Biogeosciences Discuss., 12, C6674–C6677, 2015
www.biogeosciences-discuss.net/12/C6674/2015/

Biogeosciences
Discussions
Open Access

Interactive comment on "Isotopically enriched ammonium shows high nitrogen turnover in the pile top zone of dairy manure compost" *by* K. Maeda et al.

K. Maeda et al.

k_maeda@affrc.go.jp

Received and published: 19 October 2015

Referee #1 1) Lack of scientific novelty. Quite a few studies have already reported that the manure nitrogen or ammonium becomes isotopically enriched during compost and this enrichment has been attributed to ammonia volatilization and nitrogen transformation. They only novel point is that the current study found that the enrichment was stronger in the top zone than in the side and core zones. Thank you very much for your comment. There have been only a few published studies on isotopically enriched ammonium during manure composting, and none of them have focused on the individual zones of the piles. The 15N values of the samples from different zones

enabled us to interpret how nitrogen transformation occurs between pile turnings. To our knowledge this is the first report focusing on this topic. Therefore, we believe that our manuscript has significant novelty and could provide insight into the processes of manure composting and its nitrogen transformation.

Nevertheless, the manuscript is largely based on qualitative analyses while the underlying mechanisms was not presented, i.e., the mechanisms underlying the decrease in nitrous oxide emission (this should be a major objective of this study according to the abstract) following bulking agent use or the greater enrichment in 15N in the top zone of the manure piles (this should be another major objective of this study according to the abstract and the title). For the compost piles with bulking agent, the inside temperature reached more than 60 _C. Normally under such high temperature, nitrification and denitrification or the microbial activities are much low although these processes may take place in some geothermal ecosystems. The decreased emission of nitrous oxide after bulk agent integration may due to decreased nitrification and denitrification. But this needs experiment evidence. Thank you very much for this helpful comment. We fully agree with you that the temperature is a possible explanation for the mitigation of N2O emission. A previous report suggested that the optimum temperature for nitrification or denitrification was that under a mesophilic condition (Willers et al., 1998), and another report showed that the N2O production rate can be higher under a thermophilic than under a mesophilic condition (Benoit et al., 2015). The high heterogeneity of temperature in different pile zones makes it very difficult to analyze such results. As we have already stated, the mitigation of N2O emission cannot be explained by the present dataset. We added only a few sentences on N2O emission because we did not provide data on N2O in this manuscript. However, we found many interesting phenomena in terms of 15NH4, and therefore we focused on the nitrogen transformation process between the pile turnings.

2) Mistake in methodology. An isotopic mass balance equation is presented as equation (7). The prerequisite to use an isotopic mass balance model is that the isotopic

masses in both sides of the equation are balanced. In terms of manure compost, large nitrogen loss (e.g., ammonia volatilization) is usually taking place. For equation (7), ammonia volatilization should at least be included. Thank you very much for this helpful comment. We agree with you that the isotopic masses on both sides of the equation should be balanced. However, here we cannot put the ammonia volatilization in the equation because we did not measure the 15NH4 of the volatilized ammonia. However, to truly understand this phenomenon we will need to analyze 15NH4 data obtained using the current analysis methods. As a result, the large ammonia volatilization could be one of the major obstacles to a clear explanation of the phenomenon. We believe that our present data suggest some interesting hypotheses about the sequential events between the pile turnings, as stated in the conclusion section.

3) Understandability, clarity and concise. Throughout the manuscript, there are lots of grammar issues which make the paper hard to understand. Thank you very much for your comment. The original manuscript was already edited by a professional English editing service. We have had the revised manuscript entirely re-edited by this service, and we have attached a certification of this work.

The experiment needs to be more clearly described. In addition, the terms need to be consistent. For example, according to line 19 in page 7580, samples were collected "just before each turning". However, in the following sections or the figures, it seems that samples were collected "just after the turning". Thank you very much for your comment. We fully agree with you that this can cause confusion for the readers. Actually, samples in each zone (pile top, side and core) should be taken BEFORE each turning because the turnings increase homogenization. Therefore we collected samples from each zone BEFORE each turning. We also collected the homogenized samples AFTER each turning, because the homogenized samples were also needed to understand the changes in the compost piles. We thus collected the samples both before and after the turning events.

For another, in line 1-2 of page 7581, "Total N was measured using raw samples by

the Kjeldahl method. The C/N ratio was determined using a C/N analyzer (vario MAX CNS; Elementar, Germany)". So total N was measured using two methods? Yes, we measured total N in two different ways. A C/N analyzer can miss the ammonium nitrogen, so we considered that it would be best to cross check this parameter using two approaches. We do not believe that this constitutes a limitation of the study design.

In summary, the manuscript needs substantially improvement. The manuscript was rewritten and, we believe, substantially improved through the help of your insightful comments.

Interactive comment on Biogeosciences Discuss., 12, 7577, 2015.