Zinc…essential for life

Zinc Nutrient Initiative

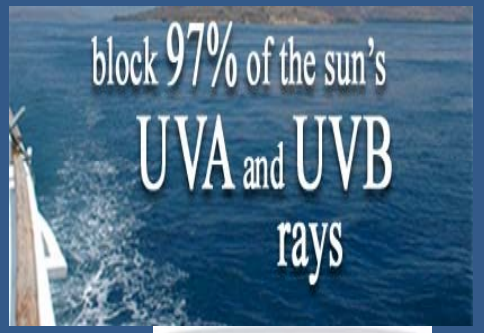
Andrew Green, Ph.D.
Director, Environment & Sustainability

2009 Fertilizer Outlook & Technology Conference
Tampa

Zinc…essential for life

Zinc is Essential for Life

- Humans, animals, plants need zinc to function
- Affects over 300 enzymes in the body
- Helps generate cells and important for growth and brain development
- Key for immune system
- People need up to 15 mg of zinc per day



Zinc…essential for life

Zinc Deficiency: Global Issue

- Well-documented public health issue
- 1/3 of global population deficient
.
- Developing countries most affected

Zinc…essential for life

- **> 450,000 deaths annually in children under the age of 5 due to zinc deficiency – Black et al, 2008 Lancet**

- **800,000 deaths estimated globally - WHO**

Zinc…essential for life

Copenhagen Conference 2008

- 8 leading economists,
  5 Nobel Laureates
- Prioritized efforts to address world's biggest challenges
- Zinc & vitamin A #1 issue

COPENHAGEN CONSENSUS 2008

Copenhagen Business School
1917 – 2007

Press Release

Copenhagen Consensus 2008 - RESULTS

COPENHAGEN CONSENSUS CENTER

The world's best investment: Vitamins for undernourished children, according to top economists, including 5 Nobel Laureates

...

Copenhagen, Denmark (May 30, 2008) – Over two years, more than 50 economists have worked to find the best solutions to ten of the world's biggest challenges. During the last week, an expert panel of 8 top-economists, including 5 Nobel Laureates, sat down to assess the research.

There is a good but sobering reason why "ending world hunger" has been a perennial hope of beauty-pageant contestants at least since Miss America contestants began naming that as their greatest wish: we haven't come close to doing it. This year some 900 million people—including 178 million children under 5—are suffering from malnutrition, estimates the United Nations; every day 50,000 starve to death

Zinc…essential for life

TIME Partners with CNN

Follow TIME

SEARCH TIME.COM

World ADD TIME NE

Main • The China Blog • Postc

Can One Pill Tame the Illness No One Wants to Talk About?

By VIVIENNE WALT / SOGOLA Monday, Aug. 17, 2009

Anna Kari / Documentography for Time

Taming a Devastating Illness with a Simple Pill

Zinc tablets help African communities fight diarrhea, a scourge that claims the lives of an astonishing 1.6 million children every year

Photographs by Anna Kari / Documentography for Time

Enter

- Diarrhea: The Great Zinc Breakthrough

Zinc…essential for life

“ZINC SAVES KIDS” Campaign

unicef

Zinc…essential for life

UNICEF–IZA Zinc Program: Objectives

- Reduce infant and child mortality
- Provide zinc treatment for children with diarrhea
- Prevent zinc deficiency through supplementation program

- Target audience: global zinc industry & customers, general public
- Target amount: $5 million + over 3-yrs

Zinc…essential for life

Donate | Media
About Us | Contact Us
Why Zinc? | Links
Projects | Tell A Friend

ZINC Saves Kids

A program of the International Zinc Association in partnership with Unicef

Welcome
to the Zinc Saves Kids website...

In spite of the proven benefits of adequate zinc nutrition, approximately 2 billion people still remain at risk of zinc deficiency. Let's do something about it.

Recent News...

9/7/09 - Zinc Supplementation Begins in NEPAL
Read More »

7/6/09 - Zinc Industry and Unicef Partner to Fight Zinc Deficiency in Children
Read More »

6/27/09 - Zinc is Solution to World's Biggest
Read More »

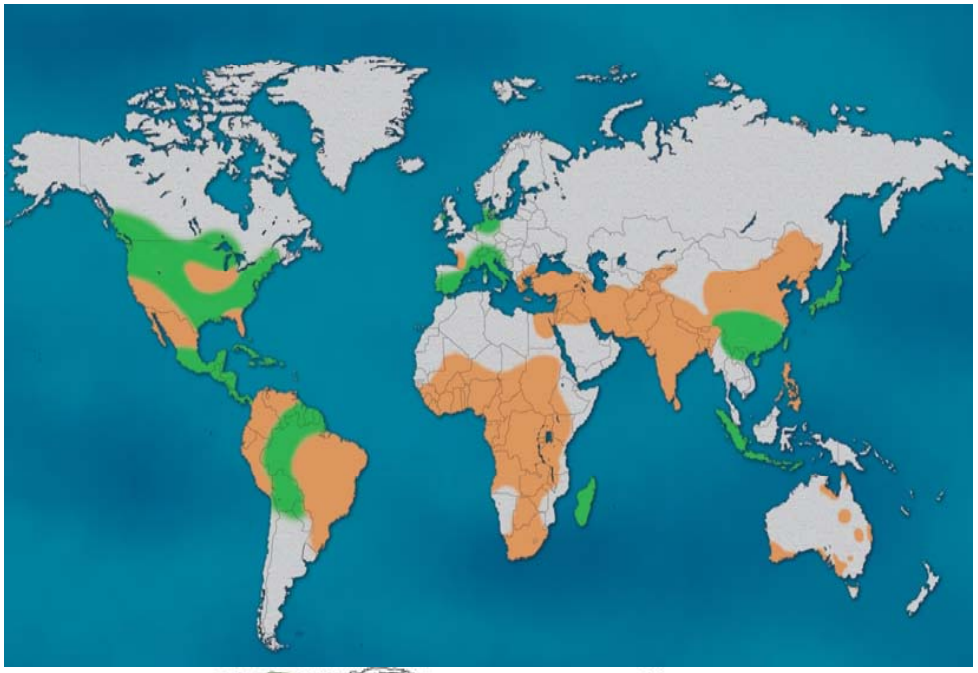
Nearly 450,000 children die every year because they don't get enough zinc through their diets. A few extra milligrams of zinc every day can make a huge difference. Zinc-containing supplements are a quick and easy, effective and inexpensive remedy.

Zinc saves Kids supports children in Nepal and Peru, two areas where children suffer most from zinc-deficiency related health problems. Your donation can save lives and improve growth and development. Children are our greatest resource, give them a chance to live and develop their full potential.

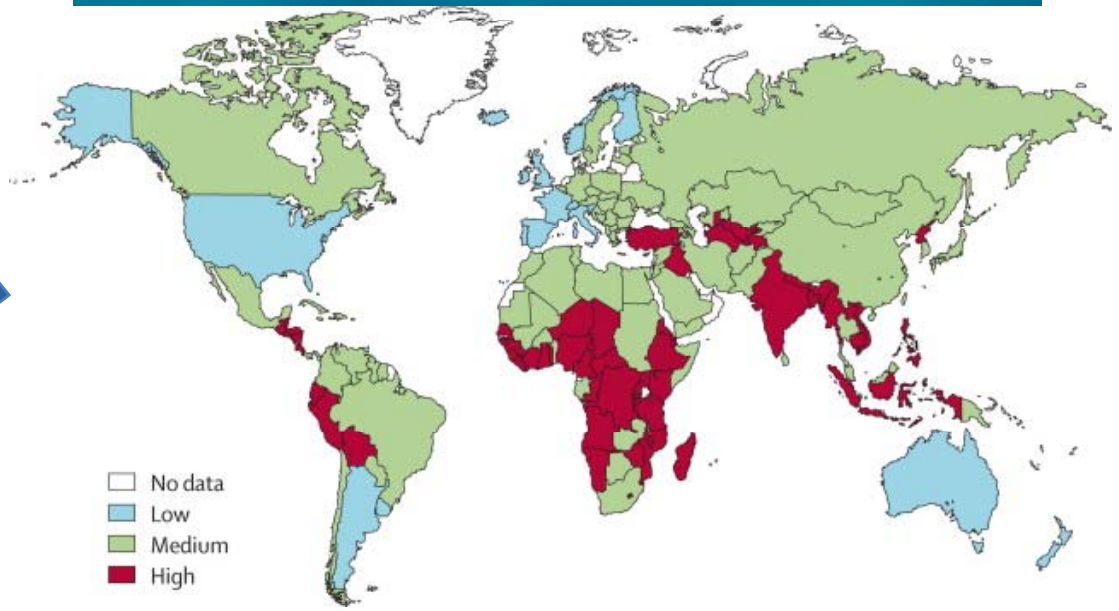
| Visit UNICEF Site | Join Our Mailing List | News | Donate | Blog |

Zinc…essential for life

World Map – Zinc Deficiency



Soils



Humans

Zinc…essential for life

Examples of Zinc Deficiency

Wheat

Severe Zn deficiency

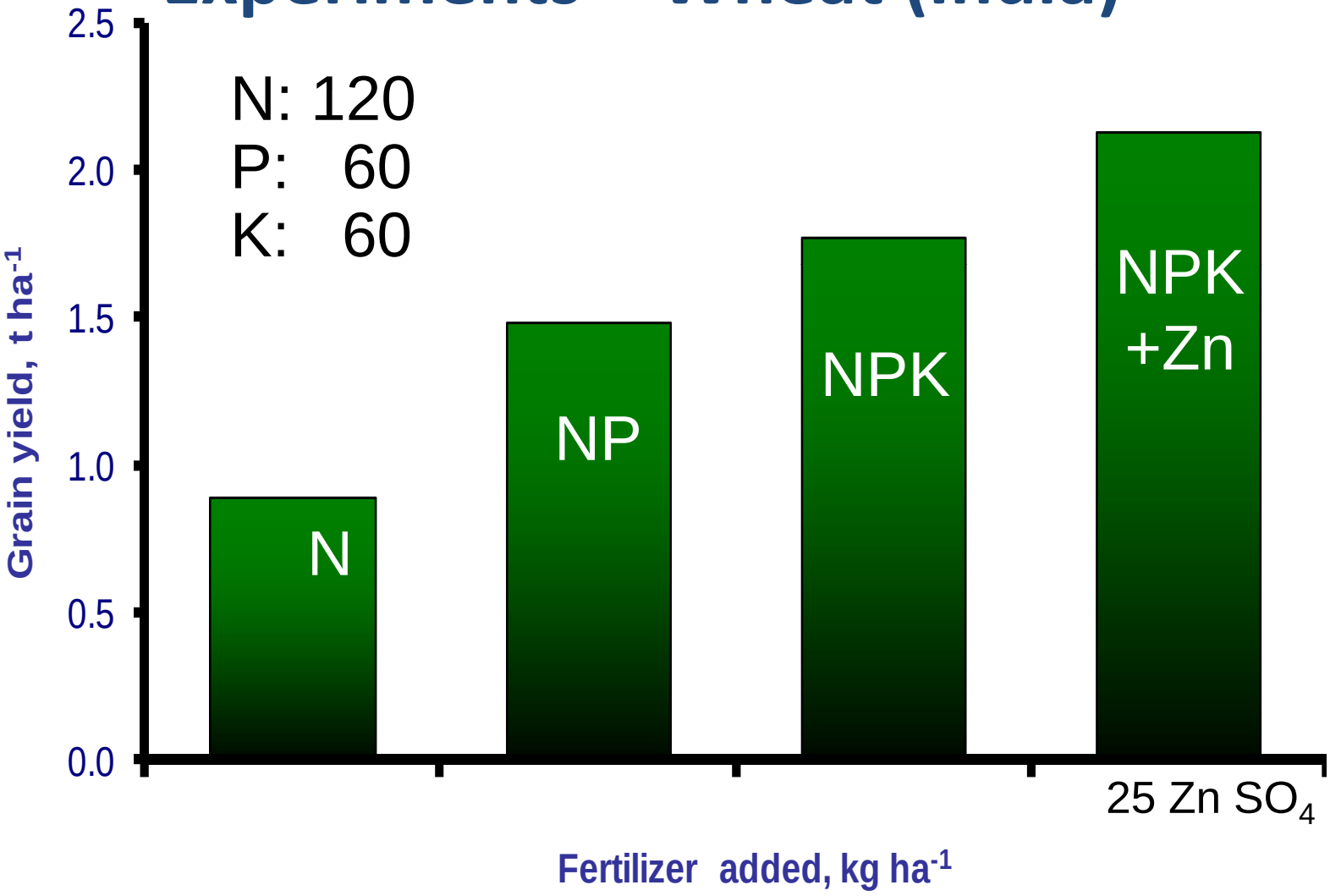
Zn treated plot

Pictures: Potash & Phosphate Institute; Int'l Rice Research Institute

Zinc…essential for life

Impact of Zinc: 20-50% Increase

Experiments – Wheat (India)



Source: Tandon, 1995; I. Cakmak, 2006

Zinc…essential for life

Applying Zinc to Crops:
A Sustainable Solution to Zinc Deficiency

Zinc…essential for life

Zinc nutrient initiative

- **4-yr program**
- **Global effort with initial focus in China, India, Thailand**

Goal:

- **raise awareness about deficiency problem & benefits of using zinc**
- **Significantly increase zinc market in fertilizers**

Zinc…essential for life

Zinc nutrient initiative

Approach

- **Demonstration crop trials**
- **Communication activities**
- **Workshops/seminars**
- **Country-based marketing**

Zinc…essential for life

Demonstration Field Trails

Rice and wheat field experiments with and without Zn applications in 2 different locations in India, China and Thailand/Laos,

- ❑ study the effects of Zn fertilization on yield and nutritional status

- ❑ increase local awareness of the importance of zinc fertilization

Harvest Zinc Fertilizer Project (www.harvestzinc.org)

Zinc…essential for life

HarvestPlus
Breeding Crops for Better Nutrition

Mosaic Co. USA

K+S KALI GmbH Germany

OMEX Agrifluids Ltd. England

Harvest Zinc
Exploring Fertilizer Use to Increase Zinc in Cereals

Int'l Zinc Assoc.

Int'l Fertilizer Ind. Assoc. France

Int'l Plant Nutr. Inst. USA

Coordinating Institution

Sabancı Üniversitesi

Collaborating Countries/Institutions

INDIA
IARI: Indian Agric. Res. Inst.

PAKISTAN
NARC: Nat. Agric. Res. Cen.

CHINA
CAU: China Agric. University

THAILAND
Chiang Mai University

MOZAMBIQUE
IIAM: Inst Inv Agr Moz

BRAZIL
APTA:Agência Paulista Tec Agr.

TURKEY
Ministry of Agriculture

ZIMBABWE
Soil Fertility Cons. for Southern Africa

Zinc…essential for life

Zinc Fertilizers: Code of Practice

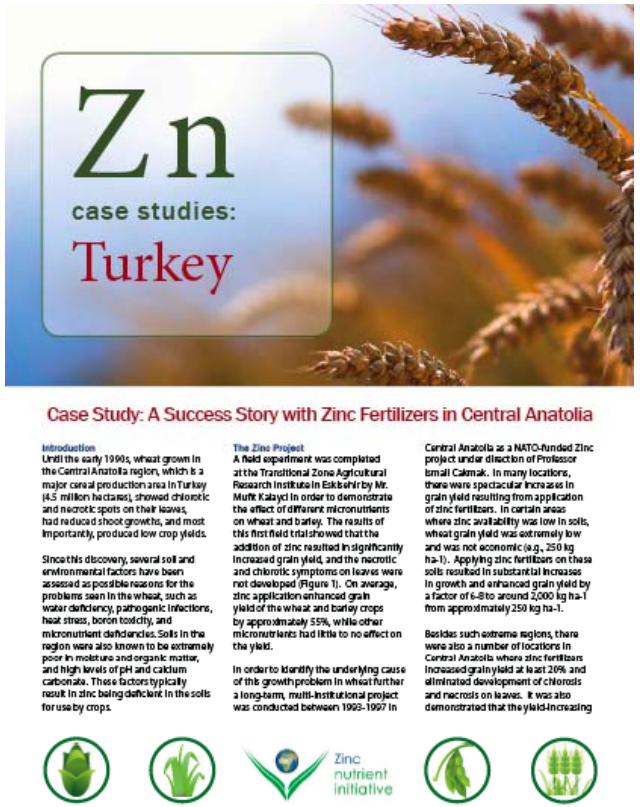
- **Will provide guidance for safe levels of contaminants**
- **Helps ensure safety & sustainability of Zn product**

Zinc...essential for life

Zinc nutrient initiative

Communication Activities:

- Case-study on success story in Turkey
- Technical brochure
- Publication of articles/book
- Fact sheets
- Newsletter
- website: zinc-crops.org
- Videos
- Seminars/workshops



Zinc…essential for life

Communication Activities:

Zinc nutrient initiative

Issue No. 1
July 2009

Zinc ...essential for life

zinc in fertilizers

Press Release: Zinc and Fertilizer Industries Form Task Force to Reduce High Mortality Rates in Developing World 2-3

HarvestZinc HarvestPlus Project: Making progress in the past year 3

National Soil and Fertilizer Conference in Thailand: A presentation of research and publications 3-4

Zinc Nutrient Initiative

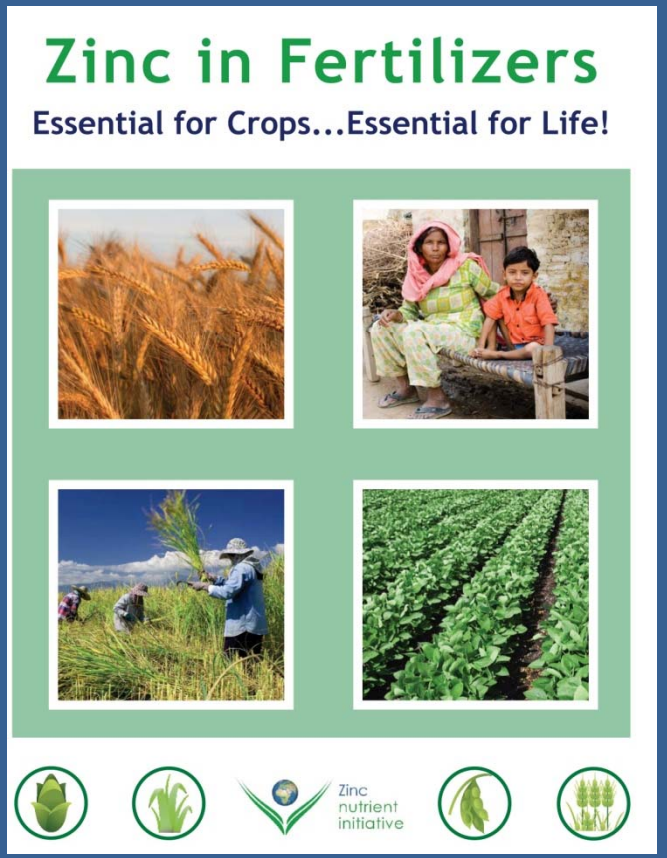
The Zinc Nutrient Initiative represents a new program with the overall goal of increasing the use of zinc in fertilizers. The Food and Agricultural Organization (FAO) has estimated that 50% of the world's agricultural lands are deficient in zinc. Further, the World Health Organization (WHO) attributes 800,000 deaths worldwide each year to zinc deficiency and highlights that zinc deficiency in humans is largely related to inadequate intake or absorption of zinc in the diet. Numerous other studies and findings have come out recently reconfirming the global and critical nature of the zinc deficiency problem, in crops and humans. The use of zinc fertilizers in zinc-deficient soils can increase crop productivity as well as the zinc nutritional status of the crops. To achieve these goals, the program will incorporate the use of demonstration crop trials (including the generation of time-elapsed video showing the benefits of adding zinc), plus communications and marketing, initiatives to government organizations, fertilizer companies, dealers and farmers.

A number of activities have occurred:

Meetings

- Latin American Fertilizer Conference held in Panama (January 2009) including presentation by Dr. Ray Hoyum (IZA Consultant) on Zinc and Fertilizers
- Zinc crop session and booth organized with Padaeng Industry (IZA Member) at Thailand's National Soil & Fertilizer conference (April 2009), including presentation by Dr. Andrew Green and Dr. Ismail Cakmak on IZA's Zinc Nutrient Initiative
- Zinc Symposium - New Delhi (April 2009) organized with Fertilizer Association of India and, including presentation by Dr. Andrew Green and Dr. Ismail Cakmak on IZA's Zinc Nutrient Initiative.

- Meeting held with the Food and Agricultural Organization (FAO) by Stephen Wilkinson and Johan Van Wesemael to discuss support of zinc fertilizer program and funding efforts.



Zinc…essential for life

Communication Activities:

Zinc nutrient initiative

Zinc ...essential for life

Zinc Fact Sheets: Rice

Zinc nutrient initiative

Introduction

Rice production systems differ widely in cropping intensity and yield, ranging from single-crop rain-fed lowland and upland rice with low yields (1-3 tons/ha), to triple-crop irrigated systems with annual grain production of up to 15-18 tons/ha. Irrigated and lowland rice systems account for about 80% of the worldwide harvested rice area and 92% of total rice production. To keep pace with population growth, overall rice production must increase by 25% over the next 20 years. Rice provides up to 80% of the calories consumed by 3.3 billion people in Asia.

High yielding, nutrient rich rice requires improved, yet balanced, crop nutrition of all major, secondary and micronutrients. Unfortunately, it is estimated that over 50% of agricultural soils devoted to cereal cultivation are potentially zinc deficient. Also, over two thirds of the rice grown worldwide is produced on flooded paddy rice soils which are typically low in plant available zinc.

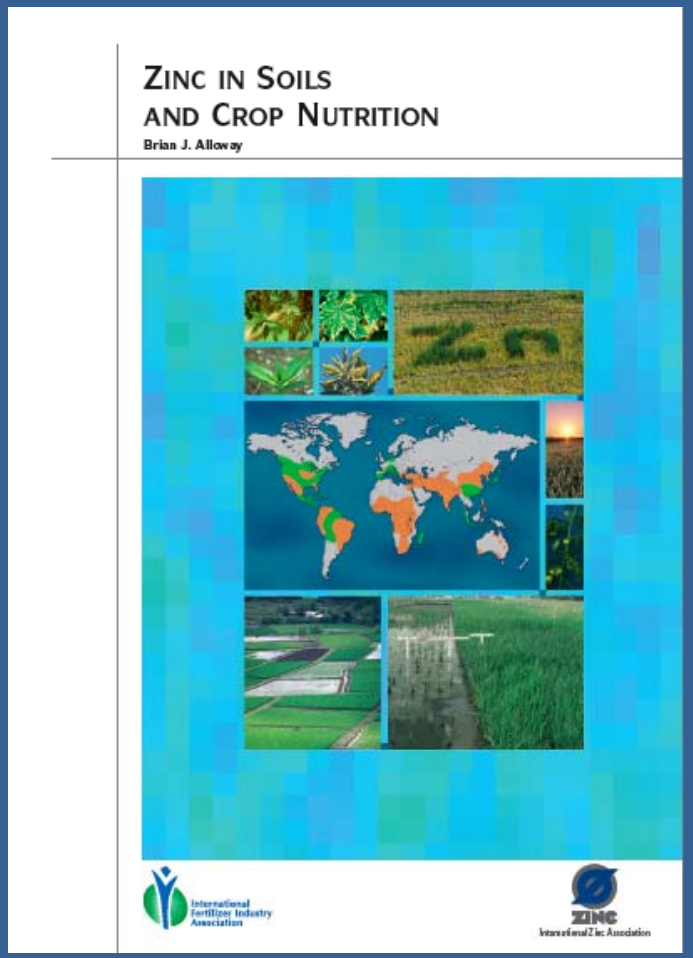
Balanced Crop Nutrition

For high yielding rice, crop nutrition must be adequate and carefully balanced. Where available, soil testing and plant analysis should be utilized to guide any fertilizer program. Any deficient or unbalanced use of nutrients potentially reduces yield. Recent research has shown significant reductions in yield when zinc is less than adequate (Table 1).

Table 1: Rice Yields With and Without Adequate Zinc

Country	+Zn (t/ha)	-Zn (t/ha)	% Change
Columbia	9.3	7.5	-19%
	11.3	10.3	-8%
	12.0	9.8	-18%
China	8.2	7.3	-10%
India	9.95	8.7	-12%

Results from 140 greenhouse trials based on soils from 17 provinces of China showed that 49% of the soils were deficient in zinc. When a variety of crops were grown, the average relative yields were only 75% of the optimum, again demonstrating the serious decline in yield when zinc is deficient.



ZINC IN SOILS AND CROP NUTRITION

Brian J. Alloway

International Fertilizer Industry Association

ZINC International Zinc Association

Zinc…essential for life

Communication Activities:

Zinc nutrient initiative

Numerous key publications in trade and academic journals

Rice is very susceptible to Zn deficiency. The symptoms can be recognised from chlorosis, necrotic spots on leaves, bronzing and/or rusetting of leaves, dwarf or malformed leaves, and stunting of plants.

ZINC

A key micronutrient

As a vital micronutrient, zinc (Zn) is a natural element that is essential for normal healthy growth and reproduction of plants, animals and humans. It appears in the soil at a typical ratio of 25-200 mg Zn/kg DW, in the air at between 40-100 ng Zn/m³, in water at between 340 µg Zn/l and biomass (25-200 µg Zn/g DW).

In plants, Zn is critical for many physiological functions, including the maintenance of structural and functional integrity of biological membranes and the facilitation of protein synthesis. Of all micronutrients, Zn is required by the largest number of enzymes and proteins. The zinc pathways have important roles in:

- Photosynthesis and sugar formation
- Protein synthesis
- Fertility and seed production
- Growth regulation
- Defence against diseases.

If the supply of plant-available Zn is insufficient, plant growth may be impaired and yields and crop quality will be reduced. Zn deficiency in a plant manifests itself in visible symptoms of stress, including:

- Stunting/reduced height
- Interveinal chlorosis, as shown by the yellowing of the leaves between the veins
- Bronzing of chlorotic leaves
- Abnormally-shaped leaves and leaf stunting.

These different types of symptoms vary with plant species and are usually only clearly displayed in severely deficient plants. In cases of marginal deficiency, plant yields can fall by as much as 20% or more without any obvious visible symptoms. (*Zinc in Soils and Crop Nutrition*, Brian J. Alloway, International Fertilizer Industry Association/International Zinc Association [July 2008].)

Zinc also plays a critical role in human and livestock diets, influencing metabolism, the perpetuation of genetic material and the transcription of DNA. Zn deficiency can lead to reduced appetite, reduced growth, vulnerability to illnesses and infections, reduced fertility and lower longevity.

Zinc is a key ingredient in human nutrition, soil and crop management and is being identified as an increasingly frequent limiting factor. This review evaluates the range of products that can counter this threat to crop yields.

Zn deficiency in animals and humans can be rectified through enhanced zinc content in cereals and other crops.

The International Zinc Association (IZA) identifies Zn as the third most important nutritional factor affecting grain yield after nitrogen and phosphorus. Many plant species are affected by Zn deficiency on a wide range of soil types in most agricultural regions in the world. The major staple crops, such as rice, wheat, maize and sorghum, are all affected by Zn deficiency, along with many different fruit, vegetable and other types of crops, including cotton and flax. Rice is particularly susceptible to Zn deficiency, as it grows in waterlogged soils which are conducive to zinc deficiency. Flooding the soil reduces Zn avail-

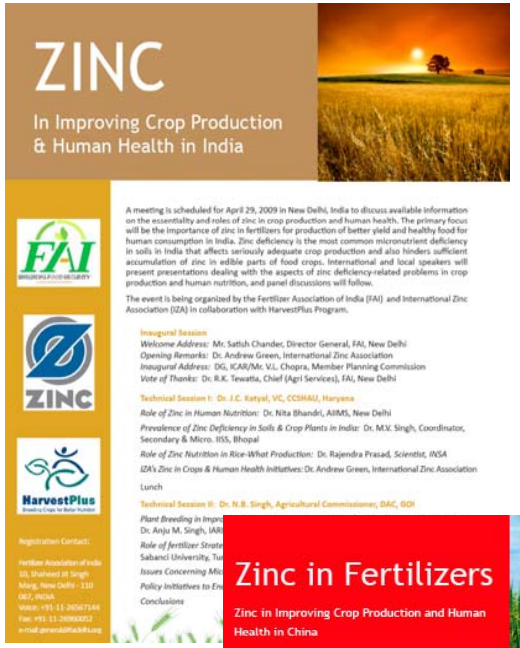
Zinc…essential for life

www.zinc-crops.org

Zinc…essential for life

Zinc Fertilizer Seminar/Sessions

- New Delhi, India with FAI
- Bangkok, Thailand
- Ottawa, CA
- Mazamita, MX
- Beijing, China in December
- 2010 events planned for Brazil, S. Africa, Canada, India, China, India



Zinc…essential for life

Global Task Group

- Organized through IZA and IFA
- Includes 2 CEO's from fertilizer industry & 2 from the zinc industry
- Will provide input on overall direction & help champion efforts within the 2 industries

Zinc…essential for life

Stakeholder Partnerships

- IFA
- IPNI
- The Sulfur Institute
- Mosaic
- Fertilizer industry
- IRRI
- United Nations -CFC
- Food and Agriculture Organization
- U.S. AID
- Clinton Global Initiative

Zinc…essential for life

CLINTON GLOBAL INITIATIVE

- **CGI highlighted the Zinc & Nutrition Initiative at annual event in September**
- **Effort focuses on addressing zinc deficiency in humans and crops through supplementation & fertilizer use**
- **Partners:**
  UNICEF
  MI
  IFA

Zinc…essential for life

- **Zinc deficiency – in humans and crops is a critical, global, and linked issue**
- **Problem is solvable – Zinc Fertilizer**
- **Benefits include increased food security, nutrition, health and economics**

Zinc…essential for life

Zinc is an essential nutrient for human health. Ensuring adequate levels of zinc intake should be a key component in efforts to reduce child illness, enhance physical growth and decrease mortality in developing countries. In spite of the proven benefits of adequate zinc nutrition, zinc deficiency is the fifth leading risk factor for disease in the developing world (WHO, 2002).

To learn more about zinc and health, visit us at booth #317 or www.zinc-health.org.

ZINC

International Zinc Association

Zinc …essential for life

www.zincworld.org

iZiNCG

International Zinc Nutrition Consultative Group

Improving health of people in need by enhancing zinc nutrition

www.izincg.org