>General comments:

This manuscript presents data on soil potential methane oxidation rates (PMORs) from incubation experiments of rubber plantation soils in Thailand. PMORs are assessed using lab incubations of soil samples with enhanced methane concentrations. PMOR appears to be negatively correlated with fertilizer application rate. In-situ measurements of methane uptake also appear to negatively correlate with fertilizer application rate. Interestingly, PMORs from the top 10 cm of soil are found to be smaller than in-situ soil methane uptake. PMORs measured at several depths down to ~50 cm indicate that PMORs may be higher in the subsurface. These measurements also tend to show PMOR throughout the soil profile with the higher fertilizer application rates. PMORs are aggregated throughout the soil profile to produce a single per-area value.

This manuscript provides some insightful data on the oxidation of methane by soils in tropical rubber plantations. The finding of fertilizer suppressing methane oxidation in the study area is presented more or less convincingly. Additionally, the discussion of PMORs throughout the soil column potentially sheds light on the interplay of biological and physical processes leading to methane uptake by soil. The introduction is well-organized and relevant, providing good context for the study.

However, this manuscript has shortcomings in several areas. The experimental design and methods are lacking thorough description. The in-field treatments, the conditions of the incubations, and the steps for aggregating soil profiles are all rather opaque. The discussion does not adequately address complex and potentially interesting findings, as in the finding that total soil nitrogen is correlated with higher methane oxidation. The dataset could benefit from some editing, such as with the inclusion of some data from a palm plantation. The data visualizations are straightforward, but have room for improvement to concisely and meaningfully present the main findings. In terms of writing, the overall organization is good, but the manuscript would benefit from thorough copy editing to improve the use of English language for clarity and readability.

**Thank you so much for your positive and constructive feedback on our manuscript. We revised the manuscript based on your comments. Especially, we added more information on methods and clarified the difference between in-situ methane fluxes and estimated oxidation potentials and improved the discussion. We have carefully edited the final version of the revised manuscript to improve the quality of the English. We hope the revised manuscript is suitable for publication.**

**We reply to your valuable comments as follows. The MS word file is also attached for easier visibility.**

>Specific comments:

- The verb tenses vary between past and present throughout the manuscript. Please standardize here

**→We have carefully edited the final version of the revised manuscript to improve the quality of the English grammar.**

- Line 24: “potential methane oxidation potential”

**→corrected**

- Line 70-71: results should be removed from the discussion

**→We agree that the results should be removed from the INTRODUCTION, and we clarified the tested hypotheses instead.**

*“In this study, we measured the potential rates of soil methane oxidation using a microcosm incubation experiment with the hypothesis that land use change and fertilization management influence methane oxidation in tropical forest soil, focusing on a para rubber plantation. While most studies assume that methane oxidation in forest soils occurs primarily in the surface soil, we also targeted the deeper soil layers and tested the hypothesis that the influence of topdressing fertilizers on soil methane oxidation reaches deeper layers of the soil profile.”*

- Line 81: The type of fertilizer and its N-P-K values should be reported, as well as its approximate application rate per hectare.

**→We revised the table accordingly.**

- Line 103-104: The preparation of MORP samples should be much expanded, using something like the following reference as an example for writing:
- Line 107-108: The amount of methane (0.5 or 1.0ml into 50ml or 100ml) doesn’t add up with the reported 50ppm in the incubation experiments - it should be 100ppm, unless I’m missing something. Also, the use of such high methane concentration comes with some cause for concern and should at least be

discussed, since it is much higher than atmospheric mixing ratios.

**→Thank you very much for pointing our mistake. The correct volumes of methane are 0.25 or 0.5 ml. The method of PMOR measurement was revised.**

- Oxygen limitation is another potential issue with these incubations, but it seems promising that at least some of the incubations fully oxidized the methane.

  **→We incubated the sieved soils at the atmospheric level of oxygen, and the soil samples with high methane oxidation potentials showed a linear decrease in methane concentration from the beginning of the incubation period even though the soils contained higher organic carbon ranging from 10-23 g $kg^{-1}$. In addition, no correlation between PMOR and soil organic carbon content was observed (Supplementary Figure S2). Thus, we consider that oxygen was not a limiting factor for the measurements of methane oxidation potential in this study.**

- Line 113: "Adding up the methane oxidation rates" needs to be described mathematically to show what has been done. More broadly, I'm not sure this technique fully respects the actual field processes, ie the concentrations of methane and oxygen at depth, and the exchange of gas with the atmosphere.

**→We fully agree with your argument. We consider the methane oxidation potential could be overestimated compared to the in-situ oxidation because of the high methane and oxygen concentrations in the incubation vials. We aimed to compare methane oxidation potentials by incubation experiment with the in-situ flux. We described in detail the method for calculating the potential methane oxidation rate per area:**

*"The potential methane oxidation rate per area ($PMOR_{area}$, nmol $m^{-2}$ $s^{-1}$) was estimated by summing the methane oxidation rates of different layers.*

$$PMOR_{area} = \sum_{l=1}^{n} (PMOR \times BD \times Th) \times 10{,}000 \div 3600 \div 16$$

*where l is the soil layer, PMOR (ng$CH_4$ $g^{-1}$ dry soil $h^{-1}$) is the potential methane oxidation rate, BD is the bulk density (1.5 g $cm^{-3}$), Th (cm) is the thickness of the soil layer, 10,000 converted $cm^{-2}$ to $m^{-2}$, 3600 converted $h^{-1}$ to $s^{-1}$, and 16 is the molar mass of methane."*

- Line 119: Methane production potential is mentioned in the discussion but not measured here, as in other works. This should also be at least discussed, as it potentially confounds some of the main findings.

**→We agree with your arguments. The net methane flux from the soil is the balance between production and oxidation. A detailed study is needed, and this point is added in the conclusion of the revised manuscript.**

*"In this study, we adapted the sampling strategy over time due to the fact that the topsoil has a low methane oxidation potential, unlike previous studies, and thus, we targeted the deeper layers in the middle of the study; a more systematic study is necessary for the future, where high-affinity methane oxidation and methane production should be addressed. The increase in methane oxidation with depth can be related to a shift in the composition of the methanotrophic community from high- to low-affinity methanotrophs, which remains to be studied. Nevertheless, our results provide a new insight into the impact of agricultural land use of tropical forests on the ecological function in a greenhouse gas cycle."*

- Line 120-124: The sample collection, preservation, preparation, and analysis all need to be better described. The sample state gives important context to the chemical analysis.

**→We added more detailed information about sample collection, preservation, preparation, and analysis.**

*"The soil samples were sieved (< 2 mm) on site and stored at room temperature to measure methane oxidation potential within a month. The sieved soil samples for chemical analysis were stored at 4°C."*

- Table 2 can and should be converted to a figure, as it represents the main findings of the manuscript

**→We like to keep the table because 1) we need to compare the flux (minus data) and PMOR and 2) we think it is important to show the values.**

- Figure 4 is presented inconsistently - why are all treatments lumped together for February 2024, but Tr1 and Tr4 are separate panels in August?

**→It is because we collected soil samples with depth with different intervals**

**between Tr1 and Tr4.**