

Interactive comment on “Effect of legume intercropping on N₂O emission and CH₄ uptake during maize production in the Ethiopian Rift valley” by Shimelis G. Raji and Peter Dörsch

Anonymous Referee #2

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This study looking at soil N₂O and CH₄ in agricultural systems of Sub-Saharan Africa addresses a significant gap in the body of literature exploring GHG exchange in intensively-managed soils, both through its location in an understudied area, and the aim to understand the relationship between inter-crop timing and N₂O emissions. Although the article does need to be further edited for grammar/phrasing, it is generally well written. However, there are some issues with clarity I'd like to see addressed, which I expand on below.

Specific comments:

Note: Phrases in quotations are suggested changes.

C1

Introduction

Line 40: Specifically define what CSA means in terms of management. The previous sentence defined intensification as 'increased use of inorganic fertilizers', and then CSA is introduced as, 'in contrast...' but the text doesn't in fact provide a contrast, instead outlining the ideals of the CSA concept.

Line 82: As you go on to explain, abundant NH₄ can inhibit methanotrophs, but may not always. Important to make that distinction here.

Materials and Methods

In general, please try to provide as much detail as possible, grouping information in a way that it is easy to find.

Line 120: "The field experiment was conducted for two years (2015-2016) at the Hawassa..."

Line 128-145: List exactly what the six treatments were, before going on to give details about planting and fertilizer application. Also, be specific about what happened when in each treatment, including when and how the legumes were mulched and applied.

Line 147: Were there live plants in the chambers during sampling or were those first removed?

Line 149: Are the chambers used in this study the same as those in Rochette et al.? If not, as the chambers were custom-made, a bit more detail about them would be useful. Some information to include: The chambers did not have permanent bases, correct? How deep into the soil were they pressed? Was the volume provided in the text (Line 148), the volume before or after the chamber was pressed into the soil? How much time was there between deployment and the first sample? Were they always measured in the same location? Do you think that soil disturbance from deployment may have affected the samples? Were the chambers vented?

C2

Line 153: The four samples were at 0, 15, 30 and 45 minutes? Or 15, 30, 45 and 60?

Line 172: Were all results less than $R^2=0.85$ rejected? (i.e. were net 0 emissions/uptake rejected?) If so, do you think that may have biased your results?

Results

Line 243: “Irrespective of legume species, the highest emission rates. . .”

Line 244-247: What about the sixth treatment? Was it significantly different than that?

Discussion

In this section, it would be helpful to go back to the original hypotheses and specifically outline how the results compared and why.

Line 333: Provide range from Pelster et al.

Line 341-342: Is that consistent with other mulching studies?

Line 344: You provide a topic sentence here, which ends with: species, inter-cropping time and weather. I'd suggest following that up by expanding on each of those in the order you present them in that sentence.

Line 353: Can you provide a reference for 'notoriously high'?

Line 363-366: Remove details of how the data was analyzed (that is in the results section) and just focus on the meaning of the results shown in the figure.

Line 380-382: Is that consistent with other mulching studies?

Line 386-389: I don't understand this. Something was at par and then not significantly different? Please rephrase and perhaps provide a reference to the Table/Figure with the results that you are discussing.

Line 487: Provide reference to Table/Figure.

Tables and Figures

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Note that these should always be able to stand alone (i.e. all necessary information required to understand them should be included). For all tables and figures, please define any abbreviations (i.e. Table 1 – DMY), remove references to previous sections (i.e. Table 1 – refer to M/M, Fig. 5 – refer to Fig. 2), and include basic information about the study (e.g. Table 1 – N inputs from forage legumes and fertilizer application in plots of maize inter-cropped with legumes 3 and 6 weeks after planting.)

Technical corrections:

Line 114/115: Rephrase.

Line 212: Capitalization.

Line 314: Remove neither/nor and just use 'or'.

There are many small editing errors in the Discussion that need to be corrected.

Some examples:

Line 334: Owing?

Line 337: “was too small”

Line 371: “owing to early”

Line 374: “legume and main crops”

Line 380: Capitalization

Table 1 – consider reformatting using spacing rather than lines, as the bold lines make it difficult to read

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