

Linear-Macropore Installation for Red-soil Erosion at Sugarcane Field

-Column experiment toward field application-

*Eisei Morioka¹, Yasushi Mori¹, Kazutoshi Osawa², Akira Hoshikawa³

1. Graduate School of Environmental and Life Science, Okayama University, 2. Department of Agricultural Engineering, Utsunomiya University, 3. Sekiseishouko Coral Reef Fund

Red-soil erosion at sugarcane field has been reported as agricultural and environmental problems in Ishigakijima island, Okinawa. In this study, we set up 4 treatments, i.e., control, mulching, subsoiler (empty linear-macropore) and linear-macropore (subsoiling with filling gap by sugarcane residue). Infiltration experiments with artificial rainfall were conducted in the laboratory. Linear-macropore was introduced for the purpose of enhancing infiltration in parallel with reducing surface runoff, and sugarcane residue was inserted to reinforce the linear-macropore structure. Soil samples were taken from a sugarcane field in Ishigakijima island, Okinawa. They were sieved through a 2-mm screen and put into a column (4.9cm inner diameter 10cm depth) with a bulk density of 1.20g cm^{-3} . A 360min simulated rainfall with an intensity of 20mm h^{-1} was applied twice to the surface of the soil at a day interval. In each run, runoff and drainage were measured at 5min intervals. As a result, surface crust or impermeable layer was formed at the most of the treatments except mulching, which protected the soil surface from rain drop impact. The fissure or gap of subsoiler treatment was easily clogged with small soil particles, therefore, surface runoff was increased and drainage was decreased. However, surface runoff was reduced and more drainage through soil profile was observed with the linear-macropore column, because macropore enhanced infiltration and sugarcane residue in the gap reinforced the linear-macropore structure. All soil columns showed decline in hydraulic conductivity, however, mulching and linear-macropore showed relatively high conductivity compared to control and subsoiling. The differences were significant between subsoiling and linear macropore. Our results suggest that linear-macropore can be an effective strategy on farmlands in Ishigakijima island, Okinawa.

Keywords: red-soil, surface runoff, soil erosion, macropore, sugarcane