

# ***Interactive comment on “Soil properties impacting denitrifier community size, structure, and activity in New Zealand dairy-grazed pasture” by Neha Jha et al.***

**Neha Jha et al.**

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Anonymous Referee #3

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# Summary:

# They sampled soils from 10 different geographical locations in New Zealand. They did an ordination of soil characteristics and found that the 10 sample locations could be grouped into 3 groups based on soil characteristics. These groupings were used in the further analysis of T-RFLP, qPCR and DEA data.

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## # General comments:

# The study attempts to find how various pasture management (soil water, carbon and fertility) will affect the denitrifier community, which increase our knowledge on denitrification in different soil types, and maybe improve our ability to promote complete denitrification and avoid N<sub>2</sub>O emission. This is a relevant question within the scope of BG. They find that fertile soil with high microbial biomass promote complete denitrification, whereas allophanic saturated soil is a source of N<sub>2</sub>O production.

# I found it hard to get a good overview of the results and discussion, maybe because of poor flow and clarity in writing. I agree with RC1 that the discussion resembles a result section. In general every section sums up observations and have some explanation with a reference. I don't think it reaches a high enough level of discussion. I'm also not confident that the data is strong enough to answer the question sufficiently. qPCR on RNA would be more reliable. To my knowledge the nir genes are very ubiquitous and not necessarily expressed.

Author's Response: We agree with R3's assessment that these doubts stem from poor flow of the manuscript and a lack of clarity in writing. These comments align with those of the other reviewers and made it clear to us that the manuscript required a major overhaul. To this end we have revised all parts of our manuscript as detailed elsewhere. Now that this is done we feel that our aim of achieving a better understanding of how soil physicochemical characteristics' affect the size, structure and activity of bacterial denitrifying communities is clear, and we think that R3 would agree that qPCR of RNA would not be an appropriate tool with which to address it.

# Both title and abstract are descriptive and clear, reflecting the study well.

## # Specific comments:

# The whole introduction argumentation for this study (P2, L11 – P3, L2) makes a good background, but somehow it's a bit vague. The idea of the study is very good and this

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framework can make it more visual with clearer and stronger formulations.

Author's Response: To this end we have added to the introduction one sentence, immediately after the statement of aim: "In particular, we asked if the size and activity of bacterial denitrifiers could be predicted on the basis of soil physicochemical characteristics."

P3, L22-23 I would mention which physicochemical characteristics were used in this study here, otherwise you only see it when reading the statistical analysis.

Author's Response: Added, thank you.

Regarding methods for physicochemical characteristics, DEA and qPCR, they refer to Morales et al. (2015). This seems to be another study of the very same soil sampling, and this manuscript is reusing data from Morales et al. (2015), right? It should appear more clearly that this study is an extension of Morales et al. (2015) with reuse of data. It would also seem natural to refer more to the earlier study since it's the same topic. There should be references to this in the introduction and/or discussion, not only for methods description.

Author's Response: Yes that's right, some of the physicochemical and molecular data presented here also appears in Morales et al. (2015), although the data analysis and objective of both the studies is entirely different. We revised the methods to more clearly convey that point, we also now refer to the Morales et al. (2015) in introduction of our paper.

P10, L25-29 Suddenly in the end of the conclusion this new stuff about allophanic soils comes up, this should have been included earlier on. The conclusion should instead round and wrap up. New stuff should not be introduced like this.

Author's Response: Yes, we agree and include the point about N<sub>2</sub>O emissions from allophanic soils in the discussion too.

# Technical corrections:

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# Inconsistent use of water content terms and abbreviations: “Moisture”/”soil water”/”soil water content”/”SWC” and also “% SWC at field capacity”/”% FC SWC”/”high moisture at FC”. Also “Field fresh” (P3, L20) and “field-moist” (P3, L22). This was all quite confusing to me.

Author’s Response: Thank you, we have revised all parts of the manuscript with an eye for consistency.

# Figure 2 have too many abbreviations in caption, the figure itself should be more descriptive.

Author’s Response: This same comment was made by R2 and so we have changed Fig 2 accordingly.

# In caption for Figure 4, SEM should first be defined and then used. Not the other way around.

Author’s Response: Agreed, done that.

P1, L3 There should not be a dot in the end of the manuscript title. This also occurs in the titles in the references.

Author’s Response: We have removed dot from the end of the manuscript title and also from the titles in the references.

P2, L34 With enhanced structure, do you then mean diversity?

Author’s Response: This comment has been rephrased for clarity.

P3, L19 “2 depths” not “2 depth”. I can’t find which depths you chose (mm/cm?), should be stated in the methods.

Author’s Response: Yes thanks, we have fixed this and also added the unit of measurement.

P4, L7-8 “2.5 ul of 10xPCR buffer (1 mM MgCl<sub>2</sub>), 0.5 mM MgCl<sub>2</sub>”. Final concentrations

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in reaction mix should be stated, this looks weird to me.

Author's Response: Okay, we have rewritten as final molarity. P4, L24 I would specify that the qPCR was performed on DNA

Author's Response: The title of the section "Quantitative polymerase chain reaction (qPCR) of total bacterial and denitrifier genes" makes this point clear.

P5, L19 Isn't the right abbreviation NMDS? Not NMS

Author's Response: Both abbreviations are in common use, with variation stemming from the term used by the particular stats package. PCOrd software refers to NMS ordinations (McCune and Grace, 2002), thus our use of that abbreviation here.

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