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“Bridging the gap between increasing knowledge and decreasing resources”

## Availability and Management of Silicon Nutrition to Rice Plants in Contrasting Southeast Asian Regions

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### Abstract

Silicon (Si) is a beneficial element for rice plants. The plant accumulates up to 10 % Si, which precipitates in plant tissue forming amorphous Si bodies, so-called ‘phytoliths’. A sufficient Si supply can enhance the strength and rigidity of rice plants, improve their resistance against pathogens, the efficiency of fertilisers, and prevent the uptake of toxic metals.

Our aim is to develop recommendations on an adequate management of Si in contrasting regions.

Plant-available Si concentrations in the fields were significantly higher in the Philippines than in Vietnam; differences between both countries are much larger than differences within the regions. We refer this finding to differences in geo- and pedologic conditions between both countries. In Vietnam, soil material derived from older land surfaces and are in comparison to the Philippines stronger weathered and thus desilicated. In the Philippines, soils were more recently formed and are in parts influenced by active volcanism and therefore high amounts of plant-available Si are released during mineral weathering. Also Si concentrations of rice plants were higher in the Philippines than in Vietnam. Si concentration in straw positively correlates with concentration of plant-available Si up to a level of 9–10 % Si in plants and 0.3 g kg<sup>-1</sup> acetate-extractable Si in soils. Higher concentrations of plant-available Si do not lead to an increase of Si uptake. Moreover, variation in plant-available Si status within regions might be due to management of rice straw (i.e., some farmers burn the straw, some export part of the straw or ash from fields). The straw comprises about 70 % of total plant Si uptake. Results of laboratory and field experiments on silicon cycling, effects of phytoliths addition (with rice straw or ash from rice straw) and of easily dissolvable silica-gel addition to topsoils on Si in soil solution, plant-Si-uptake, and plant growth will be presented.

**Keywords:** Paddy, Philippines, phytoliths, silicon, Vietnam