



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





- **> 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**





Copenhagen Conference 2008

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



Press Release Copenhagen Consensus 2008 - RESULTS



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.

Newsweek

NEWS POLITICS TECH / BUSINESS CULTURE / IDEAS HEALTH VOICES SITE GUIDE
Religion Education Sports Boomer Files Entertainment Animals and Pets Newsmakers Giving

Top Story
McCain vs. Obama: Their Foreign Policy Views

Latest News
Judge refuses to block Alaska Troopergate

GIVING GLOBALLY

Feeding the 900 Million Micronutrients



By Sharon Begley | NEWSWEEK
Published Sep 20, 2008
From the magazine issue dated Sep 29, 2008

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**

SEARCH TIME.COM

Follow **TIME**



World



ADD TIME NEWS

Main • The China Blog • Postcard

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

By **VIVIANNE 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 



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

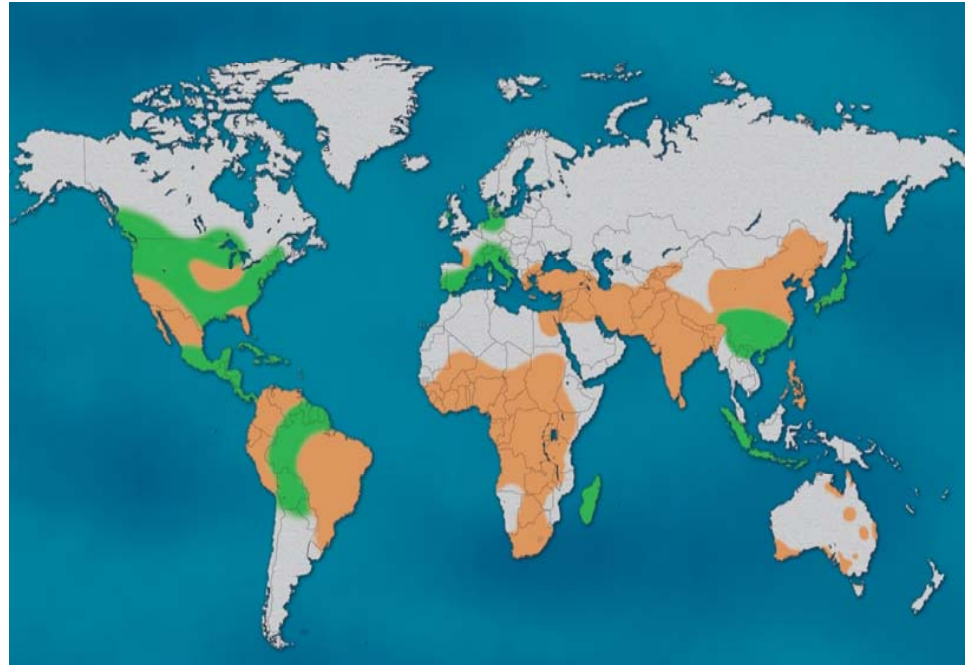
because they don't get enough zinc through their diets. A few extra milligrams of zinc every day can make a huge difference. Zinc-containing supplements are a quick and easy, effective and inexpensive remedy.

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.

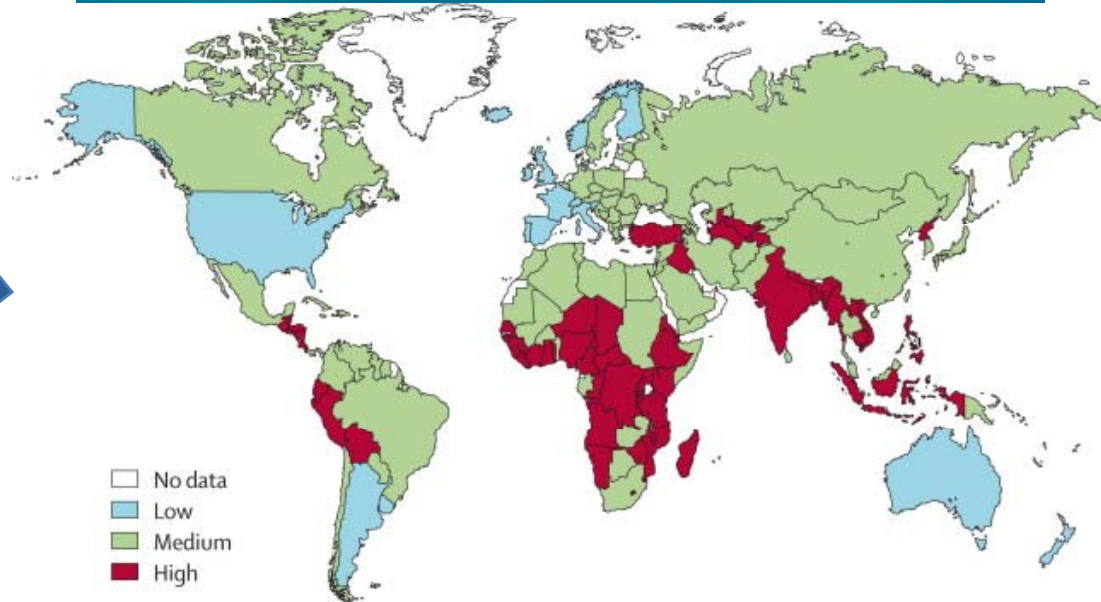
Zinc...essential for life



World Map – Zinc Deficiency



Soils



Humans



Zinc...essential for life

Examples of Zinc Deficiency

Wheat



**Severe Zn
deficiency**

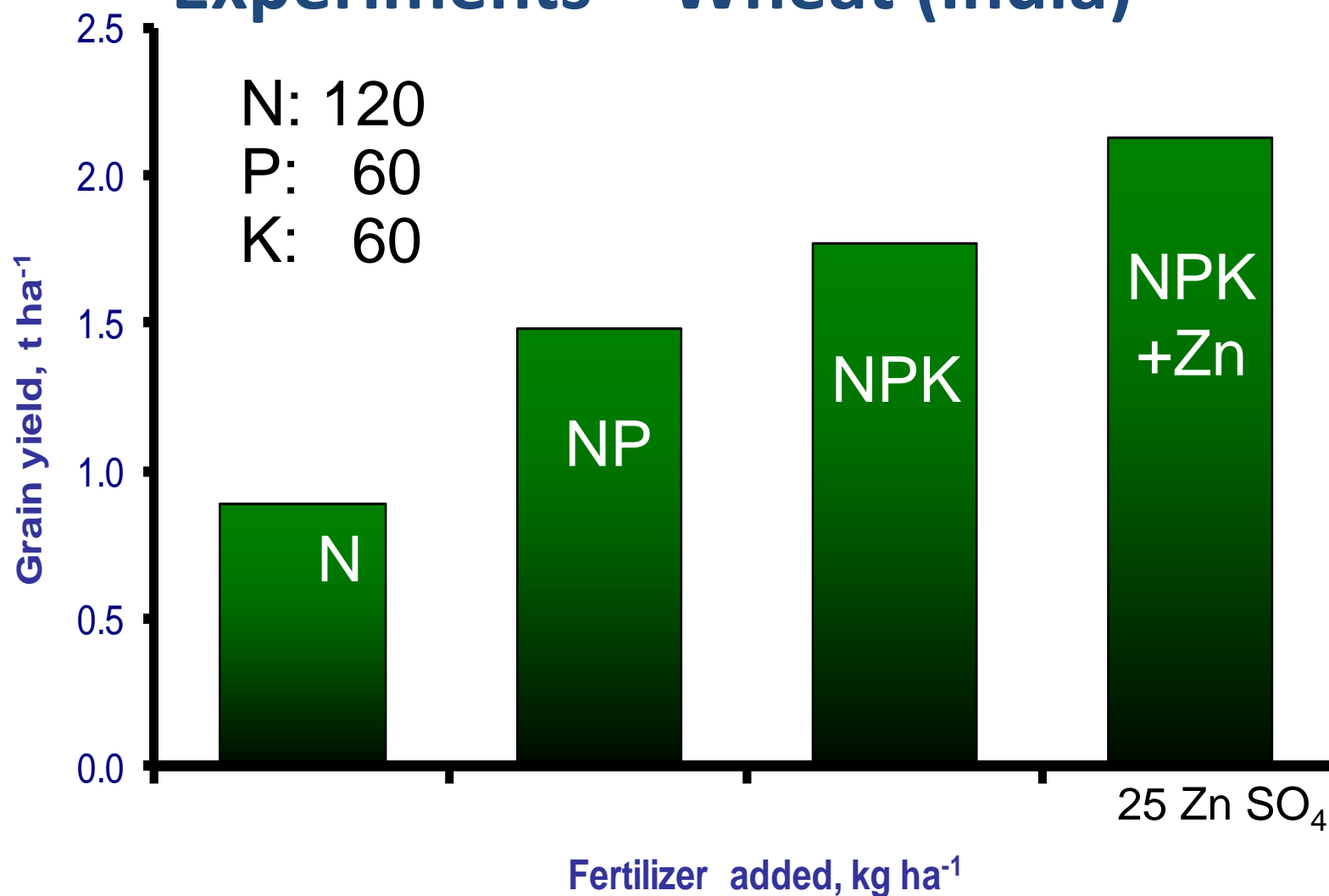


Zn treated plot



Impact of Zinc: 20-50% Increase

Experiments – Wheat (India)





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**





Demonstration Field Trails

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

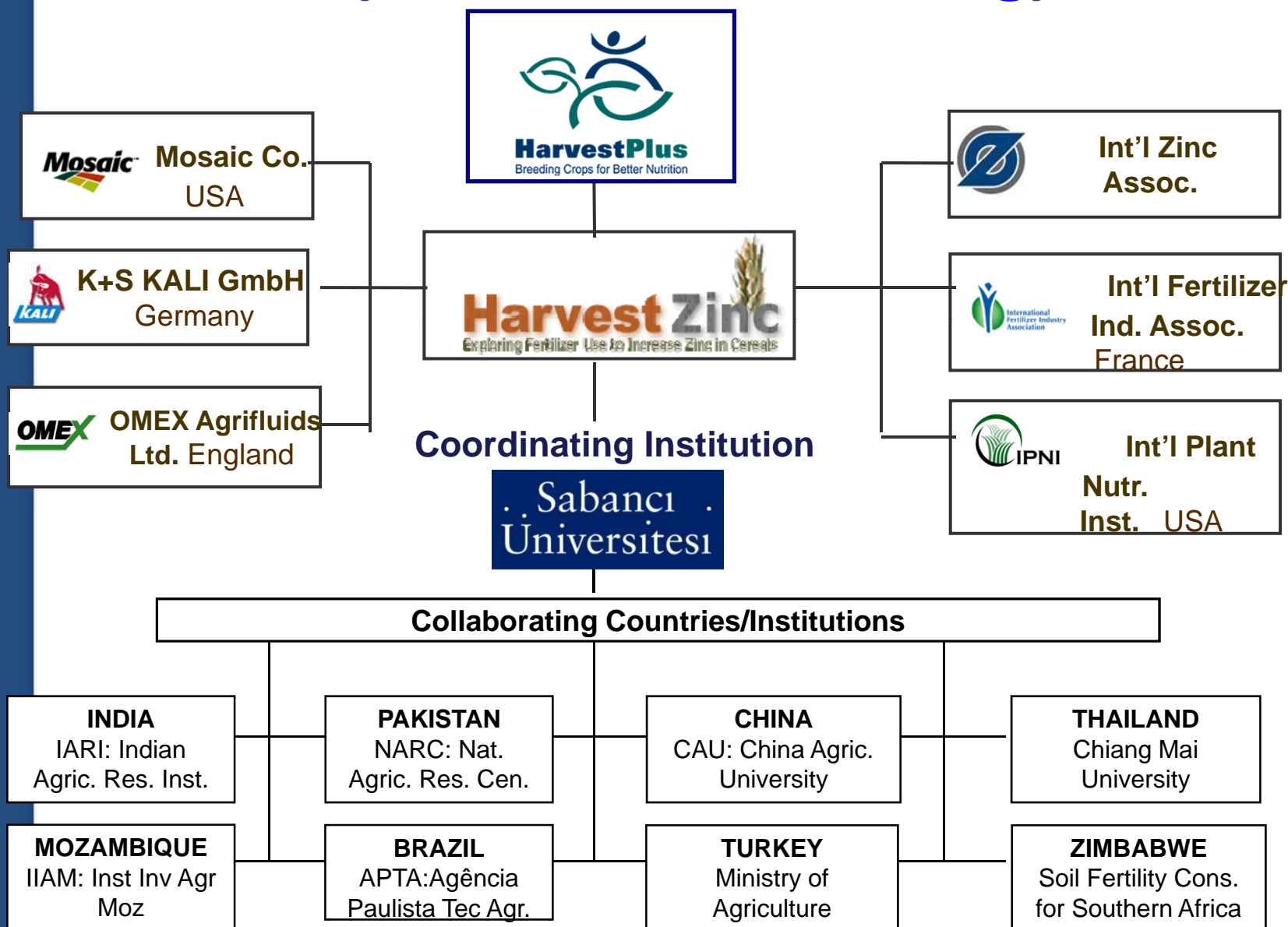
- ☐ study the effects of Zn fertilization on yield and nutritional status
- ☐ increase local awareness of the importance of zinc fertilization





Harvest Zinc Fertilizer Project

(www.harvestzinc.org)





Zinc...essential for life

Zinc Fertilizers: Code of Practice

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





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



Case Study: A Success Story with Zinc Fertilizers in Central Anatolia

Introduction

Until the early 1990s, wheat grown in the Central Anatolia region, which is a major cereal production area in Turkey (4.5 million hectares), showed chlorotic and necrotic spots on their leaves, had reduced shoot growths, and most importantly, produced low crop yields.

Since this discovery, several soil and environmental factors have been assessed as possible reasons for the problems seen in the wheat, such as water deficiency, pathogenic infections, heat stress, boron toxicity, and micronutrient deficiencies. Soils in the region were also known to be extremely poor in moisture and organic matter, and high levels of pH and calcium carbonate. These factors typically result in zinc being deficient in the soils for use by crops.

The Zinc Project

A field experiment was completed at the Transitional Zone Agricultural Research Institute in Eskişehir by Mr. Murat Kalyel in order to demonstrate the effect of different micronutrients on wheat and barley. The results of this first field trial showed that the addition of zinc resulted in significantly increased grain yield, and the necrotic and chlorotic symptoms on leaves were not developed (Figure 1). On average, zinc application enhanced grain yield of the wheat and barley crops by approximately 55%, while other micronutrients had little to no effect on the yield.

In order to identify the underlying cause of this growth problem in wheat further a long-term, multi-institutional project was conducted between 1993-1997 in

Central Anatolia as a NATO-funded Zinc project under direction of Professor İsmail Çakmak. In many locations, there were spectacular increases in grain yield resulting from application of zinc fertilizers. In certain areas where zinc availability was low in soils, wheat grain yield was extremely low and was not economic (e.g., 250 kg ha⁻¹). Applying zinc fertilizers on these soils resulted in substantial increases in growth and enhanced grain yield by a factor of 6-8 to around 2,000 kg ha⁻¹ from approximately 250 kg ha⁻¹.

Besides such extreme regions, there were also a number of locations in Central Anatolia where zinc fertilizers increased grain yield at least 20% and eliminated development of chlorosis and necrosis on leaves. It was also demonstrated that the yield-increasing



Zinc
nutrient
initiative





Communication Activities:



Zinc
nutrient
initiative

Issue No. 1
July 2009

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-elapased 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 in Fertilizers

Essential for Crops...Essential for Life!



Zinc
nutrient
initiative





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).

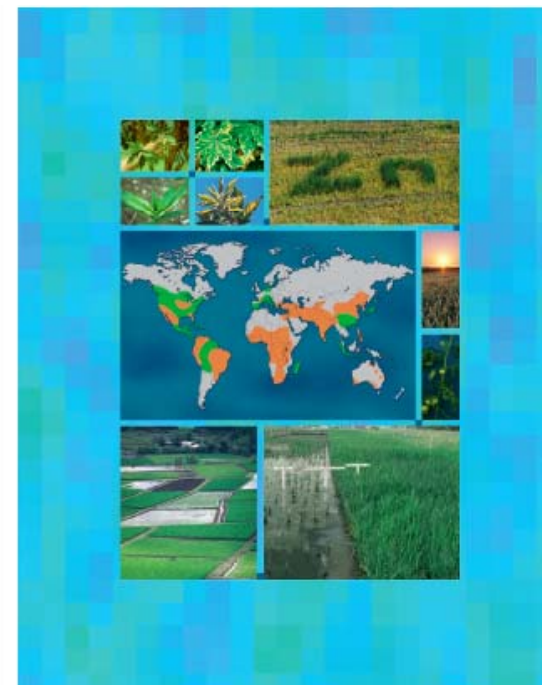
Table 1: Rice Yields With and Without Adequate Zinc

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





Communication Activities:



Zinc
nutrient
initiative

Numerous key publications
in trade and academic
journals

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

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 5-40 µg Zn/l and biomass (25-200 µg Zn/kg 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.

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-

A key micronutrient

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.

Fertilizer International 429 | March-April 2009

1



Zinc...essential for life

www.zinc-crops.org

International Zinc Association

Zinc...essential for life

- Zinc is Natural
- Zinc is Essential
- Zinc is Durable
- Zinc is Sustainable
- Zinc is Vital

Latest Zinc in Fertilizers Newsletter...

[Home](#) [Key Information](#) [Publications](#) [Conferences and Papers](#) [Links](#)

Zinc in Fertilizers

The Zinc Nutrient Initiative, a program of the International Zinc Association (IZA), seeks to address zinc deficiency in soils, crops and humans through the increased use of zinc in fertilizers.

Latest News...

addressed in a cost-effective way with vitamin A and zinc supplementation.



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
In Improving Crop Production
& Human Health in India

A meeting is scheduled for April 29, 2009 in New Delhi, India to discuss available information on the essentiality and roles of zinc in crop production and human health. The primary focus will be the importance of zinc in fertilizers for production of better yield and healthy food for human consumption in India. Zinc deficiency is the most common micronutrient deficiency in soils in India that affects seriously adequate crop production and also hinders sufficient accumulation of zinc in edible parts of food crops. International and local speakers will present presentations dealing with the aspects of zinc deficiency-related problems in crop production and human nutrition, and panel discussions will follow.

The event is being organized by the Fertilizer Association of India (FAI) and International Zinc Association (IZA) in collaboration with HarvestPlus Program.

Inaugural Session
Welcome Address: Mr. Satish Chander, Director General, FAI, New Delhi
Opening Remarks: Dr. Andrew Green, International Zinc Association
Inaugural Address: DG, ICAR/Mr. V.L. Chopra, Member Planning Commission
Vote of Thanks: Dr. R.K. Tewatia, Chief (Agri Services), FAI, New Delhi

Technical Session I: Dr. J.C. Khatyal, VC, CCSHAU, Haryana
Role of Zinc in Human Nutrition: Dr. Nita Bhandari, AIIMS, New Delhi
Prevalence of Zinc Deficiency in Soils & Crop Plants in India: Dr. M.V. Singh, Coordinator, Secondary & Micro, IIS, Bhopal
Role of Zinc Nutrition in Rice-Wheat Production: Dr. Rajendra Prasad, Scientist, INSA
IZA's Zinc in Crops & Human Health Initiatives: Dr. Andrew Green, International Zinc Association
Lunch

Technical Session II: Dr. N.B. Singh, Agricultural Commissioner, DAC, GOI
Plant Breeding in Improving Zinc: Dr. Anja M. Singh, IARI
Role of Fertilizer Strate: Sabanci University, Turkey
Issues Concerning Mic: Policy Initiatives to En: Conclusions

Registration Contact:
Fertilizer Association of India
10, Warden St. Singh
Ming, New Delhi - 110
INDIA
Phone: +91-11-26067144
Fax: +91-11-26068052
e-mail: gen@faiindia.org

Zinc in Fertilizers
Zinc: In Improving Crop Production and Human Health in China
10 December, 2009 - Beijing, China

A symposium is scheduled for December 10, 2009 in Beijing, China to discuss available information on the essentiality and roles of zinc in crop production and human health. International and national speakers will make presentations dealing with the following topics:

- The importance of zinc in fertilizers for production of better yielding crops.
- The nutritional status of plants for healthy food and human consumption.
- Zinc deficiency problems in Chinese soils and crops.

For more information, please contact:
Professor Zhang Fusuao
China Agricultural University
Email: zhangfs@cau.edu.cn
Phone: 0086-10-62732499



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



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
nutrient
initiative



- **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.



International Zinc Association
Zinc ...essential for life
www.zincworld.org



International Zinc Nutrition Consultative Group
Improving health of people in need
by enhancing zinc nutrition
www.iznong.org