Zinc Nutrient Initiative

Zinc Fact Sheet: RICE

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. Furthermore, rice provides up to 80% of the calories consumed by 3.3 billion people in Asia.

Rice:

- staple food for nearly 1/2 the world's population
- 95% of rice crops are grown and consumed in Asia
- highest level of per capita rice consumption: Bangladesh, Cambodia, Indonesia, Laos, Myanmar, Thailand, and Vietnam
- highly subject to zinc deficiency

High yielding, nutrient rich rice requires improved, yet balanced, crop nutrition of all major, secondary and micronutrients. 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).

Results from 140 greenhouse trials based on soils from 17 provinces of China showed that 49% of the soils were deficient in zinc. When zinc was added to a variety of cereal crops, including rice, crop yields increased from 3.6% to as high as 35.3%.[1]

Table 1: Rice Yields With and Without Adequate Zinc

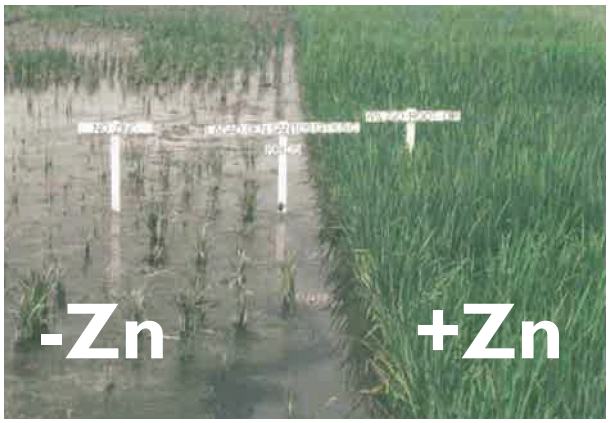
Country	+Zn (t/ha)	-Zn (t/ha)	% Change
Columbia	9.3	7.5	-19%
	11.3	10.3	-8%
	12.0	9.8	-18%
China	8.2	7.3	-10%
India	9.95	8.7	-12%

1. Alloway, B.J. 2008. Zinc in Soils and Crop Nutrition

Occurrence of Zinc Deficiency

Zinc deficiency is the most widespread micronutrient disorder in rice. Its occurrence has increased with the introduction of modern varieties, crop intensification and increased zinc removal. Soils particularly prone to zinc deficiency include:

- Neutral and calcareous soils containing large quantities of bicarbonate. On these soils (widespread in India and Bangladesh), zinc deficiency often occurs with sulphur deficiency.
- Intensively cropped soils where large amounts of N, P and K fertilizers (which do not contain zinc) have been applied in the past.
- Paddy soils under prolonged inundation (e.g. when three crops are grown in one year or when rice is grown in a low-lying area that does not adequately drain during fallow).
- Soils with high availability of phosphorus.



Rice Paddy with and without zinc fertilizer.

Correction of Zinc Deficiency

Where zinc soil tests confirm a zinc deficiency, or where a zinc deficiency is suspected, 5-10 kg/ha of zinc as zinc sulfate, zinc oxide or zinc chloride should be incorporated in the soil before seeding or transplanting. Zinc can also be effectively incorporated into an NPK granulated fertilizer or mixed in a blend. Although it has been shown that zinc applications can last several years, under severe zinc deficiency situations or in intensely managed and high yielding cropping systems, annual applications of zinc are recommended.

Balancing Crop and Human Nutrition

Zinc deficiency in crops directly correlates to zinc deficiency in humans, a critical issue with significant impacts on food security and health. Adding zinc to soils and crops can make a key contribution towards the global food production and nutritional value problem with significant social, health, and economic benefits.

In human health, zinc deficiency is the fifth leading cause of death and disease in the developing world—a fact that is gaining global attention. The World Health Organization (WHO) estimates that 800,000 people die annually due to zinc deficiency, with 450,000 of these being children under the age of five

When combined with the use of improved plant varieties, proper soil fertility management contributes significantly to the goal of increasing the zinc content of rice grain for improved human nutrition.

Zinc ...essential for life

The Zinc Nutrient Initiative was launched by The International Zinc Association (IZA) in response to the critical issue of zinc deficiency in soils, crops and humans. To learn more, visit: www.zinc.org/crops.

IRRI

The International Rice Research Institute (IRRI) helps reduce global poverty & hunger by helping farmers grow more rice & keep people & the environment healthy. To learn more, visit: www.irri.com.