

Silicon 'plant stones' for strong rice: Fertilizing and recycling Si in Vietnamese fields

October 1 2015



Lost in rice: this image shows a farmer walking on a bund between the submerged rice fields in Northern Vietnam. Credit: Hans-Christian Marxen

Recent research showed that silicon (Si) is an important nutrient

enhancing the durability of rice plants, however, what controls on Si availability in soils still remain poorly studied. Researchers of the LEGATO project tested the effects of Si fertilization on Si uptake and growth of rice and on decomposability of the produced straw in Northern Vietnam. The study was published in the journal *Plant and Soil*.

Silicon quite literally pumps up the strength of a [rice](#) plant. Rice takes up Si with the [soil](#) solution and forms amorphous Si dioxide bodies within the plant tissue, the so-called phytoliths (literally translated "plant stones"). These phytoliths make the plant stem and leaves stronger and more rigid. Thus, a sufficient Si supply enhances the [plants'](#) resistance against heavy rain and wind and against attacks of pests and fungi.

Undoubtedly, an indispensable element for sustainable rice production, the processes which control Si availability in the soil remain rather understudied. In their paper Anika Marxen from the Helmholtz Centre for Environmental Research - UFZ and her team study rice soils in Vietnam in order to understand these processes, providing scientific base for future recommendations for sustainable rice production.

Silicon is contained in most soil minerals and mineral weathering slowly releases the important element into the soil solution. In Vietnam, soils are strongly weathered due to high temperatures and precipitation which means that Si availability is very low.

The study shows that Si application to the soil increased Si uptake by rice and rice grain yield. When the produced rice straw (that is Si-rich) is left on the field after harvest, a large proportion of the Si is released during straw decomposition and is available for the upcoming rice crop. Thus, Si is recycled and Si supply for rice plants can be maintained on a high level with one single fertilizer application for many cropping seasons.

Lignin, a hardly degradable carbon compound in plant cells, has the same function than phytoliths have, which is to give the plant stability. The formation of lignin is energetically much more expensive for the plant than the formation of phytoliths. Therefore, increased Si availability and uptake by rice probably lowers lignin formation and thus fastens decomposition and nutrient release of the produced straw. Hence, Si fertilization might also exert effects on the cycling of other important nutrients, with yet unknown consequences for [rice plant](#) growth.

"Our study showed positive effects of Si fertilization on rice growth and decomposability of the produced straw, however Si cycling must be understood in more detail before applying Si fertilizer at a large scale. More research is certainly needed, but these first steps seem to take us in the right direction," comments Anika Marxen.

More information: Marxen A, et al. (2015) Interaction between silicon cycling and straw decomposition in a silicon deficient rice production system. *Plant and Soil*. [DOI: 10.1007/s11104-015-2645-8](https://doi.org/10.1007/s11104-015-2645-8)

Provided by Pensoft Publishers

Citation: Silicon 'plant stones' for strong rice: Fertilizing and recycling Si in Vietnamese fields (2015, October 1) retrieved 26 June 2024 from <https://phys.org/news/2015-10-silicon-stones-strong-rice-fertilizing.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.
