# SOIL SCIENCE COLLOQUIUM

## Guest speaker

## Tuesday 7th of Dec 2021, 4.15 pm – 5.15 pm

## Limiting As in rice through water and Si management

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**ABSTRACT.** Rice is a staple food for half of the world; therefore, it is imperative to ensure that rice yields increase as demand for food increases. Arsenic (As) poses a double threat to global food security by lowering rice yields and directly impacting human health via consumption of As-contaminated grain. The flooded soil conditions under which most rice is grown facilitate As mobilization through reductive dissolution of As-bearing Fe (oxyhydr)oxide minerals. This released As can be re-adsorbed by soil minerals including Fe plaque, methylated by soil microbes, or taken up by rice roots and eventually transported to grain.

One strategy to limit As concentrations is by growing rice under less flooded conditions (i.e., water management). Another strategy is through soil Si management due to the competitive interaction between As and Si. Most of the arsenic entering plant roots in flooded soils is present as the reduced inorganic form, arsenite, which is carcinogenic and is fully protonated under circumneutral conditions. Under these conditions, arsenite is chemically similar to dissolved Si (as silicic acid) and both are transported into rice roots via the same pathway. Rice plants demand high quantities of Si, higher than N, P, and K, and this Si is stored at levels up to 10% in straw and hulls in a relatively bioavailable form. However, these Si-rich materials are removed with each harvest. While most soil contains ~30% Si, most is tied up in secondary soil minerals and is largely unavailable to plants. Thus, many highly-weathered rice soils are expected to be Si deficient. Research in the Seyfferth lab has focused on return of Si-rich rice residues to rice soil, to help improve yields and decrease inorganic As uptake into grain, on the impact of Si addition on As-sorbing Fe plaque minerals and localization of As species in the grain using conventional and advanced spectroscopic techniques. This talk will discuss how changes in water management and Si availability affect root Fe plaque

mineralogy, and As speciation and localization in planta in the context of global food security.

**BIO.** Prof. Angelia L. Seyfferth obtained her doctoral degree in Soil and Water Sciences at University of California, Riverside. Later she joined Stanford University as a Postdoctoral scholar. Since 2012 she has been part of the University of Delaware first as Assistant Professor and then as an Associate Professor since 2018. Her research is borderline between soil, plant, ecosystem, chemical and biological sciences, along with engineering to understand the biogeochemical cycles of different elements and their impact on society.

**You are welcome to attend virtually in the Zoom seminar room.**

The presentation will be followed by a talk by Hang Guan, doctoral candidate from the Soil Science Group, on the topic:

"*The effects of soil microbes and plant growth on arsenic fate in the soil environment*."