

VITAMINS AND MINERALS ARE VITAL FOR HUMAN HEALTH

How RLF’s Biofortification Technologies are Responding to this Global Call to Action

Based on Extracts from:

Investing in the Future. A United Call to Action on Vitamin and Mineral Deficiencies.

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Essential for Life

Vitamins and minerals are vital components of good nutrition and human health, advancing physical and intellectual development in many important ways. A number of vitamins and minerals – **also known as micronutrients** – are particularly important because of the large numbers of people around the world who are deficient in them.

Principal amongst these are vitamin A, iodine, iron, zinc and folate.

The successful delivery of large-scale interventions to remedy this requires broad-based partnerships. Internationally and locally, the private sector brings its pharmaceutical and food processing expertise and ingenuity to produce, promote, and ensure quality control. **Small-scale processors and farmers also play key roles.** Partnerships have created some stunning successes in recent years. One such successful approach is food fortification, which is the process of adding vitamins and/or minerals to foods to increase their overall nutritional content. Multiple micronutrient solutions – across a broad range of interventions – warrant urgent and wide expansion given the scope of the problem faced by large population groups across the globe.

“ Good nutrition, especially in the first years of a child’s life, provides lifelong benefits in health, education and productivity. However, one in four children under-five in the developing world – approximately 148 million children – suffer from undernutrition. Affordable and proven micronutrient interventions to address undernutrition exist. We must work collectively to scale up access to these micronutrients, so children everywhere have the chance to reach their full potential and contribute to the development of their communities. ”

Ann M. Veneman, Executive Director, UNICEF
 (sourced from *Investing in the Future. A United Call to Action on Vitamin and Mineral Deficiencies.*
A Global Report 2009)

Micronutrients are inexpensive commodities, and low-cost supplements and fortificants are already available. Micronutrient initiatives can easily be integrated into ongoing health services, or into existing methods for food production, **including that of biofortification at the very beginning of the food production process.** Biofortification refers to the use of traditional crop breeding practices and/or modern biotechnology to produce micronutrient-dense staple crops.

This new approach to improving health has been researched to determine the true public health potential, and it is indeed promising. Although biofortification efforts are relatively new, they are already producing promising results in terms of improved household vitamin intake and reduced deficiencies.

Without access to simple but vital micronutrients, either through diet, fortification or supplementation, an individual can suffer tremendous, otherwise avoidable, lifelong hardship. Families, communities, societies, nations and ultimately the world all lose whenever human capital’s potential is cut short.

In no small way, the quality of every human life is determined very early on by nutrition.

The most unacceptable effects of vitamin and mineral deficiencies are unnecessary child and maternal deaths. For too many, death comes with pregnancy and birth, and for even more it comes after battles with disease. This table shows the human toll of vitamin and mineral deficiencies:

Type of Repercussion	Numbers Affected
Lives Lost Annually	<ul style="list-style-type: none"> 1.1 million children under five die due to vitamin A and zinc deficiencies 136,000 women and children die because of iron-deficiency anaemia
Lives Impaired Annually	<ul style="list-style-type: none"> 18 million babies are born mentally impaired because of maternal iodine deficiency 150,000 babies are born with severe birth effects due to inadequate maternal folate intake 350,000 children become blind due to vitamin A deficiency
Lost Productivity	<ul style="list-style-type: none"> 1.6 billion people suffer reduced productive capacity due to anaemia

The scientific evidence is indisputable.

Innovative research continues to create new options for micronutrient delivery. And the economic argument is authoritative. Back as far as May 2008, the Copenhagen Consensus panel of eight distinguished economists, considered 30 options and ranked the provision of micronutrients as the **world's best investment for development**. And, with upwards of two billion people deficient in micronutrients, the global need is great.



Biofortification. A Remedy that RLF Products Contribute to Significantly.

Biofortification refers to the use of traditional crop breeding practices and/or modern biotechnology to produce micronutrient-dense staple crops. In addition to the use of conventional plant breeding programs, it also involves new, more modern agronomic practices to increase the levels of specific micronutrients in crops as they grow and yield.

Agronomic biofortification certainly has a significant role to play, and for over 25-years RLF has been developing and manufacturing specialty liquid fertilisers that in so many ways target the deficiencies outlined by the UN and FAO. The total focus on the equal importance to the crop of the minor and trace elements has always underpinned RLF's approach to nutritionally balanced crops and subsequent healthier produce.

Through our R&D program RLF has developed some of highest analysis broad spectrum complex liquid foliar fertilisers globally. RLF **Broadacre Max** for instance – in addition to the major nutrients of phosphorus, nitrogen, potassium, magnesium and sulphur – contains the optimally balanced, 'essential for life' micronutrients of zinc, manganese, copper, iron, boron, cobalt and molybdenum. During manufacture, RLF chelates these trace elements with phosphate, organic acids boosting hydrogen ions to charge and supply plants with the extra energy needed to take up micronutrients and mobilize photosynthates within the plant for more efficient carbon conversion to plant metabolites and vitamins.

The trace elements in RLF foliar products such as copper, iron, molybdenum and manganese form the essential elements in the chloroplast electron transfer system referred to as photophosphorylation during which ATP (high energy) is produced from ADP utilising the light energy. This energy charging cycle enables plants to synthesise organic molecules and plant vitamins – like vitamin C, vitamin A (Carotenoids) and vitamin B groups. If such trace elements are deficient, electrons are stolen from the chain and Free Radicals are produced which oxidise the chlorophyll and destroy membrane structures thereby preventing energy flow to ATP and the synthesis of plant vitamins.

Achieving full agronomic solution is what RLF strives for, and its products include biotechnologies that deliver solutions that embrace all parts of a crop cycle (vegetative or reproductive), and all parts of the plant (being seed, leaf and root). The nutrient pathways of seed, leaf and root are especially important and the RLF ethos is to encourage that they be viewed as a total package towards a full agronomic solution.

Keypoints

- The quality of every human life is determined very early on by nutrition.
- There is simply no avoiding our need for vitamins and minerals. Human capacity is built on them.
- Biofortification efforts are already producing promising results in terms of improved household vitamin intake and reduced deficiencies.
- Small-scale processors and farmers have a key role to play.
- RLF understands nutrient deficiency, and its science-based approach to crop nutrition is helping change this dire global nutrient deficiency scenario through modern agronomic and bio-technology advances so that every plant can achieve maximum nutrient benefit.

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