HarvestPlus
Better Crops • Better Nutrition

Biofortification and Women's Nutrition

The Micronutrient Deficiency Burden for Women

Micronutrient deficiency leaves millions of women more vulnerable to complications and death during pregnancy and childbirth, increases the risk of infection, reduces physical and cognitive productivity, and diminishes overall quality of life. Micronutrient requirements are high for women because of their increased needs during menstruation, pregnancy, and lactation. Iron deficiency is experienced by approximately one of every two pregnant women in developing countries and 15 million pregnant women are at risk of vitamin A deficiency. Zinc is involved in more bodily functions than any other nutrient, many of them essential for normal growth and development —nearly 20 percent of the world's population is at risk for inadequate zinc intake.

Chronic undernutrition in women also poses serious impacts for their children, who can consequently suffer from micronutrient deficiency, birth defects, low birth weight, premature birth, and stunting. When mothers lack the proper nutrients, the intergenerational cycle of poor nutrition and decreased earning potential is perpetuated.

Addressing Women's Nutritional Needs

HarvestPlus nutritionists set micronutrient targets for the breeding of biofortified crops that are calibrated to help meet the physiological requirements of women of reproductive age (as well as children). Regular consumption of food made from biofortified crops improves women's and young girls' health and gives their children a better start in life. HarvestPlus develops nutritious *staple* crops, which are more likely to reach and benefit women and girls because staples are not susceptible to gender-discriminatory distribution in the household.

Iron biofortified beans, which contain up to twice the amount of iron as common bean varieties, can provide up to 75 percent of women's average daily iron needs, prevent and reverse iron deficiency in young women, and improve their cognitive abilities and physical work capacity. **Iron pearl millet** can provide up to 80 percent of average daily iron needs, improve nutrition, and enhance cognitive performance.

Zinc-biofortified crops (such as zinc rice and zinc wheat) support women's normal growth and development, the maintenance of body tissues, reproductive functions, vision, and immune systems. Our zinc crops also may also help reduce the risk of stunting. Because of the higher content of zinc, the total zinc absorbed by the body from biofortified wheat is significantly greater than from non-biofortified varieties.

Vitamin A crops, including sweet potato, maize, and cassava, can provide between 50 and 100 percent of a woman's average daily vitamin A needs.

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Biofortification and Women's Nutrition: The Evidence

A randomized controlled efficacy study conducted in Rwanda demonstrated that biofortified iron beans significantly increased hemoglobin, ferritin, and total body iron in previously iron-deficient young women (ages 18-27). This impact was seen after only four-and-a-half months of consumption. Eating biofortified beans also profoundly and positively affected memory retrieval and attention—key skills for optimal performance at school and work. This research has provided the first evidence implicitly linking consumption of iron beans, improved iron status, positive changes in brain activity, and improved cognitive performance.

Pearl millet is eaten daily by more than 50 million people in the semi-arid regions of India and by millions of people in Sahelian Africa. Research in India has shown that iron pearl millet can reverse iron deficiency among school-age girls and improve their cognitive performance; these positive impacts were seen after the girls consumed flatbreads or snacks made from iron millet for six months.

In India, zinc wheat consumption reduced morbidity in mothers (and children). A randomized controlled trial showed that women (non-pregnant and non-lactating) of reproductive age (15 to 49) who ate foods made with zinc wheat spend significantly fewer days (9 percent) with fever than mothers in a control group.

We have also seen in Uganda and Mozambique that regular consumption of biofortified sweet potato improves vitamin A intakes in women of reproductive age.

"Iron beans are especially good for pregnant and breastfeeding mothers. Two pregnant women came back to thank me for the advice and the beans after their doctors confirmed that blood iron levels that were low had increased to normal."

— **Mukampabuka Placidie**, Rwandan bean retailer trained by HarvestPlus to sell high-iron beans.

HarvestPlus improves nutrition and public health by developing and promoting biofortified food crops that are rich in vitamins and minerals, and providing global leadership on biofortification evidence and technology. HarvestPlus is based at the International Food Policy Research Institute (IFPRI) and is part of the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH).

Learn more about the evidence base for biofortified crops: Harvestplus.org/evidence-document

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