Keynote Speech

Artificial macropores installation to restore organic matter in soils

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Abstract
Soil is the largest terrestrial carbon storage; it contains carbon as much as three times of plant biomass and two times of the atmosphere. Surface layer is the most fertile zone which is rich in organic matter. However, this fertile zone is degraded from rough land management, and also removed by heavy rain, which is considered as the effect of climate change. The typical characteristics of these degraded soils are poor in infiltration. Lack of organic matter fails to create soil aggregates and surface crust tends to be formed at the surface soils. Traditional countermeasure for this situation in cultivation is soil turn over. It makes soil layer softer, agricultural jobs easier and enhances infiltration. However, it may also break soil aggregates and make soils drier, which would be a cause of erosion and loss of organic matter. X-ray CT images of the natural soils showed that root created macropores were predominant. The tubular pore networks helps water and solute movement. Therefore, artificial macropores were installed in degraded red-yellow soils to enhance vertical infiltration without cultivation. Fibrous materials were inserted in the macropores to reinforce its structure while enhancing infiltration with their capillary force. Macropores and control (no macropore) plots were established and bulk density, hydraulic conductivity, plant biomass and total carbon in soil were measured. The results after one-year macropores installation were that bulk density was lower and hydraulic conductivity was relatively higher at macropores plot than that of the control plot. In addition, plant biomass and total carbon were larger at macropores plot. There was a concern that introduced fresh water with nutrient and oxygen would decompose organic matter. However, enhancing infiltration along with naturally occurred nutrient would positively affect plant growth which subsequently helps carbon storage in soils.

Keywords: Carbon sequestration, Climate change, Infiltration, Macropore, Root channel

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