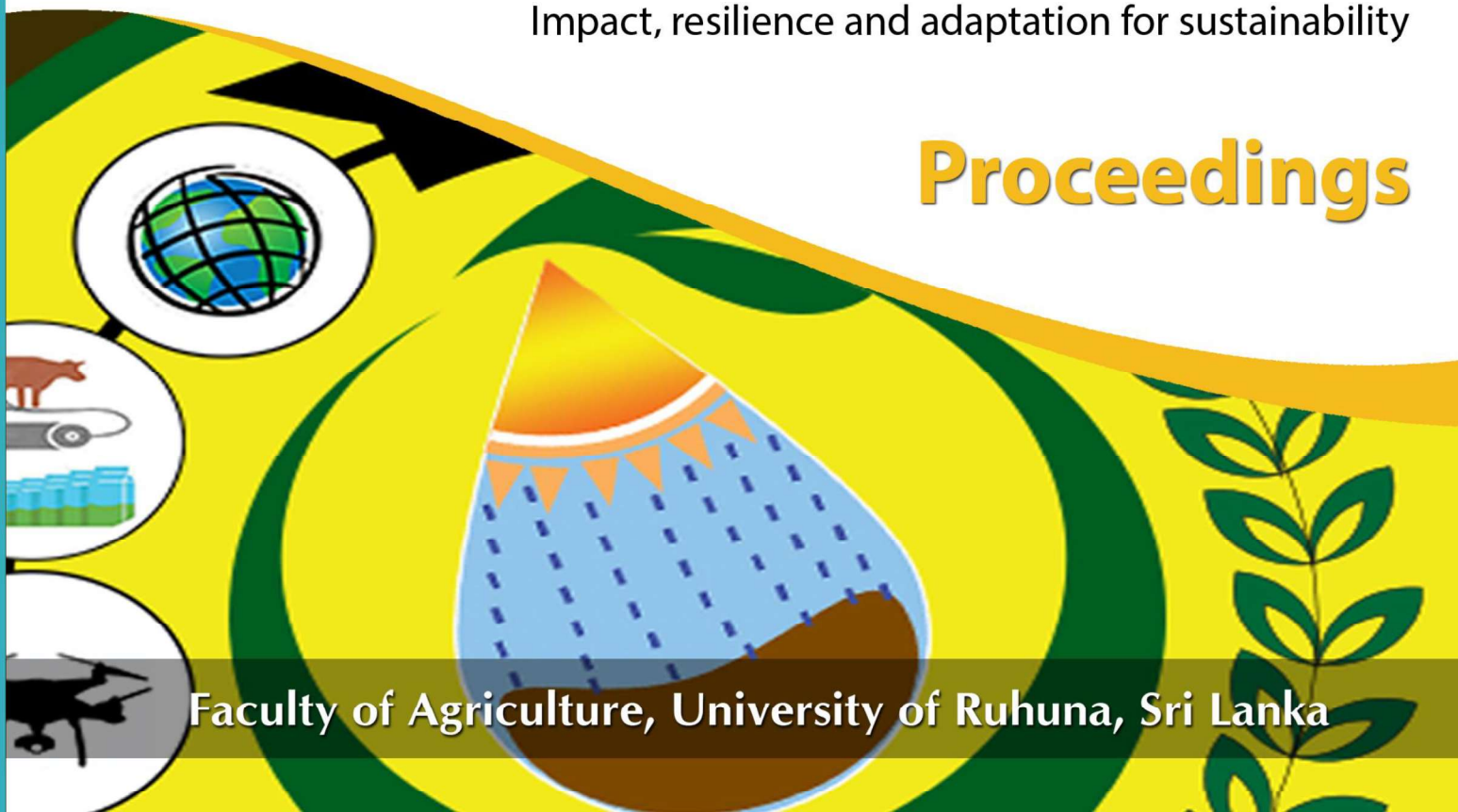
ISAE 2021

International Symposium on Agriculture & Environment

Challenges in Agriculture:
Impact, resilience and adaptation for sustainability

Proceedings



Faculty of Agriculture, University of Ruhuna, Sri Lanka

Impact of soil Nitrogen on below-ground Carbon dynamics of paddy soils in Sri Lanka

T.M. Paranavithana, S.U. Galketiyahewage and R.R. Ratnayake*

National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka

Abstract

Organic carbon accumulation in paddy ecosystems is faster and more pronounced than in other arable ecosystems. The carbon and nitrogen are stored predominately as organic forms in the soil, so mineralization affects both. Soil Nitrogen (SN) can be considered as an essential component of soil carbon sequestration. The combined effect of fresh organic C inputs with low soil N availability leading to a higher SOM mineralization rate and a lower Soil Carbon (SC) storage potential. Hence, soil C responses to N enrichment might play a key role in detecting potential atmospheric CO_2 concentration trajectories. Therefore, the current study was conducted to detect the relationships among soil C, N, and other influential chemical properties associated with C sequestration capacity in paddy soils of Sri Lanka. Conditional Latin Hypercube Sampling design (CLHs) was employed for the study covering all major paddy growing areas (wet, intermediate, and dry zones). One thousand pooled soil samples were collected throughout the country. Soil C and N contents were estimated by using CHN elemental analyzer. Soil pH and Electrical Conductivity (EC) were measured using standard protocols. Statistical analyses were performed using R statistical software. The current study reported the zonal average values of soil C and N contents under wet, intermediate, and dry climatic conditions. The average SC% for the wet zone (n=146) was 5.32 ± 2.82. Meanwhile, the average SC% for the intermediate zone (n= 179) and dry zone (n= 675) were 2.24 ± 0.75 and 1.91 ± 0.82. The average SN% for the wet, intermediate and dry zones were 0.51 ± 0.31, 0.22 ± 0.12 and 0.22 ± 0.17. Specifically, a highly significant, positive linear relationship was found between SC and SN contents ($r=0.73$, $p<2.2$ e-16). Furthermore, significant negative relationships were recorded between SC and pH ($r= -0.38$, $p<2.2$e-16) as well as SN and pH ($r=-0.30$, $p= 2.2$e-16). The study confirms that the increased level of soil N and low pH conditions enhanced the soil C storage potential in paddy soil. Thus, the modest increases in SC resulting from N fertilizer applications up to sensible agronomic rates would be useful in enhancing C sequestration capacity in paddy soils of Sri Lanka.

Keywords: Carbon sequestration, Nitrogen, Organic Carbon, Paddy Soil, pH

****Corresponding Author***: renuka.ra@nifs.ac.lk