

HarvestPlus leads a global effort

to breed and disseminate micronutrient-rich varieties of staple food crops eaten by the poor to reduce hidden hunger.

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-third 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 were willing to adopt and substitute 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 a doubling of vitamin A intakes in some cases.



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, as there is demand for OSP in her community, even from a local school. "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 leads a global effort to breed and disseminate micronutrient-rich staple food crops to reduce hidden hunger among malnourished populations. It is an interdisciplinary program that works with academic and research institutions, civil society organizations, governments, and the private sector in more than 40 countries.

HarvestPlus is a Challenge Program of the Consultative Group on International Agricultural Research (CGIAR). It is coordinated by the International Center for Tropical Agriculture (CIAT) and the International Food Policy Research Institute (IFPRI).

CREDITS

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CGIAR Partners

AgroSalud (Biofortification program based at CIAT)
Bioversity International
International Center for Tropical Agriculture (CIAT)
International Maize and Wheat Improvement Center (CIMMYT)
International Potato Center (CIP)
International Center for Agricultural Research in the Dry Areas (ICARDA)
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)

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The World Bank
World Food Programme (WFP)

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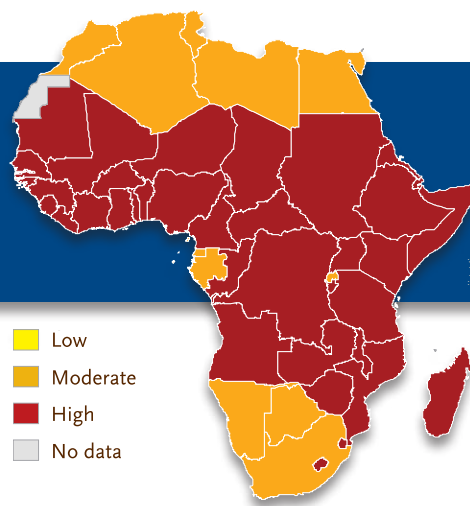
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**6 crops.
7 countries.
1 farmer at a time.**

Africa

Combined vitamin A, zinc, and iron deficiency



Vitamin A Cassava

Release Date: 2011

Cassava is a robust crop able to withstand disease, drought, and pests. It grows well on marginal soils and is grown where both poverty and malnutrition are widespread.

Nutrient: Provitamin A
Baseline: 0 parts per million
Target: 15 parts per million
Agronomic Traits: High yielding, virus resistance

Target Countries: Nigeria, Democratic Republic of Congo (DRC)
Deficiency Rates: 30% of children under 5 in Nigeria and 61% of children under 5 in DRC are estimated to be vitamin A deficient.
Average Consumption (adults): 600 grams/capita/day
Vitamin A Cassava Can Provide: 50% of the mean daily vitamin A needs of adult women.

Spillover Countries: Angola, Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Ghana, Guinea-Bissau, Guinea-Conakry, Liberia, Republic of Congo, Sierra Leone, Togo
CGIAR Partners: International Institute of Tropical Agriculture (IITA), International Center for Tropical Agriculture (CIAT)

Iron Bean

Release Date: 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.

Nutrient: Iron
Baseline: 50 parts per million
Target: 94 parts per million
Agronomic Traits: High yielding, virus resistance, heat and drought tolerance

Target Countries: Rwanda, Democratic Republic of Congo (DRC)
Deficiency Rates: In Rwanda, an estimated 56% of children under 5 and 33% of non-pregnant women are anemic. In DRC, an estimated 71% of children under 5 and 53% of non-pregnant women are anemic.
Average Consumption (adults): 250 grams/capita/day
Iron Bean Can Provide: 30% of the mean daily iron needs of adult women.

Spillover Countries: Burundi, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia, Zimbabwe
CGIAR Partner: International Center for Tropical Agriculture (CIAT)

HarvestPlus Crops

HarvestPlus and its partners are developing six micronutrient-rich staple food crops for Africa and South Asia. All crops listed are conventionally bred. These micronutrient-rich crops will first be released in select target countries. Subsequently, they can be released in spillover countries with similar agroecologies or tailored to local conditions through adaptive breeding. All crops will have at least 50 percent of the nutrient target at first release; subsequent 'waves' of releases will have progressively higher levels of target nutrients. Adult women* are used as a reference in setting nutrient targets. Children aged 4–6 years have about 50 percent of the estimated average requirement of adult women and consume about half the amount

of staple foods. The average amount of the food crop that is consumed is based on secondary data that is being validated through dietary surveys in target regions. The amount of nutrient provided through each crop is based on local food preparation methods and normal consumption habits.

Target country deficiency data** is presented for children under 5 (and for women in the case of iron). Data is based on the best estimates and research results and can change. For up-to-date information and a complete list of our partners, please visit www.HarvestPlus.org.

* Non-pregnant and non-lactating women
** Stunting is used as a proxy for zinc deficiency, and anemia is used as a proxy for iron deficiency. Approximately 50 percent of anemia is thought to be due to iron deficiency.

Vitamin A Maize

Release Date: 2012

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

Nutrient: Provitamin A
Baseline: 0 parts per million
Target: 15 parts per million
Agronomic Traits: High yielding, disease and virus resistance, drought tolerance

Target Country: Zambia
Deficiency Rates: 54% of children under 5 are estimated to be vitamin A deficient.
Average Consumption (adults): 300 grams/capita/day
Vitamin A Maize Can Provide: 50% of the mean daily vitamin A needs of adult women.

Spillover Countries: Angola, Ethiopia, Kenya, Malawi, Tanzania, Uganda, Zimbabwe
CGIAR Partners: International Maize and Wheat Improvement Center (CIMMYT), International Institute of Tropical Agriculture (IITA)

Iron Pearl Millet

Release Date: 2012

Pearl millet is grown in harsh environments in the arid and semi-arid regions of Asia and Africa providing both energy and nutrition to poor farming communities.

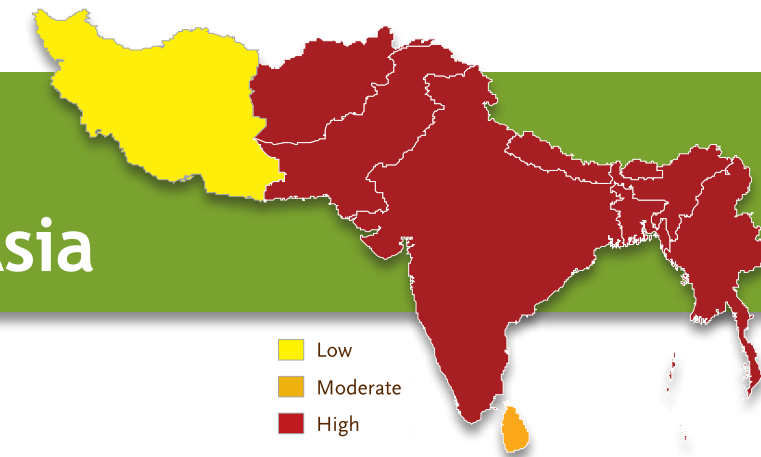
Nutrient: Iron
Baseline: 47 parts per million
Target: 77 parts per million
Agronomic Traits: High yielding, mildew resistance, drought tolerance.

Target Country: India
Deficiency Rates: 74% of children under 5 and 52% of non-pregnant women are anemic. In western India, where pearl millet is a staple food, an estimated 66% of children under 5 are anemic.
Average Consumption (adults): 300 grams/capita/day
Iron Pearl Millet Can Provide: 30% of the mean daily iron needs (and 40% of zinc needs) of adult women.

Spillover Countries: Mali, Niger
CGIAR Partner: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

South Asia

Combined vitamin A, zinc, and iron deficiency



Zinc Rice

Release Date: 2013

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

Nutrient: Zinc
Baseline: 16 parts per million
Target: 24 parts per million
Agronomic Traits: High yielding, disease and pest resistance

Target Countries: Bangladesh, India
Deficiency Rates: Approximately 44% of children under 5 in both Bangladesh and India are at risk of zinc deficiency.
Average Consumption (adults): 400 grams/capita/day
Zinc Rice Can Provide: 40% of the mean daily zinc needs of adult women.

Spillover Countries: Cambodia, Indonesia, Philippines, Vietnam
CGIAR Partner: International Rice Research Institute (IRRI)

Zinc Wheat

Release Date: 2013

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.

Nutrient: Zinc
Baseline: 25 parts per million
Target: 33 parts per million
Agronomic Traits: High yielding, disease resistance

Target Countries: India, Pakistan
Deficiency Rates: 44% of children under 5 in India and 37% in Pakistan are at risk of zinc deficiency.
Average Consumption (adults): 350 grams/capita/day
Zinc Wheat Can Provide: 40% of the mean daily zinc needs of adult women.

Spillover Countries: Afghanistan, Bangladesh, Egypt, Nepal
CGIAR Partner: International Maize and Wheat Improvement Center (CIMMYT)