Journal of Agriculture, Ecosystems & Environment

Editor-in-Chief: J. Fuhrer

ISSN: 0167-8809

SJR Info:

http://www.scimagojr.com/journalsearch.php?q=15110&tip=sid&clean=0

H Index: 120

1. Most Downloaded

Soil erosion in the humid tropics: A systematic quantitative review

Abstract

Healthy soils provide a wide range of ecosystem services. But soil erosion (one component of land degradation) jeopardizes the sustainable delivery of these services worldwide, and particularly in the humid tropics where erosion potential is high due to heavy rainfall. The Millennium Ecosystem Assessment pointed out the role of poor land-use and management choices in increasing land degradation. We hypothesized that land use has a limited influence on soil erosion provided vegetation cover is developed enough or good management practices are implemented. We systematically reviewed the literature to study how soil and vegetation management influence soil erosion control in the humid tropics. More than 3600 measurements of soil loss from 55 references covering 21 countries were compiled. Quantitative analysis of the collected data revealed that soil erosion in the humid tropics is dramatically concentrated in space (over landscape elements of bare soil) and time (e.g. during crop rotation). No land use is erosion-prone per se, but creation of bare soil elements in the landscape through particular land uses and other human activities (e.g. skid trails and logging roads) should be avoided as much as possible. Implementation of sound practices of soil and vegetation management (e.g. contour planting, no-till farming and use of vegetative

buffer strips) can reduce erosion by up to 99%. With limited financial and technical means, natural resource managers and policy makers can therefore help decrease soil loss at a large scale by promoting wise management of highly erosion-prone landscape elements and enhancing the use of low-erosion-inducing practices.

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2. Recent Article

The nature of biogenic Si and its potential role in Si supply in agricultural soils

Abstract

Although the biogenic pool of Si in soils is known to be of central importance to plant uptake and Si cycling in natural forest and grassland ecosystems, its role in agricultural systems is controversial and unclear. The biogenic pool is mainly composed of phytogenic (plant-derived) amorphous silica (deposited in plant shoots as phytoliths) but there are also minor components of zoogenic, microbial and protistic silica. In natural ecosystems the pool of biogenic Si in the soil is typically several orders of magnitude greater than annual plant uptake so slow dissolution of this Si pool supplies the plant with Si (as silicic acid) while litter fall replenishes the pool with newly-formed phytolith Si. However except for grazed pastures, such cycling of Si is much decreased under agriculture because phytolith Si is removed from the field in harvested products and crop residues. For graminaceous crops, which commonly accumulate Si and are Si responsive (e.g. rice and sugarcane) only about 20% of accumulated Si is present in harvested products (e.g. harvested grain or cane) and the remaining 80% is present in harvest residues (straw or cane trash). The extent of phytolith Si removal, and thus rate of diminution of the biogenic pool of soil Si, is therefore greatly dependant on the magnitude of Si uptake by the crop and whether crop residues are retained or removed. Where crop residues are regularly returned to the soil, and for pastoral soils, biogenic Si will remain a significant source of potentially available Si. Thus, in addition to routine soil tests for Si using neutral salt or acidic reagents, an additional broad estimate of biogenic Si (e.g. alkali-soluble Si) is likely to improve evaluation of potentially plant available Si in many agricultural soils.

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3. Most Cited

The knowns, known unknowns and unknowns of sequestration of soil organic carbon

Abstract

Soil contains approximately 2344. Gt (1 gigaton = 1 billion tonnes) of organic carbon globally and is the largest terrestrial pool of organic carbon. Small changes in the soil organic carbon stock could result in significant impacts on the atmospheric carbon concentration. The fluxes of soil organic carbon vary in response to a host of potential environmental and anthropogenic driving factors. Scientists worldwide are contemplating questions such as: 'What is the average net change in soil organic carbon due to environmental conditions or management practices?', 'How can soil organic carbon sequestration be enhanced to achieve some mitigation of atmospheric carbon dioxide?' and 'Will this secure soil quality?'. These questions are far reaching, because maintaining and improving the world's soil resource is imperative to providing sufficient food and fibre to a growing population. Additional challenges are expected through climate change and its potential to increase food shortages. This review highlights knowledge of the amount of carbon stored in soils globally, and the potential for carbon sequestration in soil. It also discusses successful methods and models used to determine and estimate carbon pools and fluxes. This knowledge and technology underpins decisions to protect the soil resource.

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4. Open Access Article

مقاله ی زیر بصورت کامل قابل دریافت و درصورت تمایل قابل ترجمه می باشد

Understanding variability in the benefits of N_2-fixation in soybean-maize rotations on smallholder farmers' fields in Malawi

Abstract

Soybean production can contribute to the nitrogen economy of smallholder farming systems, but our understanding of factors explaining variability in nitrogen fixation and rotational benefits across farms and regions is limited. Biological nitrogen fixation (BNF) was quantified with the natural abundance method in 150 farmer-managed soybean plots under different varieties and inputs in Dowa, Mchinji and Salima districts of Malawi. Soybean yielded on average 1.2 t ha^{-1} grain and the above-ground biomass at mid pod filling (R5.5) was 2.8 t ha^{-1} and contained in total 63 kg ha^{-1} nitrogen derived from the atmosphere (Ndfa). Locally sourced varieties obtained a larger %Ndfa (65%) than the 'improved' variety Nasoko (53%). The %Ndfa was positively associated with soil sand content, sowing date, plant population and biomass accumulation, but it was not affected by inoculation with rhizobia or the combination of inoculation and NPK fertiliser application. Quantities of N_2 fixed differed between regions and

years, and was enhanced by applying inoculant and fertiliser together, leading to more biomass accumulation and larger grain yields. Soil available P and exchangeable K contents also increased the total amount of N_2 fixed. In a related trial, continuous maize yields were compared with maize following soybean in 53 farmer-managed fields. Average yield in continuous maize was 2.5 t ha^{-1}, while maize after soybean produced 3.5 t ha^{-1} (139% of continuous maize). Farmers with higher maize yields, who applied external nutrient inputs, and with a larger value of household assets achieved greater yield responses to rotation with soybean. A relative yield increase of more than 10% was observed on 59, 90 and 77% of the fields in Dowa, Mchinji and Salima respectively. We conclude that fields of soybean and maize that receive adequate nutrient inputs and good management to ensure good yields benefit most in terms of quantities of N_2 fixed by the legume and the yield response of the following maize crop. The results suggest that the promotion of soybean-maize rotations should be done through an integrated approach including the promotion of appropriate soil and crop management techniques. Furthermore, they suggest that wealthier households are more likely to apply adequate nutrient inputs and good crop management practices and are likely to receive larger maize yield responses to the incorporation of soybean.

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