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A preliminary study on impact of agrochemical-free rice cultivation on soil characteristics

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Rice is the major staple crop in Sri Lanka. Rice is cultivated mostly using agrochemicals, both fertilizer and pesticides. This study was carried out to have an insight into the impact of agrochemical use on soil properties and hence soil fertility. Three adjacent sites were selected from Rammuthugala in the Gampaha District, to represent paddy fields cultivated with and without agrochemicals (both inorganic fertilizer and pesticides), and an abandoned field. Soil samples were collected from ten sampling sites randomly from each type of field, and from two depths, i.e. from surface down to 15 cm depth and from 15 – 30 cm depth. Five composite soil samples were prepared from each paddy field for each depth. All soil samples were collected one month after harvesting. As soil physical properties, water content, bulk density, porosity, texture, water saturation capacity and soil color were determined. Chemical properties, i.e. pH, saturated paste extract conductivity, Oxidizable matter/ organic carbon content, exchangeable Ca and Mg content (by EDTA titration method), Fe content and NO_3^- (by colorimetric method), total nitrogen content (by Kjeldhal method), available P content (by spectrophotometer method), loss on ignition (using muffle furnace), C: N ratio and exchangeable acidity were also measured. Earth worm density was determined as a surrogate variable for overall fertility of soil. “Sandy Clay Loam” soils were found in all three sites and the soil in the field cultivated without chemicals was dark grey to black in color indicating the presence of high organic matter content. It also contained the highest available water content as 43.53%, soil porosity as 52.62%, water saturation capacity 50.18%, optimum pH level, as well as highest saturation paste extract conductivity 257.40 $\mu\text{S}/\text{cm}$, and organic matter content 10.02%. The highest ex. Ca (3.1 me / 100 g content), exchangeable iron content (13.86 mg / kg) nitrate content (6.94 mg / kg), total nitrogen (N) (0.37%), and average. phosphorous (18.39 mg / kg), content along with organic matter (highest loss on ignition, 16.53%), C/N ratio (44.68), and CEC (6.27 meq / 100 g), lowest soil bulk density (0.47 g cm^{-3}) and exchangeable acidity (22.88 meq/ 100 g) were also observed more in this field than in the field where chemicals were used. Highest earthworm density (255.56 no / m^3) indicated improved overall soil fertility in the field cultivated without agrochemicals. The results indicate that agrochemical-free rice cultivation is healthier for soil than agrochemical based rice cultivation.

Keywords: Agrochemicals, modern farming, organic farming, rice cultivation, soil