



Controls on silicon cycling in Southeast Asian rice production systems

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Recent research suggests that silicon (Si) is beneficial for rice plants, i.e. a sufficient Si supply improves their resistance against pests and pathogens and increases the uptake of essential nutrients. Despite its potential importance for rice yields, cycling of Si in rice production systems is poorly studied. We assess plant-available Si (Sipa; determined using acetate extraction) in topsoils (Ap+Arp horizons) and Si uptake by plants at 70 paddy fields managed by local farmers in contrasting regions of Vietnam and the Philippines. First results show that Sipa contents are considerably larger in Philippine (217 ± 100 mg Sipa kg⁻¹) than in Vietnamese (32 ± 19 mg Sipa kg⁻¹) paddy soils. Rice straw from the Philippines contains 8.6 ± 0.9 % Si, straw from Vietnam 5.0 ± 1.2 % Si. Laboratory experiments showed that Si is limiting the growth of rice plants in some of the Vietnamese soils. We assume that differences in geo-/pedologic conditions between Vietnam and the Philippines explain the data. Large Sipa contents in the Philippine soils are due to recent rock formation by active volcanism, hence, by a large Sipa input due to mineral weathering in recent geologic history. In contrast, parent materials of the Vietnamese paddy soils derive from old and highly weathered land surfaces. Hence, our data suggest that geo-/pedologic conditions are the main control for the availability of Si in paddy soils. Currently, we examine the relevance of agricultural practices for small-scale differences in the availability of Si within regions. Inadequate practices, such as removal of rice straw from the fields, might deplete Sipa in paddy soils causing a decrease in rice yields in some regions of Vietnam. We investigate the role of phytoliths (amorphous Si bodies contained in rice straw) as source of Sipa in paddy soils. Our methods include laboratory experiments and the assessment of turnover times of phytoliths in paddy soils; first results will be presented and discussed at the EGU conference.