



Tropentag, October 7-9, 2008, Hohenheim

“Competition for Resources in a Changing World:
New Drive for Rural Development”

Balanced Fertilisation – A Prerequisite for a Sustainable Improvement of Crop Yield and Quality in Developing Countries

GEORG EBERT, FLORIAN WICHERN

K+S Kali GmbH, Germany

Abstract

In developing countries, the plant nutrient input into agricultural systems by organic and mineral fertiliser is often low and thus limiting crop yield. In Africa, so-called nutrient mining results in nutrient loss of up to 100 kg nutrient ha⁻¹ year⁻¹. Nutrient mining (esp. P and K) has become a serious problem for crop production not only in Africa but also in many Asian countries. In these regions, the most widespread used fertiliser is urea, which is often applied in large quantities. Generally, in most of these countries, N is used in higher quantities as compared to P, K, Mg and micro nutrients. Consequently, soil fertility along with water, another serious threat for crop production in developing countries, will be negatively affected by nutrient imbalances. This nutrient imbalance has a number of detrimental effects on crop production: decrease of area productivity (yield/ha), decrease of N efficiency (*i.e.* less crop output per kg N used), lower plant resistance to pests and diseases and a lower product quality in terms of mineral content, vitamins and others. Nutrient imbalances and the use of large quantities of N-fertiliser also results in negative environmental effects associated with N, such as nitrate leaching and N₂O-emission. Moreover, the lack of micro nutrients (first of all Zn) has led to lower crop yield but also to nutritional problems for consumers. Today, Zn deficiency is regarded as one of the most serious causes for malnutrition of children. This is reflected by special Zn promoting programmes of the FAO, Bill Gates Foundation and other organisations.

In the present study, we show results from various field trials carried out in India and other Asian and African countries showing the detrimental effects of unbalanced NPK fertilisation on crop yield and on soil fertility. Our results indicate that K improves water use efficiency and nutrient availability in soils, that Mg improves assimilate production and translocation in the plant and that S improves plant resistance. We show the practical relevance of balanced fertilisation and economic benefit for some crops against the background of increasing fertiliser prices.

Keywords: Crop quality, fertilisation, nutrient cycling, nutrient mining, soil fertility