

Review report on Wachiye et al. *Soil greenhouse gas emissions under different land-use types in savanna ecosystems of Kenya*

General comments

This is interesting study conducted in semi-arid parts of Kenya, where similar data are quite scarce. The set-up is an area characterized by a series of activities. It is a surprise that there is some form of cultivation/farming in an area that looks more like Tsavo national Park. Nonetheless, the study provides valuable data that extend our knowledge of ecosystem gas fluxes in this part of the world. The study was conducted in a relatively poor soil. What the authors failed to mention, especially for the cropped and grazed sites was the slope of the field. I tend to imagine that erosion must be playing a critical role in mineralization processes in this place. It looks like the organic/humus, top soil layer is completely gone and what remains is mainly the mineral soils. Unfortunately, the paper is already too long and I won't recommend inclusion of more information on land use history, which would have been helpful in understanding/interpreting these results.

It's very surprising that temperature and soil moisture had no influence on soil CO₂ fluxes. Could it be the method of data collection, with significant data collection gaps that led to this? For future, the authors need to consider higher frequencies of data collection. In such arid ecosystems, evaporation is quite high and it is likely that critical information is lost by not collecting data more regularly.

CH₄ seems to contribute little to this paper, why not exclude it completely? I don't see the two lines of discussion on CH₄ are of major benefit to the readers. The paper is already too long and probably removing all the descriptions on CH₄ could reduce the number of pages.

The word "Soil Organic Carbon SOC" is introduced in the introductory part of the Ms. In the methods, there is total soil carbon and in the results, I met Soil Carbon. In the discussions, SOC becomes the main discussion line. The authors need to be consistent in the use of these terms, otherwise the readers get confused. Ln 65. Not all savanna belongs to the ASALs. The humid savannas are relatively wet, with green vegetation almost throughout the year. It is therefore not right to make such a sweeping statement.

Specific comments

Ln 67. Note that shrubs are woody vegetation

Ln 88. Revise the sentence. Overstocking leads to grazing pressure. The way the sentence is written is redundant.

Ln 96-7. ---Croplands are still being cleared from natural vegetation----re-write the sentence, it's not making the intended meaning.

Ln 104, what's "cropland farming"?

Ln 153. The authors need to be clear on the physiognomic characterization of the vegetation they are studying. Here you have woodlands, bushlands and on line 155 you have wood bushlands, which is which?

Ln 156 are Lions also grazers?

Ln 160 –other important land use(s)

Ln 173. Is the farm rain-fed or not? Are there other sources of moisture input apart from rain?

Ln 237, how deep was the collar inserted into the soil?

Result

Label Fig. 3 as a and b

Ln 377, Sand proportion was lower than what? In comparative sentences, learn also to use “lowest” or “highest” see Ln 417.

Ln. 456 present data/results according to the chronology of the figures and avoid this back and forth.

Ln 481. Delete (in) before during.

Discussions

SOC is only mentioned in the introduction but not in the methodology or results, yet it becomes very prominent in the discussions. Be consistent in the use of terms.

Ln 525 is not correct. You cannot attribute the differences only to vegetation. It is definite that land use itself leads to the differences in soil C. Although this is argued correctly in the later sections, this section should be revised.

Ln 548. The argument with clays is a bit far-fetched anyway.

Ln 592. ---temperature was measured “down” to 5 cm. I would imagine that 5 cm depth is almost at the surface. What was the deciding factor for installing temp/moisture sensor at this depth? This depth, being close to the surface is associated with very strong temperature fluctuations. It may be one of the reasons why the authors found no temperature correlation with CO₂ efflux. Most grass roots, cereals included, have roots located within 10 cm, and may extend down to 30 cm. the woody vegetation in such dry places have their roots even deeper. Trying to establish relations with variables measured at 5 cm may not yield positive results.

Ln 593 check the sentence. How does root respiration tap moisture?

Ln 640. Consider soil erosion and volatilization also.

Ln 651. Use “dung” instead of faeces.

Ln 665 what's T? from nowhere, you introduce T.