

HarvestPlus leads a global effort

to improve nutrition and public health by developing and deploying staple food crops that are rich in vitamins and minerals.

Hidden hunger is caused by a lack of vital minerals and vitamins in the diet. **HarvestPlus** focuses on three critical micronutrients recognized by the World Health Organization as most lacking in the diets of the poor:

Vitamin A: Globally, about 127 million preschool children are vitamin A deficient. Every year, up to half a million preschool children go blind from lack of vitamin A, and about as many die within months of going blind. Close to 20 million pregnant women in developing countries are also vitamin A deficient.

Zinc: About one-fifth of the world's population is at high risk of zinc deficiency. Zinc deficiency can cause stunting and worsen diarrhea and

pneumonia (the most common causes of death among children in developing countries). Almost half a million children die every year from infections that could have been easily overcome if they had enough zinc.

Iron: Iron deficiency is the most common micronutrient deficiency in the world. Anemia (often due to iron deficiency) affects more than 1.6 billion people. Almost half of preschool children and pregnant women in developing countries are iron deficient. Iron deficiency impairs mental development and learning capacity in children. It reduces adults' capacity for physical labor and, when severe, increases the risk of mothers dying in childbirth.

A Sweet Success Story



From 2007–09, **HarvestPlus** and its partners released their first micronutrient-rich crop, orange sweet potato (OSP), in Uganda and Mozambique. These new orange varieties were bred by the International Potato Center (CIP) and African scientists to be rich in beta-carotene, a provitamin A that the body converts into vitamin A. In both countries, farmers adopted and substituted these new varieties for their traditional white and yellow varieties that provided little vitamin A. The amount of OSP consumed by children and women in both countries increased markedly, resulting in up to a doubling of vitamin A intakes. In Uganda, a modest improvement in vitamin A levels in the body was measurable in children.



Rose is a Ugandan farmer who takes care of four grandchildren. Ever since she received OSP, she does not grow any other sweet potato variety. "Kabode and VITA have been my best varieties; they are high yielding and not easily attacked by the sweet potato virus," she says. She has also increased the size of her sweet potato gardens to meet growing local demand for OSP. "Sweet potato was not food for me before, but with training and more information, I now eat it more regularly—can't you see how healthy I look, and my family?" she asks. "Now my grandchildren rarely get sick."

HarvestPlus is scaling up OSP to reach another 225,000 Ugandan households by 2016.

HarvestPlus leads a global effort to improve nutrition and public health by developing and deploying staple food crops that are rich in vitamins and minerals. We work with public and private sector partners in more than 40 countries. HarvestPlus is part of the CGIAR Research Program on Agriculture for Nutrition and Health. CGIAR is a global agriculture research partnership for a food secure future. Its science is carried out by 15 research centers in collaboration with hundreds of partner organizations. The HarvestPlus program is coordinated by two of these centers, the International Center for Tropical Agriculture (CIAT) and the International Food Policy Research Institute (IFPRI).

CREDITS

Cover photos from left to right: Top row: IRRI; Embrapa; M. Listman; ICRISAT. Second Row: Y. Islam; H. de Groote; HarvestPlus; CIAT. Inside fold from left to right: J. Bbemba; Y. Islam. Inside Left and Right Pages: WHO (Map Data).

Design: Gerlach Graphic

CGIAR Partners

Center for International Forestry Research (CIFOR)
International Center for Tropical Agriculture (CIAT)
International Maize and Wheat Improvement Center (CIMMYT)
International Potato Center (CIP)
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
International Food Policy Research Institute (IFPRI)
International Institute of Tropical Agriculture (IITA)
International Rice Research Institute (IRRI)

WorldFish

Country Programs

Embrapa (The Brazilian Agricultural Research Corporation)
HarvestPlus China
India Biofortification Program

Donors

Asian Development Bank (ADB)
Austrian Ministry of Finance
Bill & Melinda Gates Foundation
Canadian International Development Agency (CIDA)
European Commission
The International Fertilizer Group
International Life Sciences Institute (ILSI)
Royal Danish Ministry of Foreign Affairs (DANIDA)
Swedish International Development Agency (SIDA)
Syngenta Foundation for Sustainable Agriculture
United Kingdom Department for International Development (DFID)
United States Agency for International Development (USAID)
United States Department of Agriculture (USDA)
The World Bank
World Food Programme (WFP)

HarvestPlus Crop Strategies



HarvestPlus
c/o IFPRI
2033 K Street, NW
Washington, DC
20006-1002 USA
Tel: 202-862-5600
Fax: 202-467-4439
HarvestPlus@cgiar.org
www.HarvestPlus.org

Copyright © 2013 HarvestPlus.
Revised April 2015.



RESEARCH
PROGRAM ON
Agriculture for
Nutrition
and Health

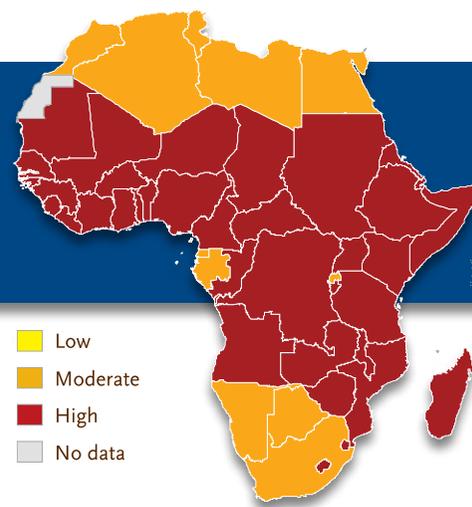


Better Crops • Better Nutrition

It all starts with a seed.

Africa

Combined vitamin A, zinc, and iron deficiency



HarvestPlus Crops

All initial crops released have at least 50% of the nutrient target; subsequent 'waves' will have progressively higher levels of the nutrient until the goal is reached. All crops are conventionally bred.

We use adult women in target countries as a reference to determine nutritional benefits. Children age 4–6 years will get about the same percentage of their daily needs met as adult women because although their average food intake is lower, they only need about half the amount of nutrients as adult women. The average amount of the food crop eaten and how often it is eaten is obtained through surveys. The amount of nutrient provided also depends on local food storage and preparation methods and habitual consumption patterns in the target country.

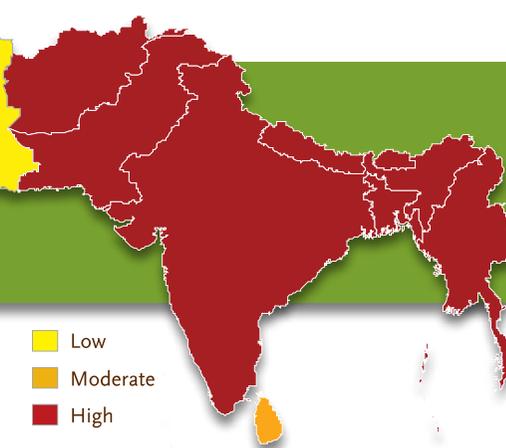
Thus, benefits for consumers in other countries may not be the same, unless food preparation and consumption patterns are very similar. In any population, there are also people whose needs will be below or above the estimated average requirement.

Nutrient deficiency data for women refers to non-pregnant and non-lactating women. Stunting is used as a proxy for zinc deficiency. Rates of iron deficiency are based on WHO's estimates on iron deficiency anemia (IDA) and take into account that for every person without IDA there is at least one more person without anemia but who still is iron deficient.

For up-to-date information and a complete list of our partners, please visit www.HarvestPlus.org.

South Asia

Combined vitamin A, zinc, and iron deficiency



Vitamin A Cassava

Released: 2011

Cassava is a robust climate-smart crop able to withstand disease, drought, and pests. It grows well on marginal soils and is an important staple food in much of tropical Africa.

Target country: Nigeria

Other countries: Democratic Republic of Congo (DRC)

Vitamin A deficiency: Children under 5: 30% in Nigeria and 61% in DRC

Benefit to farmers: High yielding, virus resistant

Benefit to consumers: Provides up to 40% of daily vitamin A needs.

Goal: Provide 50% of daily vitamin A needs through fully biofortified cassava.

CGIAR Partners: International Institute of Tropical Agriculture (IITA), International Center for Tropical Agriculture (CIAT)

Iron Bean

Released: 2012

The common bean is among the world's most important food legumes. Beans are an important part of the diet for millions of people in Africa and Central and South America.

Target country: Rwanda

Other countries: DRC, Uganda

Iron deficiency rates: Children under 5: 38 % in Rwanda, 71% in DRC, and 49% in Uganda

Women: 17% in Rwanda, 53% in DRC, and 23% in Uganda

Benefit to farmers: High yielding, virus resistant, heat and drought tolerant

Benefit to consumers: Provides up to 50% of daily iron needs.

Goal: Provide 60% of daily iron needs through fully biofortified beans.

CGIAR Partner: International Center for Tropical Agriculture (CIAT)

Vitamin A Maize

Released: 2012

Maize is the most important cereal food crop in Sub-Saharan Africa and Latin America.

Target country: Zambia

Other countries: Nigeria

Vitamin A deficiency rates: Children under 5: 54% in Zambia and 30% in Nigeria

Benefit to farmers: High yielding, disease and virus resistant, drought tolerant

Benefit to consumers: Provides up to 25% of daily vitamin A needs.

Goal: Provide 50% of daily vitamin A needs through fully biofortified maize.

CGIAR Partners: International Maize and Wheat Improvement Center (CIMMYT), International Institute of Tropical Agriculture (IITA)

Iron Pearl Millet

Released: 2012

Pearl millet is a hardy cereal grain that grows well in hot arid regions where soil fertility is often poor. It is widely eaten in drier parts of India and Africa.

Target country: India

Iron deficiency rates: Children under 5: 70%

Women: 55%

Benefit to farmers: High yielding, mildew resistant, drought tolerant

Benefit to consumers: Provides up to 80% of daily iron needs.

Goal: Provide 70% of daily iron needs through fully biofortified pearl millet.

CGIAR Partner: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Zinc Rice

Released: 2013

Rice is the staple food for more than half the world's population. In many Asian countries, rice provides up to 80% of the energy intake of the poor.

Target country: Bangladesh

Other countries: India

Zinc deficiency rates: Children under 5: 41% in Bangladesh and 48% in India (stunted)

Benefit to farmers: High yielding, disease and pest resistant

Benefit to consumers: Provides up to 60% of daily zinc needs.

Goal: Provide 80% of daily zinc needs through fully biofortified rice.

CGIAR Partner: International Rice Research Institute (IRRI)

Zinc Wheat

Release: 2015

Wheat is the second most consumed cereal in Asia, after rice, but is grown worldwide; wheat is sown on more than 200 million hectares of developing country farmland.

Target country: India

Other countries: Pakistan

Zinc deficiency rates: Children under 5: 37% in Pakistan and 48% in India (stunted)

Benefit to farmers: High yielding, disease resistant

Benefit to consumers: Provides up to 50% of daily zinc needs.

Goal: Provide 60% of daily zinc needs through fully biofortified wheat.

CGIAR Partner: International Maize and Wheat Improvement Center (CIMMYT)