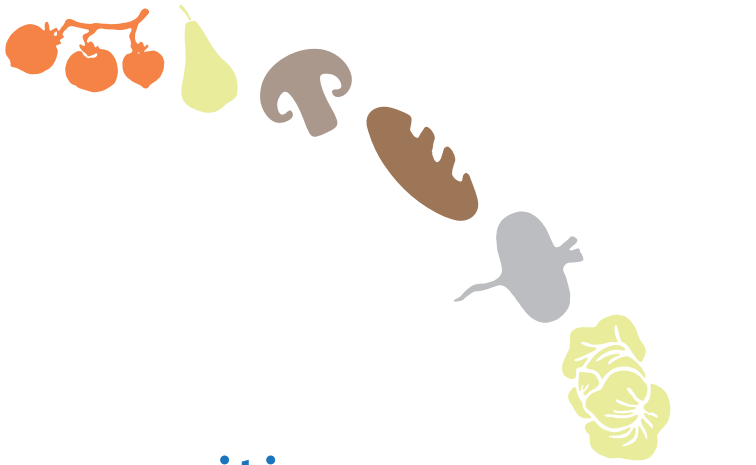
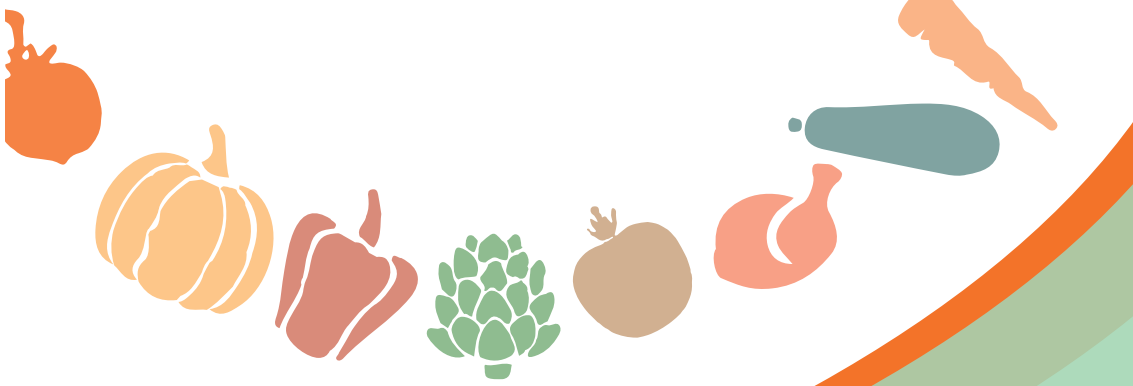
Food and Agriculture Organization of the United Nations



Nutrition-sensitive agriculture and food systems in practice

Options for intervention



BIOFORTIFICATION

WHAT?

Biofortification consists in developing new varieties of staple crops (i.e. cassava, maize, orange-fleshed sweet potatoes, irish potatoes, wheat, rice, pearl millet, sorghum, banana, plantain, squash, beans, lentils and cowpeas) with the explicit intent of enhancing levels of bioavailable micronutrients (i.e. pro-vitamin A, iron and zinc). While biofortification is most commonly accomplished using conventional plant breeding, agronomic biofortification (i.e. application of micronutrient-rich fertilizers via soil or leaves) and transgenic techniques are also used.

WHY?

Micronutrient deficiency is a very widespread form of malnutrition, caused by inadequate intake of fruits, vegetables, animal-source products and other micronutrient-rich foods. These foods are often prohibitively priced and out of the reach of many of the world's poor, whose diets tend to rely heavily on cereals and other relatively inexpensive, carbohydrate-dense staple crops. While it is important to continue efforts to increase dietary diversity and quality as a long-term solution to all forms of malnutrition, consumption of biofortified crops allows many people to increase dietary micronutrient adequacy simply by substituting a micronutrient-poor staple with its micronutrient-rich counterpart. A growing body of evidence demonstrates the efficacy and cost-effectiveness of this strategy.

HOW?

- The main target group of biofortification programmes is subsistence and semi-subsistence farmers who grow crops for their own consumption.
- Biofortification is a complex process involving multiple stages:
  - *Discovery* – includes identifying target populations, setting and validating nutritional breeding targets, identifying appropriate candidate crops, screening crop genes.
  - *Development* – includes breeding new locally adapted varieties that have higher amounts of bioavailable micronutrients than conventional varieties and agronomic traits which match or exceed conventional varieties.
  - *Delivery* – includes the registration of new varieties and release to seed companies or directly to producers. It often includes leveraging the informal seed sector, as a vast majority of poor farmers acquire inputs through these systems.

- To achieve impact beyond the farm gate, biofortification programmes typically include additional activities such as technical assistance in post-harvest storage and handling, creation of market linkages, and support to value addition and demand creation. These post-farm gate activities require building a strong network of stakeholders all along the value chain, from research institutes and breeders to processors, retailers and consumers.
- The objective of biofortification is not to promote increased consumption of staples but rather to substitute consumption of nutrient-poor varieties with nutrient-rich ones. Hence, biofortification is best promoted as part of a broader portfolio of sustainable, food-based approaches to nutrition. For example:
  - Biofortification promoted in tandem with production diversification maximizes synergies between these two complementary strategies and increases nutrition impact.
  - Biofortification implemented in tandem with conservation policies that provide explicit support to biodiversity can mitigate the inherent risks of genetic erosion due to selective breeding focused on a few varieties and crops.

ENABLING ENVIRONMENT:

- Prior to actual planning, a robust rationale for biofortification programming must be developed, based on market assessment, solicitation of government endorsement, assessment of food consumption patterns, production system analysis and assessment of the micronutrient status of the target population.
- Recognition of the nutrition-promoting role played by biofortification in national policies is necessary for ensuring sustainability of programmes over time.
- Public sector investment to strengthen national agriculture research and extension systems and seed producers is crucial to ensure continuous production of high quality, nutritious seeds.
- Investing in impact research to evaluate the impact of biofortification on the micronutrient status of target groups and on other key variables (e.g. farmer adoption rates, consumer acceptance, cropping and seed systems) is important to maintain sustained public and private sector investment and support.
- Regulatory and legal frameworks which provide harmonized standards for claims regarding quality, nutrient levels, health benefits and biosafety of biofortified crops need to be developed at international and national levels.

KNOW MORE ON THE TOPIC:

- HarvestPlus. 2016. *Biofortification. The Evidence.* www.harvestplus.org/node/609
- Bouis, H. 2014. *Biofortification Progress Briefs* August 2014. Washington DC, Harvest Plus, August 2014 www.harvestplus.org/sites/default/files/Biofortification_Progress_Briefs_August2014_WEB_2.pdf
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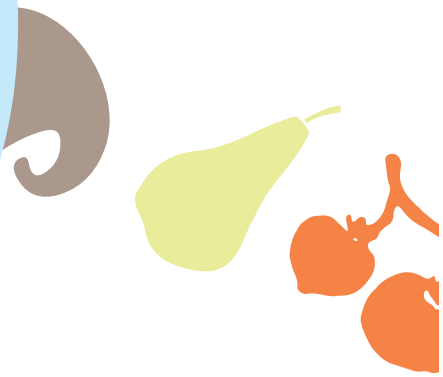
- Meenakshi, J. V. 2009. *Best practice paper: cost-effectiveness of biofortification.* Lowell, MA, USA: Copenhagen Consensus Center. www.copenhagenconsensus.com/publication/biofortification
- FAO (forthcoming). *Biofortification: A food based approach for reducing micronutrient deficiencies.* Background paper.



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