

9th Swiss Health Cooperation Symposium Basel, 9th November 2010

Biofortification and Health

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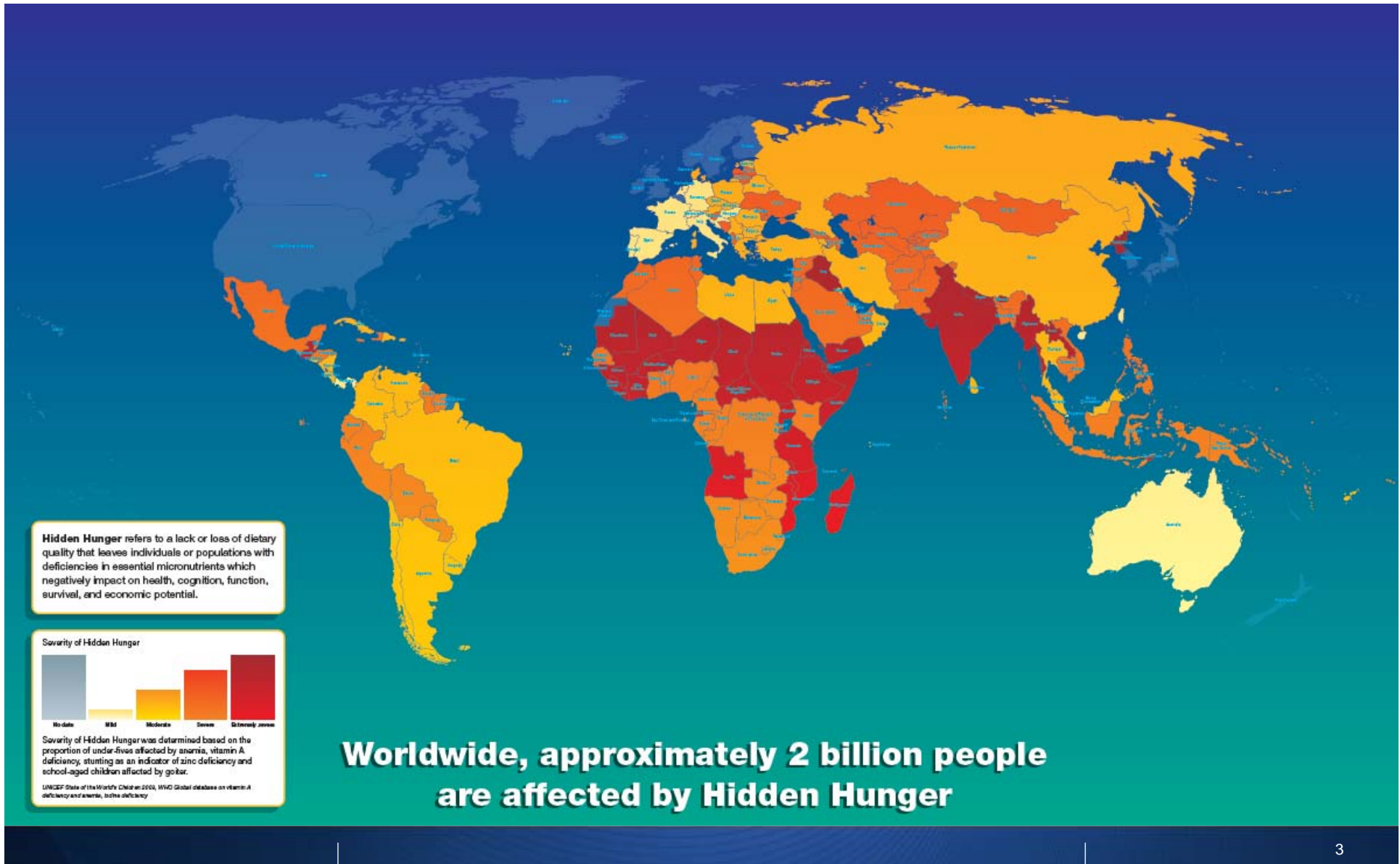


Hidden hunger

- Micronutrient (vitamin and mineral) malnutrition
 - Caused mainly through lack of micronutrients in diets based on staple foods
 - Affects estimated 2 billion people
 - Consequences
 - Reduced physical and cognitive development in children
 - Increased morbidity and mortality in children and adults
 - Negative consequences often before clinical signs appear

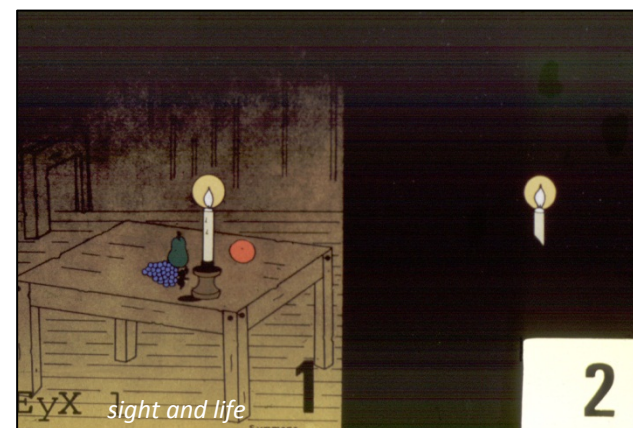


Global Hidden Hunger map Sight and Life



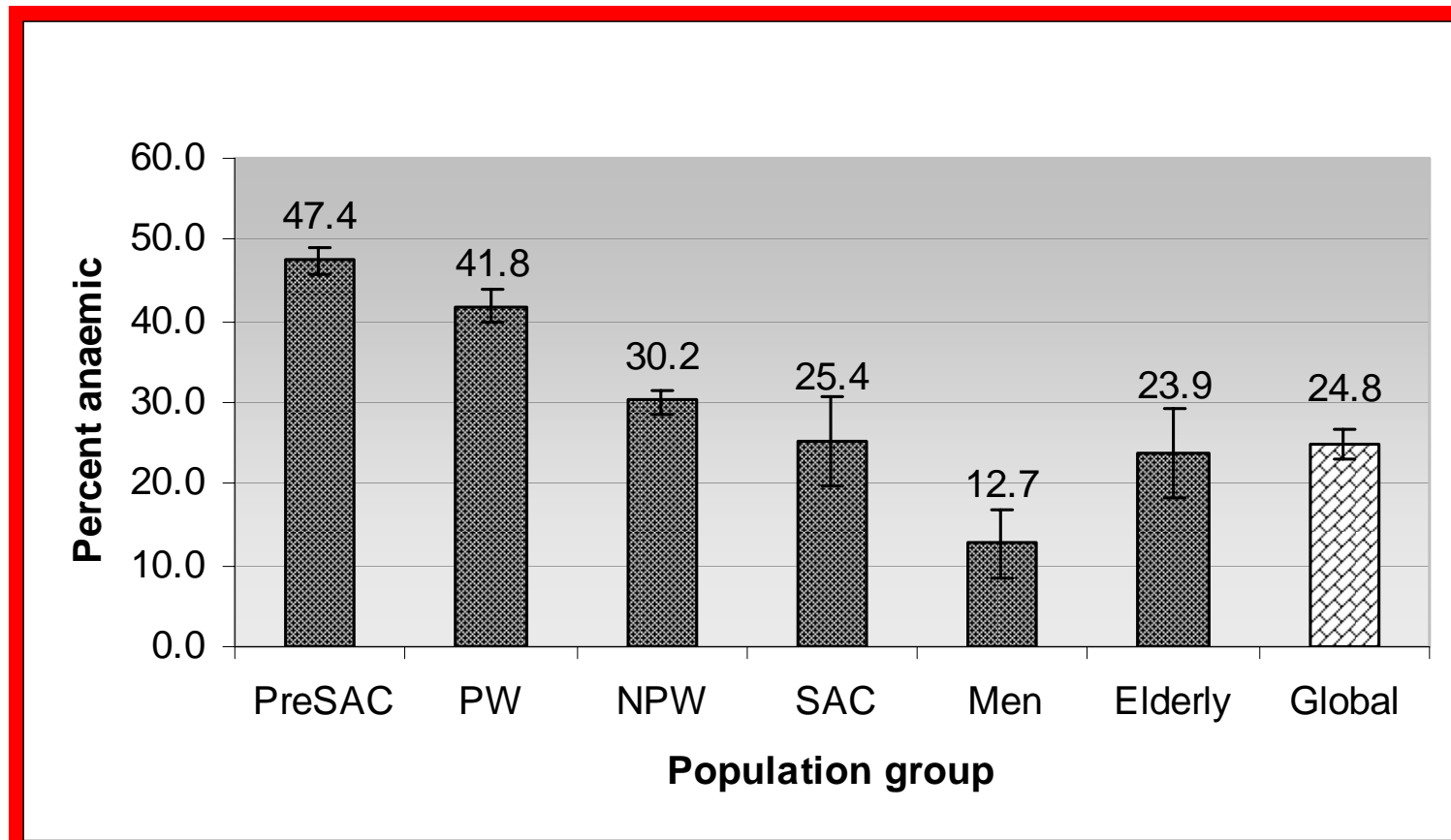
Major micronutrient deficiencies

- Anemia (iron deficiency)
 - Circa 1.6 billion people
- Iodine deficiency
 - Circa 1.9 billion at risk of insufficient iodine intake
- Vitamin A deficiency
 - Circa 190 million children <5 yrs with sub-clinical deficiency
 - Circa 5 million with night blindness
- Zinc, folate, B-vitamins deficiency
 - Limited data on magnitude of deficiencies



WHO 2004, 2008, 2009

Global anemia prevalence: Highest prevalence in young children and pregnant women



Total number of anaemic people: 1621.2 (95% CI: 1497.4 - 1745.0) millions

Strategies to reduce micronutrient malnutrition I

- Dietary diversification
 - Increased utilization of foods with high content and bioavailability of micronutrients

- Supplementation
 - Administration of pharmacological doses of micronutrients to specific groups at risk



Strategies to reduce micronutrient malnutrition II

- Fortification
 - Addition of one or several micronutrients to foods
 - During food processing
 - To home prepared foods



Sprinkles Global Health Initiative



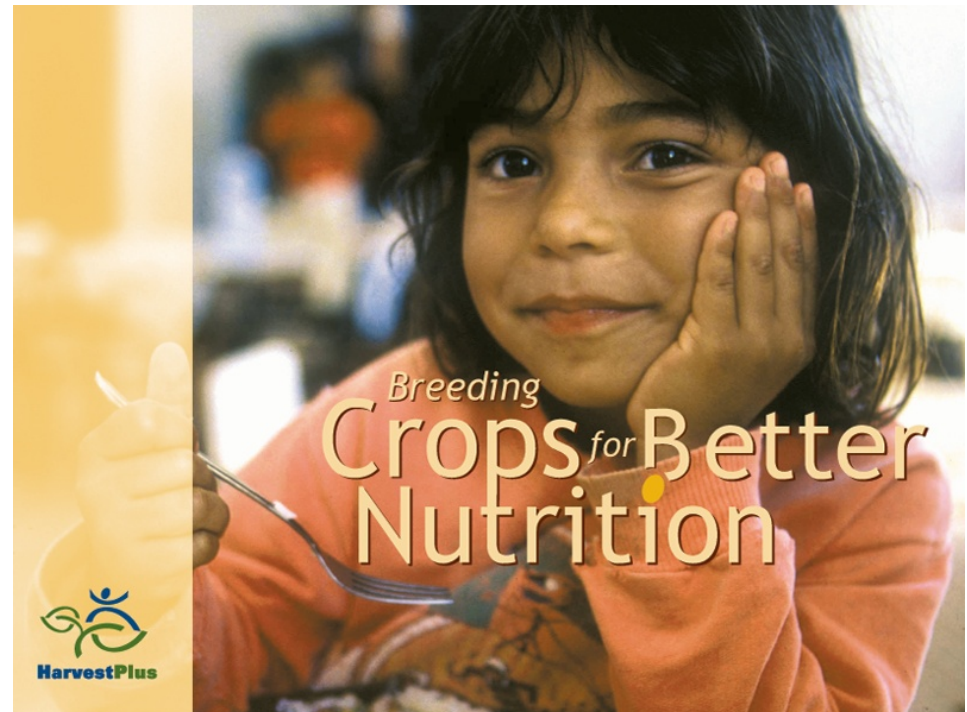
- Biofortification
 - Increasing micronutrient content in edible parts of plants



Biofortification - Advantages

- Targets low income households
 - Staple foods predominant in diets of poor population
 - Reaches rural populations
- Sustainable
 - needs one-time investment to develop crops
- Cost-effective
 - Crops developed for one region can be adapted to others at low costs

www.harvestplus.org



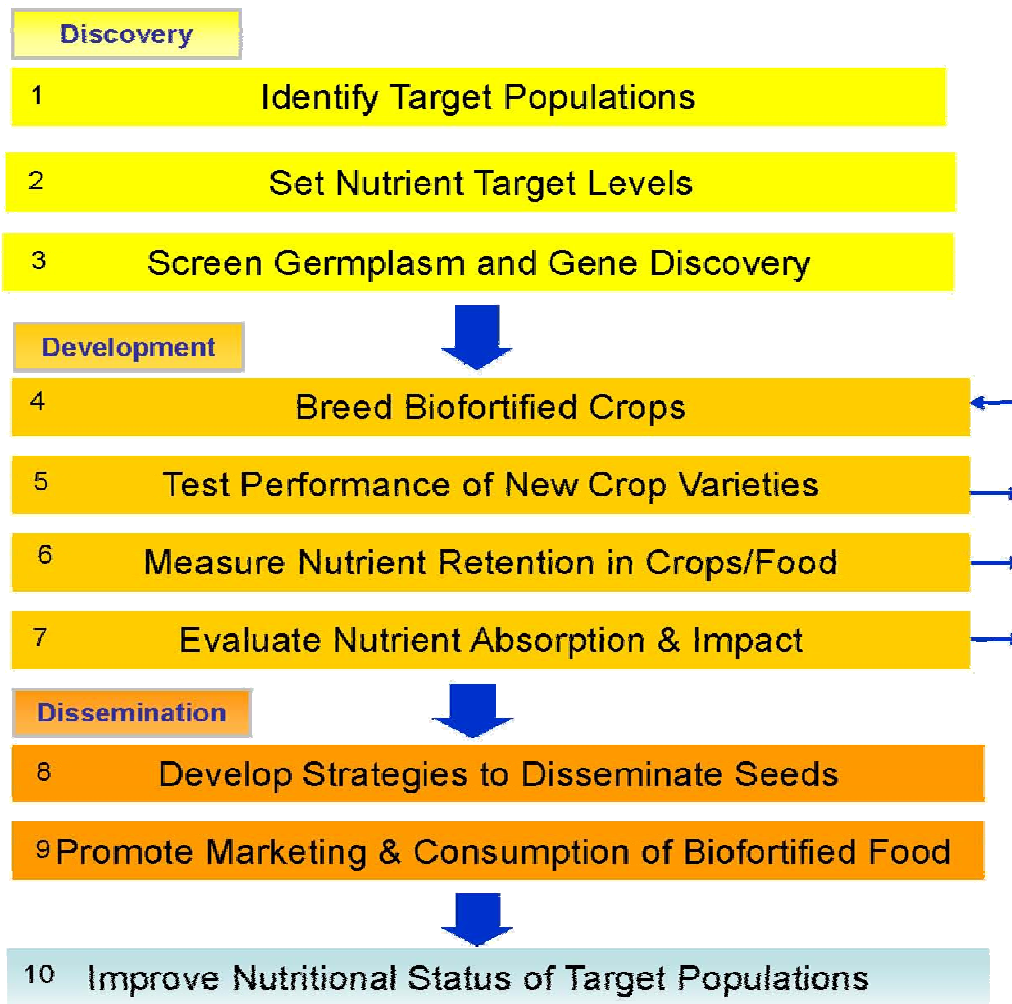
Biofortification - Approaches

- Traditional plant breeding
 - Identification of genetic potential
 - Crossing and backcrossing
 - Stability across environments
- Transgenic approach
 - To reach sufficient increase
 - To introduce lacking micronutrients
- Agronomic approach
 - Application of fertilizers
 - To increase micronutrients in crops
 - To improve uptake from soil by crops



www.goldenrice.org

Biofortification – Impact Pathway



HarvestPlus Crops

- Provitamin A Sweet Potato

- First release: Uganda, Mozambique 2007



- Iron Bean

- First release: Rwanda, DR Congo 2011



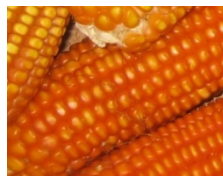
- Provitamin A Cassava

- First release: Nigeria, DR Congo 2012



- Provitamin A Maize

- First release: Zambia 2012



- Iron Pearl Millet

- First release: India 2010



- Zinc Rice

- First release: Bangladesh, India 2012



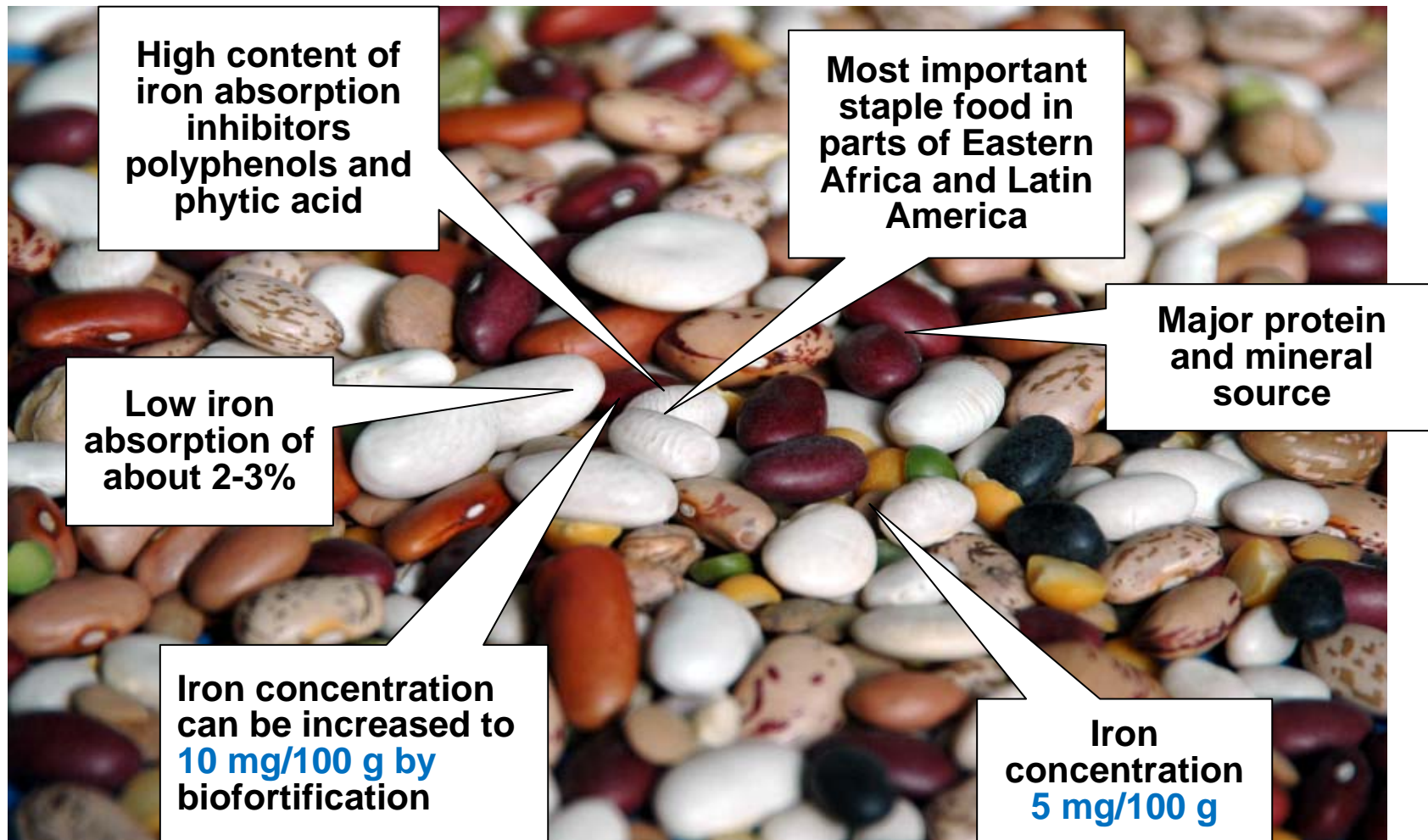
- Zinc Wheat

- First release: India, Pakistan 2012



Biofortification – Example common beans

(*Phaseolus vulgaris*)



Iron beans – Studies in Rwanda I



- Objective
 - Optimization of bean breeding strategies to improve iron status of the population

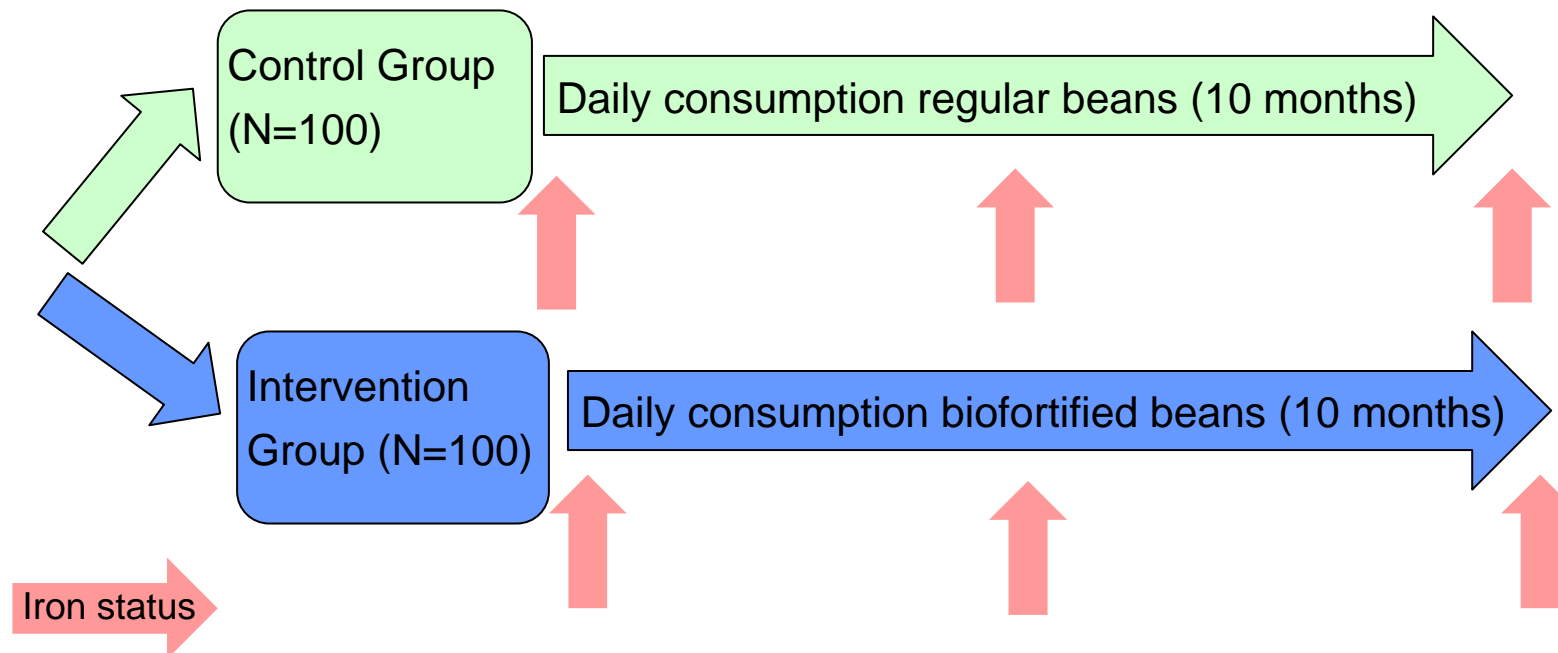
- Approaches
 - Measuring impact of inhibitors on iron bioavailability
 - Bean polyphenols
 - Phytic acid content

 - Defining iron absorption from bean meals

 - Population based study to test long term impact of consumption of high iron beans

Iron beans – Studies in Rwanda II

- Findings of bioavailability studies
 - Optimal iron bioavailability from beans with low inhibitors phytic acid and polyphenols
- Currently population based study being implemented
 - Assessment of impact of biofortified beans on iron status





Hillary Clinton Receives Prestigious Hunger Award, 5th October 2010

“And it is important that we focus on science and research again, that we put a lot of effort and commitment behind looking for ways to bring about the widespread distribution of micro-nutrients, for example, the integration of nutrition into HIV and AIDS programs, the development of heartier nutrient-rich crops like beans, bread, to contain more iron. These are now being field tested in Rwanda to address anemia, a leading cause of deaths of mothers and children and of cognitive delay among children.”

<http://www.wfp.org/stories/hillary-clinton-receives-prestigious-hunger-award>



BIOFORTIFICATION



The First Global Conference:
From Discovery to Delivery

Nov. 9-11, 2010 Washington, D.C.