

Modelling CO₂ and N₂O emissions from soils in silvopastoral systems of the West-African Sahelian band

Agbohessou et al.

Authors' Responses to Referee's comments

We express our gratitude to the referee for their invaluable comments, which we have taken into consideration and addressed. We hope that these revisions will lead to an improved manuscript. In the following responses, we will be referencing the line numbers of the version of the manuscript that the reviewers have provided comments and questions on. Our responses are in italic.

RC= Referee's Comment and AR = Authors' Response

RC: thank you very much for the revised version of the manuscript. It has been improved quite a lot. However the referee and myself agree on the fact that the length of the spinup still needs some clarification.

Please submit a revised version with better explanations on the spinup procedure.

***AR:** Thank you, we provided more clarification on the spin-up time at lines 142-145. Now these lines read: "Simulations were performed over an 11-year period (2012-2022) preceded by a 6-year spin-up using the meteorological forcing data of year 2012, which was repeated 6 times. The spin up period allows for carbon and nitrogen pools to reach stability, as in Agbohessou et al. (2023). Indeed, in the model, the carbon compartments for buried litter, feces, and dry roots are not initialized at 0, thus our simulations start with initial carbon values of 3.7, 0.3, and 6.0 gC for buried litter, feces, and dry roots, respectively. These values represent means derived from in situ measurements collected over several years at the Dahra site, where the model has been previously employed at the local scale. The carbon and nitrogen submodel used is relatively simple, employing first-order differential equations with moderate nonlinearity, which likely accounts for the rapid convergence observed in the model. All this explains why extensive spin-up time is not necessary for running the model with appropriately supplied carbon and nitrogen compartments."*