Evidence Brief, October 2022

Biofortification in Ethiopia: Current Opportunities and Challenges

THE PROBLEM

In 2016, 14% of Ethiopian children under five years were vitamin A deficient, indicating that vitamin A deficiency is a moderate public health problem in the country[1]. Additionally, 35% of pre-school children and 34% of women are zinc deficient[2]. The major consequences of micronutrient deficiencies include impaired physical and cognitive development, increased risk of morbidity, low educational attainment, reduced work productivity and earning potential[3]. In Ethiopia, vitamin A supplementation for pre-school children and iron/folic acid supplementation for pregnant women are being implemented at scale[4]. However, the coverage of these programs is low. Ethiopia also recently approved mandatory fortification for wheat flour and edible oil. Yet fortification will mainly reach urban residents, creating inequities in access to micronutrient fortified foods[5]. Consequently, strategies that complement these interventions such as biofortification are needed. These brief highlights the pathways through which biofortification can reduce micronutrient deficiencies in Ethiopia and describe bottlenecks to the production and consumption of biofortified crops.

METHODOLOGY

Review of literature: We summarized available literature including published research manuscripts and gray literature, including policy and strategic documents, reports, working papers, and conference proceedings.

Key informant interviews: We conducted several key informant interviews to assess the state of biofortification in Ethiopia. Key informants were drawn from the Ethiopian Institute of Agricultural Research (EIAR), Ministry of Agriculture, International Potato Center (CIP), International Maize and Wheat Improvement Center (CIMMYT), and HarvestPlus.

Photo credit: HarvestPlus/2009

KEY FINDINGS

1. Benefits of biofortification

BIOFORTIFICATION CAN BE USED TO ADDRESS MICRONUTRIENT DEFICIENCIES IN RURAL AREAS

Compared to micronutrient interventions, biofortification is an equitable intervention that can address economic disparities in the affordability of nutritious foods[6].

BIOFORTIFICATION IS SUSTAINABLE

Another unique advantage of biofortification is sustainability. After an initial investment in developing biofortified varieties, the seeds fortify themselves

BIOFORTIFICATION DOES NOT CHANGE FOOD CONSUMPTION PATTERNS

Foods biofortified with iron and zinc have no noticeable change in color, taste, odor, texture, or cooking qualities. Thus, no modification in food consumption

[1] Ethiopian Public Health Institute. Ethiopian national micronutrient survey report Ethiopian Public Health Institute; 2016.
[2] Han X, Ding S, Lu J, Li Y. Global, regional, and national burdens of common micronutrient deficiencies from 1990 to 2019: A secondary trend analysis based on the Global Burden of Disease 2019 study. EClinicalMedicine 2022;44:101299.
[3] Federal Democratic Republic of Ethiopia. National Nutrition Program: 2016-2020. Addis AbabaEthiopia.2016.
[4] Olson R, Gavin-Smith B, Ferraboschi C, Kraemer K. Food Fortification: The Advantages, Disadvantages and Lessons from Sight and Life Programs. Nutrients 2021;13(4).
[5] Bouis HE, Welch RM. Biofortification-A Sustainable Agricultural Strategy for Reducing Micronutrient Malnutrition in the Global South. Crop Science 2010;50:S-20-S-32.
[6] Talsma EF, Melse-Boonstra A, Brouwer ID. Acceptance, and adoption of biofortified crops in low- and middle-income countries: a systematic review. Nutr Rev 2017;75(10):798-829.

patterns are required. However, crops that are biofortified with vitamin A obtain a deep orangish color, requiring a different approach to promote production and consumption[7].

2. Bottlenecks to scale up biofortification

LACK OF FINANCIAL RESOURCES FOR RESEARCH

Limited financial resources are available to fund research with, and well-equipped laboratories needed at later stages of biofortification are lacking.

THE SEED SUPPLY SYSTEM DOES NOT FUNCTION WELL

One of the most critical factors contributing to low improved seed adoption in Ethiopia is the unavailability or untimely availability of improved seeds, mainly due to the poor seed supply system.

INFORMATION ON BIOFORTIFIED CROPS IS NOT ADEQUATELY PROVIDED TO FARMERS

The adoption of biofortified seeds increases with access to information on benefits through informal communications, social networks, cooperatives, credit, and saving groups.

BIOFORTIFIED CROPS SHOULD HAVE THE SAME SENSORY APPEAL AS CONVENTIONAL CROPS TO FACILITATE ADOPTION

Sensory characteristics, such as taste, color, and texture, influence the adoption of biofortified crops. Additionally, the sensitivity of taste, expectations, and food recipes used to introduce new varieties influence adoption.

ACTIONS TO INCREASE PRODUCTION AND CONSUMPTION OF BIOFORTIFIED FOODS IN ETHIOPIA

ACTION 1: IMPROVE ACCESS TO BIOFORTIFIED SEEDS

Access can be improved by;

- Increasing the number of seed producers by incentivizing entry through tax, investment, and import policies.
- Decentralization of seed production may also enable the promotion of localized improved varieties.
- Identifying and implementing strategies to improve the lack of coordination between seed developers, seed producers, and seed demand analyzers.

ACTION 2: PROMOTE THE BENEFITS OF BIOFORTIFIED CROPS BY IMPLEMENTING SOCIAL BEHAVIOR CHANGE COMMUNICATION (SBCC).

Increase the production and consumption of biofortified foods by effective social behavior change interventions such as community mobilization and mass media messages.

ACTION 3: INTRODUCE BIOFORTIFIED CROPS FOR TARGETED POPULATION GROUPS AND AREAS

- Consider context specific (region, eating habits, access to markets) biofortified crop promotion

ACTION 4: IMPROVE SENSORY CHARACTERISTICS OF BIO FORTIFIABLE CROPS

- Involve consumers during the development of biofortified varieties.
- Also, it is important to work with food science experts to develop recipes that fit cultural/local contexts.

ACTION 5: ADVOCATE FOR THE IMPLEMENTATION OF BIOFORTIFICATION ACTIVITIES OUTLINED IN THE NATIONAL FOOD AND NUTRITION STRATEGY

Ethiopia's National Food and Nutrition Strategy identifies the development and promotion of the production of biofortified crops as a strategic action to improve the availability of nutritious foods. Thus

- Biofortification stakeholders should advocate for implementing this and other actions outlined in related policy documents.
- There is a need to identify an institution that coordinates the activities of different stakeholders engaged in biofortification to create accountability.

FURTHER INFORMATION

The manuscript from which information for this brief was drawn is available on the NIPN website (http://www.nipn.ephi.gov.et/). Detailed description of the findings is included in the manuscript.

AUTHORS

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[7] Andersson M. Progress update: Crop development of biofortified staple food crops under HarvestPlus. African Journal of Food, Agriculture, Nutrition and Development 2017;17(02):11905-11935