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Soil hydrological and soil property changes resulting from termite activity on agricultural fields in Burkina Faso

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Termites are important ecosystem-engineers in subtropical and tropical regions. The effect of termite activity affecting soil infiltration is well documented in the Sahelian region. Most studies find increased infiltration rates on surfaces that are affected by termite activity in comparison to crusted areas showing non-termite presence.
Crusted agricultural fields in the Sanmatenga region in Burkina Faso with clear termite activity were compared to control fields without visual ground dwelling termite activity. Fine scale rainfall simulations were carried out on crusted termite affected and control sites. Furthermore soil moisture change, bulk density, soil organic matter as well as general soil characteristics were studied.
The top soils in the study area were strongly crusted (structural crust) after the summer rainfall and harvest of millet. They have a loamy sand texture underlain by a shallow sandy loam Bt horizon. The initial soil moisture conditions were significantly higher on the termite plots when compared to control sites. It was found that the amount of runoff produced on the termite plots was significantly higher, and also the volumetric soil moisture content after the experiments was significantly lower if compared to the control plots. Bulk density showed no difference whereas soil organic matter was significantly higher under termite affected areas, in comparison to the control plots. Lab tests showed no significant difference in hydrophobic behavior of the topsoil and crust material. Micro and macro-structural properties of the topsoil did not differ significantly between the termite sites and the control sites. The texture of the top 5 cm of the soil was also found to be not significantly different.
The infiltration results are contradictory to the general literature, which reports increased infiltration rates after prolonged termite activity although mostly under different initial conditions. The number of nest entrances was clearly higher in the termite areas, but apparently did not significantly affect infiltration. The increased soil organic matter contents in the termite affected areas however, are as expected from literature, but did not improve soil aggregation which would be expected given the importance of organic matter in soil aggregation in this type of soils.
One of the explanations for the reduced infiltration rates might be that termites bring clay from the finer textured subsoil to the surface to build casts over the organic material on the surface (mainly millet stems). It is speculated that the excavated clay material could be involved in crust formation, only present is in the upper 0.5 cm of the soil crust, which is enough to block pores in the crust surface, hampering infiltration. The topsoil aggregates are slaking under the summer rainfall and the increase in fine textured material, excavated by the termites, could be incorporated into the crust and reduce infiltration. Furthermore this specific effect might also be related to the type of termite involved, as impacts from ecosystem engineers on their environment is highly dependent on the specific species involved.