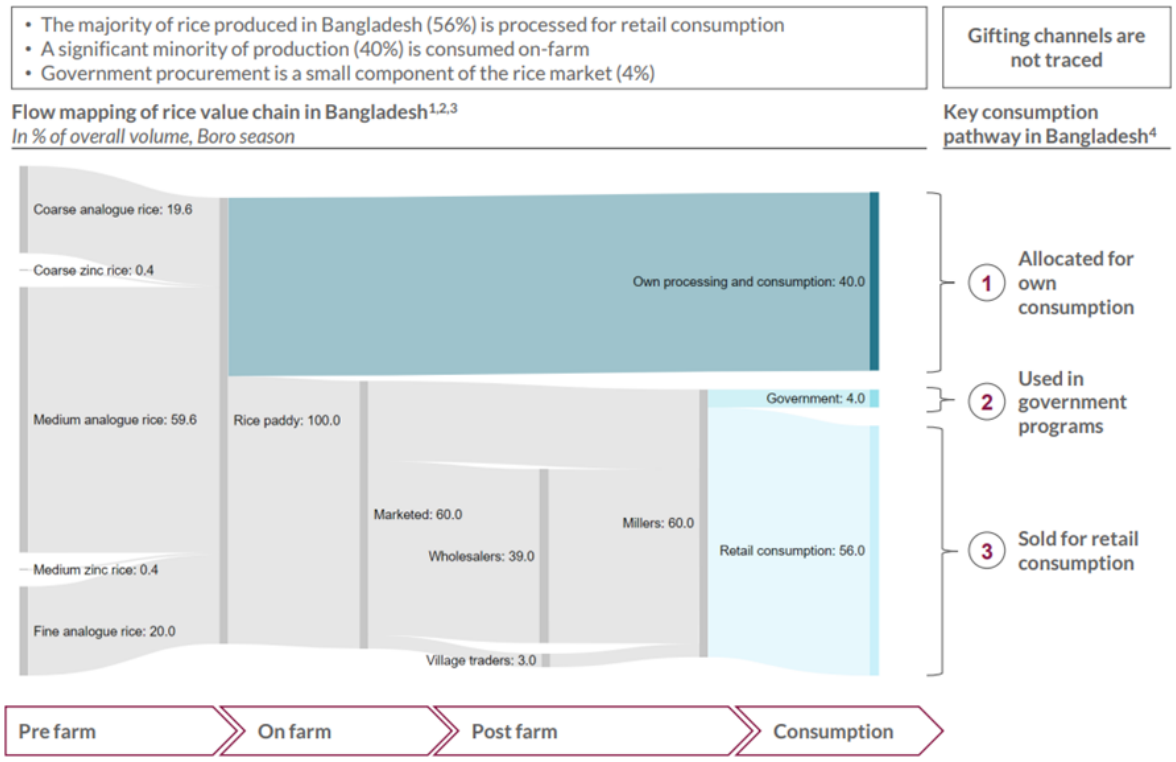
- Leverages Tanzania's existing school meal programme and government policies that promote school meal programmes among public and private primary and secondary schools.
- Builds partnerships between school boards, school suppliers, and policymakers, thus has potential to be sustainable over time.
- Children could serve as agents of change to influence buying decisions in their homes, catalysing demand beyond the school.

Areas for improvement:

- Improved specificity in prioritising schools: public schools have lengthy procurement processes and are highly dependent on government funding, which sometimes is not available immediately.
- Need to assess prices of competing products among food suppliers: suppliers tend to sell the high-iron beans at a slightly higher price than the analogue varieties, so uptake is less likely for school procurement systems that mostly look at cost and not the nutritional proposition. Sensitisation may be required to ensure informed decision making.

BOX 2. COMMERCIALISATION OF ZINC RICE IN BANGLADESH

Commercialisation assessment findings:



Main **commercial pathway** selected: commercial market, since 56% of consumption of zinc rice is sold through retail channels.

Additional assessment:

Due to gaps in some assumptions and study design, an additional assessment was conducted to better understand the key drivers of and constraints on adoption of zinc rice across the value chain. Specific objectives for the second assessment were to:

- Identify which type of zinc rice has the greatest potential for commercialisation and to reach the largest number of consumers.
- Recommend what specific activities can be done to increase the supply of the selected zinc-rice type(s) in the market and how these activities should be best sequenced.
- Recommend what specific activities can be done to increase demand for the selected zinc-rice type(s) among consumers.

Positive lessons from Bangladesh's strategy:

- Brings specificity on the variety with the greatest potential for commercialisation and highest potential to reach the largest number of consumers.
- Identified specific activities to increase supply of the selected zinc-rice type(s) in the market and the best sequence of the activities and increase the demand for the selected zinc-rice type(s) among consumers.
- A clear division was established between the role of the government and the private sector in the distribution of rice seed and grain, and commercialisation viability was confirmed.

DISCUSSION

The evidence review, generation, and interpretation activities carried out during the CBC programme inception phase enabled the development of context-specific commercialisation strategies for nine country-crop combinations. This process played a critical role in helping to unpack each step of the value chain to understand where key constraints may occur and what activities could be undertaken to address them and achieve the scale up of adoption of biofortified crop varieties and the consumption of biofortified foods.

The commercialisation assessments were particularly important inputs into the commercialisation strategy development process for the specific country-crop combinations. They were purposely designed so that the results were linked to a clear activity designed to overcome the identified barriers and enhance opportunities. For example, where evidence suggested significant barriers in seed supply at the pre-farm level, activities geared towards increasing the share of biofortified seed within the market, such as providing technical and financial support to seed companies to increase their seed production capacity, were included in the strategy. Where evidence suggested poor aggregation and segregation systems at the post-harvest level and poor linkages from farmers to processors, the strategy included activities to strengthen aggregation systems (models) to ensure that the harvested crops reach the processors and can be traced. Where evidence suggested poor offtake by processors, activities such as technical support for packaging, branding, labelling, and marketing of biofortified food products were included to engage and develop the capacity of processors and traders to be able to utilise the biofortified crops to process and sell innovative nutritious foods.

Two key lessons were learned from the commercialisation strategy development process. First, while the process of developing the country-crop strategies may appear linear (i.e., desk reviews, then commercialisation assessments, then interpretation of all evidence alongside the PIP), the verification of the resulting information is not always straightforward and, in some cases, may require further data collection to validate the findings and resulting strategies. For example, in Bangladesh and Pakistan, there was insufficient evidence and/or validation of the available evidence to support the initial commercialisation strategies that were developed. As a result, additional data were collected to fill the remaining evidence gaps and/or confirm some findings before deciding whether and how to proceed to an implementation phase. This highlighted the need to have clear and transparent processes in place to review and validate the accuracy of information that is collected during a programme inception phase and to review and approve the resulting commercialisation strategies. Secondly, the evidence review, generation, and interpretation process may be lengthy but is a necessary step of the inception phase to ensure programmes are evidence based and have high potential for impact. In other words, taking the time to carry out an in-depth inception phase can result in programme strategies that contain the right set of activities to achieve a desired impact rather than rushing to an implementation phase only to learn that unforeseen barriers are blocking the impact of the selected activities.

The process undertaken to develop the commercialisation strategies for the CBC programme had several strengths. First, the systematic methods carried out across countries made it easy to compare the relative feasibility and potential for impact of different country strategies, which was useful to help inform budget allocations within a large programme like CBC. Second, the evidence reviews, commercialisation assessments, and strategy design and review occurred over an extended period (~6 months), which enabled the results to be thoroughly analysed and interpreted. While this was critical for the CBC programme given its large scale and scope, such a long period of time may be a luxury that other programmes of this kind may not have. Third, the joint process to review and approve the commercialisation strategies ensured transparency and commitment from both partners and built on the expertise and experience of staff from both teams. From a partnership perspective, these two sets of expertise were critical to the successful design of commercialisation strategies with high potential for impact. Finally, outsourcing the design and implementation of the commercialisation assessments to a third party reduced bias in evidence generation and interpretation.

At the same time, there were some limitations to the strategy development process. First, the data at inception is only as good as the data sources available and depending how long the inception phase is and the type of data included, it may become out of date quickly (e.g., market share of biofortified seeds). As such, it is important to maintain processes to verify the initial assumptions and data points, as there may be a need to make changes during the implementation stage (as was the case for some of the country-crop examples). Second, because much of the essential data required during the evidence review stage was not in the public domain, considerable investments were needed to generate the data through the commercialisation assessments. When planning an inception phase, it is important to consider costs associated with necessary evidence review and generation activities.

CONCLUSION

Commercialising biofortified crops and foods has the potential to reduce the burden of micronutrient deficiencies by increasing micronutrient intakes. Rigorous systematic examination of value chains and potential opportunities and barriers is essential to developing effective commercialisation strategies for biofortified crops and foods. Evidence-based assessments linked to a programme impact pathway can strengthen programme design and increase potential for impact.

REFERENCES

1. Bailey RL, West Jr KP, Black RE. The epidemiology of global micronutrient deficiencies. Annals of Nutrition and Metabolism. 2015;66(Suppl. 2):22–33.

2. Victora CG, Christian P, Vidaletti LP, Gatica-Domínguez G, Menon P, Black RE. Revisiting maternal and child undernutrition in low-income and middle-income countries: variable progress towards an unfinished agenda. The Lancet. 2021;397(10282):1388–99.

3. Horton S. The economic impact of micronutrient deficiencies. In Karger; 2004. p. 187–202.

4. Pfeiffer WH, McClafferty B. HarvestPlus: breeding crops for better nutrition. Crop Science. 2007;47:S-88.

5. Scaling Sustainability, 2021 Annual Report [Internet]. HarvestPlus; 2021 [cited 2022 Jun 3]. Available from: https://www.harvestplus.org/wp-content/uploads/2022/05/HarvestPlus-2021-Annual-Report.pdf

6. Foley JK, Michaux KD, Mudyahoto B, Kyazike L, Cherian B, Kalejaiye O, et al. Scaling Up Delivery of Biofortified Staple Food Crops Globally: Paths to Nourishing Millions. Food and Nutrition Bulletin. 2021;42(1):116–32.

7. Mitra-Ganguli T, Boyd K, Uchitelle-Pierce B, Walton J. Proceedings of the workshop 'Biofortified food-Working together to get more nutritious food to the table in India'. Journal of Nutrition & Intermediary Metabolism. 2019;18:100100.

8. Dewey KG. Nutrition and the commoditization of food systems in Latin America and the Caribbean. Social Science & Medicine. 1989;28(5):415–24.

9. Global Alliance for Improved Nutrition (GAIN). The Commercialisation of Biofortified Crops Programme Flyer [Internet]. 2020 [cited 2021 Oct 28]. Available from: https://www.gainhealth.org/sites/default/files/publications/documents/commercialisation-of-biofortified-crops-programme-flyer.pdf

10. The Development Practice. Commercialisation of Publicly Developed Goods Review: Report [Internet]. 2019 [cited 2022 Jun 3]. Available from: https://nutritionconnect.org/media/83

11. Nyangaresi AM, Granger K, Friesen VM, McClafferty B, Haswell D, Mudyahoto B, et al. Commercialising public agricultural technologies and goods: A framework to identify opportunities for interventions [Internet]. Geneva, Switzerland: Global Alliance for Improved Nutrition (GAIN) and HarvestPlus; 2022. Discussion Paper #11. Available from: https://doi.org/10.36072/dp.11

12. Friesen VM, Mudyahoto B, Birol E, Nyangaresi AM, Reyes B, Mbuya MN. Using a Programme Impact Pathway to Design, Monitor, and Evaluate Interventions to Commercialise Biofortified Crops and Foods [Internet]. Geneva, Switzerland; 2022. Working Paper #29. Available from: https://doi.org/10.36072/wp.29

13. Global Alliance for Improved Nutrition (GAIN). Commercialisation of Biofortified Foods Programme Reference Manual [Internet]. 2020 Jan. Available from:

https://gainhealth.org/resources/reports-and-publications/commercialisation-biofortified-crops-programme-monitoring