Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HGG28-03 Room:102B Time:May 23 16:00-16:15

Land rehabilitation methods based on the refuse input: local practices of Hausa farmers in the Sahel, West Africa

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To develop the land rehabilitation methods in Sahel of West Africa, it is necessary to examine the indigenous knowledge and daily practice against desertification. In order to avoid the land degradation and crop failure problems, the Hausa farmers in Niger carry refuse as manure from their homestead into the degraded land of the millet fields. This degraded land is cemented and strongly acidic with poor nutrition and produces no plants or crops. The content of refuse is mainly organic materials such as plant residue and livestock excreta, and it can provide abundant N, C, P and nutritional salts with weak alkalinity.

The author carried out the in situ experiment and put urban trash of 0 kg/m^2 (plot 1), 5 kg/m^2 (plot2), 10 kg/m^2 (plot 3), 20 kg/m^2 (plot 4) and 45 kg/m^2 (plot 5) on the degraded solid sedimentary layer. After one year of trash input, the regenerated plant growth was 16 species of 2.6g/ m^2 on plot 2, 16 species of 33.4 g/ m^2 on plot 3, 35 species of 496.2 g/ m^2 on plot 4 and 17 species of 365.4 g/ m^2 on plot 5, although there was no plant growth on the degraded land of plot 1. According to the field observation, the termites drilled tunnels under the trash and carried up silt and clay from the underground for building their shelters over the organic matter. The rainwater percolated into the ground through the termite tunnels of the cemented sedimentary layer, in spite of flowing away on the sedimentary layer.

Refuse input increased soil porosity as well as termite activity, which promoted moisture retention as well as penetration. The rises of the trash were able to catch the wind-blown sand as well as organic materials provided by sandstorm, and to disperse rainwater running off on the ground. These wind-blown sand, and clay and silt lifted up by the termites were important for improving soil physical property for the millet cultivation. The trash on the cemented sedimentary layer prevented from soil erosion and exposure of the cemented sedimentary layer. refuse input of 20 kg/m2 remarkably improve soil moisture for only the first year as well, whereas land degradation afterwards was somewhat slower.

The Hausa farmer and the Fulbe nomad interviewed for the experiment also agreed that the refuse amount at 20 kg/m2 scattered over Plot 4 was effective in preparing pearl millet fields and grazing grounds. Because the Sahel area has seen rapid population growth, and land use pressure by both cultivators and pastoralists are high, it is critical that degraded land is rehabilitated for new fields and grazing grounds. The critical amount of urban refuse was at least 20 kg/m2. However, the improved soil property deteriorated after two years due to depletion of nutrients through termite activity, grazing, and utilization by people, and sand grain erosion from wind and rain. Land degradation was greater with sloped topography with more soil erosion. In order to maintain plant productivity recovered using urban refuse, it is necessary for continuous input of refuse to compensate for nutrient depletion from wind and rain erosion.

Keywords: Sahel, land degradation, desertification, revegetation, termite, urban refuse