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Functional Food for the Poor — The Potential Impact of "Biofortification" on Public Health in India

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Abstract

It is generally acknowledged that the Green Revolution has helped to prevent widespread famines, hunger and undernourishment. Yet, the Green Revolution mostly focused on solving the problem of protein-energy malnutrition and paid little attention to micronutrient malnutrition. Combating this hidden hunger, which affects and threatens billions of lives worldwide and which economic development and income growth alone are not expected to remedy any time soon, was left to non-agricultural interventions like supplementation and industrial fortification. Only more recently did the role of agriculture in addressing this aspect of food and nutrition security come to the fore: biofortified staple crops — i.e. food crops that are being bred for higher levels of micronutrients like iron, zinc or provitamin A — have the potential to improve public health in micronutrient-deficient populations. Yet, knowledge about the cost-effectiveness of biofortification is limited. This study analyses the expected costs and benefits of **(i)** iron-rich and **(ii)** zinc-rich staple crops in India, which are currently being developed in the framework of the HarvestPlus Challenge Programme of the CGIAR.

For the analyses health economics models that build on the disability-adjusted life years (DALYs) approach have been developed; DALYs can be used to measure health as they incorporate mortality and (weighted) morbidity data in one single index. Health improvements due to improved nutrition can therefore be expressed in the number of healthy life years that are saved through an intervention; current and expected nutrition statuses are derived from nationally representative food consumption data. Given that both crops are not yet cultivated, these models are used for ex-ante studies. It is hypothesised that the continuous streams of health benefits resulting from a single investment in the development of biofortified crops will prove to be cost-effective. Preliminary results indicate that saving one DALY through iron biofortification costs between US$ 0.36 and 1.78. For zinc biofortification these costs range from US$ 1.80 to 8.90. Both sets of results would prove a high cost-effectiveness by World Bank and WHO standards and yield internal rates of return of 74–152 % and 46–92 %, respectively. These findings suggest that biofortification can be a worthwhile public investment.

Keywords: Biofortification, cost-benefit analysis, cost-effectiveness, DALYs, health benefits, India, iron deficiency, iron-rich and zinc-rich staple crops, micronutrient malnutrition, micronutrients, plant breeding, rice, wheat, zinc deficiency

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