BIOFORTIFICATION AROUND THE WORLD

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For biofortification to be successful, three broad questions must be addressed:

- Can breeding add the target increment to achieve the micronutrient density in food staples that nutritionists have determined will make a measurable and significant impact on nutritional status?
- When consumed under controlled conditions, will the extra nutrients bred into the food staples be bioavailable and absorbed at sufficient levels to improve micronutrient status?
- Will farmers adopt the biofortified varieties and will consumers buy/eat them in sufficient quantities?

For all crops, high nutrient parents have been identified and breeding is underway. It is expected that high-yielding, nutrient-dense lines can be made available for release in a first country according to the schedule indicated below in Table 1.

Measures of bioavailability (the percentage of extra nutrients absorbed) have tended to be about what was assumed for iron (5-10%) and for zinc (25%), but better than levels assumed for provitamin A (12-to-1 conversion to retinol) in setting the target levels for breeders.

Our experience with dissemination of biofortified crops is confined thus far to release of orange sweetpotato in Uganda and Mozambique.

Table 1. Schedule of product release for HarvestPlus biofortified crops.

Crop	Nutrient	Countries of first release	Agronomic trait	Release year*
Sweet potato	Pro-vitamin A	Uganda, Mozambique	Disease resistance, Drought tolerance, acid soil tolerance	2007
Bean	Iron, Zinc	Rwanda, DR Congo	Virus resistance, Heat and drought tolerance	2012
Pearl Millet	Iron, Zinc	India	Mildew resistance, Drought tolerance	2012
Cassava	Pro-vitamin A	Nigeria, DR Congo	Disease resistance	2011
Maize	Pro-vitamin A	Zambia	Disease resistance, Drought tolerance	2012
Rice	Zinc, Iron	Bangladesh, India	Disease and pest resistance, cold and submergence tolerance	2013
Wheat	Zinc, Iron	India, Pakistan	Disease resistance, Lodging	2013