World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Physical Properties of Rice Field Receiving Irrigation Polluted by Gold Mine Tailing: Case Study in Dharmasraya, West Sumatra, Indonesia

Authors : Yulna Yulnafatmawita, Syafrimen Yasin, Lusi Maira

Abstract : Irrigation source is one of the factors affecting physical properties of rice field. This research was aimed to determine the impact of polluted irrigation wáter on soil physical properties of rice field. The study site was located in Koto Nan IV, Dharmasraya Regency, West Sumatra, Indonesia. The rice field was irrigated with wáter from Momongan river in which people do gold mining. The soil was sampled vertically from the top to 100 cm depth with 20 cm increment of soil profile from 2 year-fallowed rice field, as well as from the top 20 cm of cultivated rice field from the terrace-1 (the highest terrace) to terrace-5 (the lowest terrace) position. Soil samples were analysed in laboratory. For comparison, rice field receiving irrigation wáter from non-polluted source was also sampled at the top 20 cm and anaysed for the physical properties. The result showed that there was a change in soil physical properties of rice field after 9 years of getting irrigation from the river. Based on laboratory analyses, the total suspended solid (TSS) in the tailing reached 10,736 mg/L. The texture of rice field at polluted rice field (PRF) was dominated (>55%) by sand particles at the top 100 cm soil depth, and it tended to linearly decrease (R2=0.65) from the top 20 cm to 100 cm depth. Likewise, the sand particles also linearly decreased (R2=0.83), but clay particles linearly increased (R2=0.74) horizontally as the distance from the wáter input (terrace-1) was fartherst. Compared to nonpolluted rice field (NPRF), percentage of sand was higher, and clay was lower at PRF. This sandy texture of soil in PRF increased soil hydraulic conductivity (up to 19.1 times), soil bulk density (by 38%), and sharply decreased SOM (by 88.5 %), as well as soil total pore (by 22.1%) compared to the NPRF at the top 20 cm soil. The rice field was suggested to be reclaimed before reusing it. Otherwise the soil characteristics requirement, especially soil wáter retention, for rice field could not be fulfilled.

Keywords : gold mine tailing, polluted irrigation, rice field, soil physical properties
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020