Computational exploration: using APSIM, Knearest and Rosetta for the simulation of nitrous oxide emissions in Brazilian sugarcane soil

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ABSTRACT

This study aimed to compare two data inputting approach to APSIM platform [1] first with data from pedotransfer functions (PTFAA-matric potential of -100Kpa) obtained by multi-linear regression, second which data were generated through the use of software KNEAREST [2] and ROSETTA [3] setting the so-called coupling (KNEAREST + ROSETTA + APSIM) (KRAc). The first software has as its central element on the K - NN algorithm and the second one on artificial neural networks, both of them output hydraulic soil properties; all of them were used as a tool for increasing knowledge about strategies to simulate the flux of nitrous oxide gas (related to the greenhouse effect) from sugar cane farm for fuel ethanol and other products. The data used to set K_{denit} in experiments were previously published [4]. The values used from this data set were the hourly averages (n = 8) of nitrous oxide fluxes emitted to the atmosphere in three different treatments about dosage of trash maintained after harvest above the soil of a sugar cane field configuring this treatments: T1 (7 tons / ha) , T2 (14 tons / ha) , T3 (21 tons / ha) (random blocks , 4x2 factorial , without application of vinasse) .Using K_{denit} 0.0008 (P2), simulated emissions of PTFAA approach was compared to that produced by KRAc approach (Figures 1 , 2 and 3).
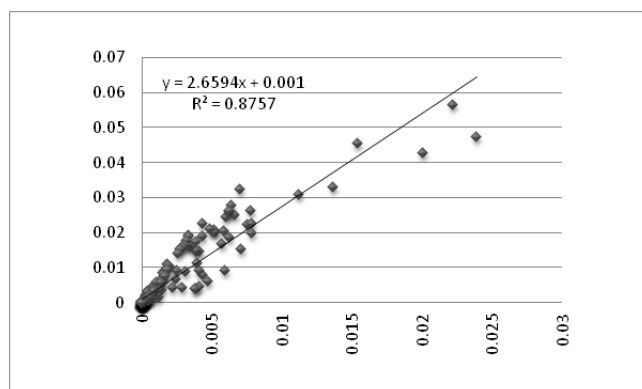
Figure 1 - Plot of nitrous oxide flux (g/m²day) simulated in the same dates for T2 -P2 (more usual condition in farms) in PTFA (horizontal axis) versus KRAc approach (vertical axis)
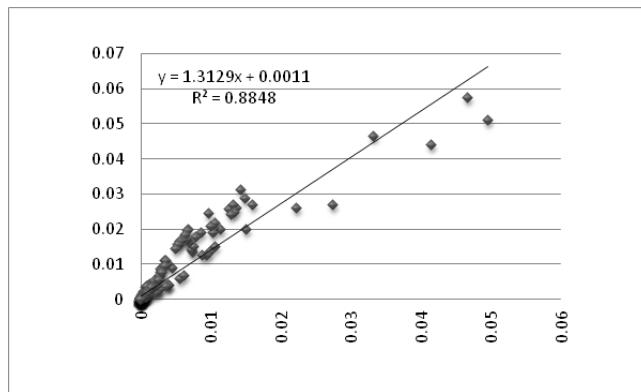
Figure 2 - Plotting the flux of nitrous oxide (g/m²day) simulated on the same dates for the T1- P2 PTFA (horizontal axis) versus KRAc approach (vertical axis).
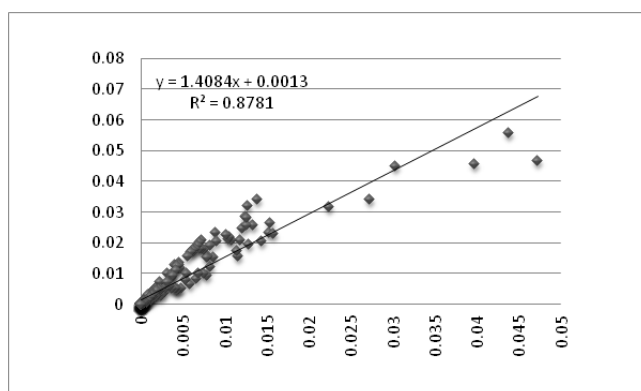

Figure 3 - Plotting the flow of nitrous oxide (g/m²day) simulated on the same dates for the T3- P2 PTFA (horizontal axis) versus KRAc (vertical axis) approach.

The linear correlations to PTFAA (that has the best fit o field measurements-data not shown) indicate that KRAC approach may be useful in preliminary studies for the delimitation of scenarios of nitrous oxide using simplified database and computational skills, free software .
Keywords: Flux, N_2O, input , APSIM

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