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Interactive comment on "Impacts of rice varieties and management on yield-scaled greenhouse gas emissions from rice fields in China: a meta-analysis" *by* H. Zheng et al.

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Referee 1 comment: The manuscript used meta-analysis to investigate the effects of rice variety and management on yield-scaled greenhouse gas emissions from rice fields. It is an interesting topic and within the scope of BG. The manuscript contributes to our understanding of how management practices influence GHG emissions from rice fields and the development of strategies to mitigate climate change. However, the manuscript is not written with fluent language and it is not well organized, such that the presentation is not clear and sometimes confusing. A substantial revision of this manuscript will greatly improve the quality of this manuscript.

Response: A substantial revision of this manuscript was made to improve language and presentation.

Referee 1 comment: In the method section (2.2.5), the authors stated that 95% CI was used to indicate statistical difference among treatment effects, but at the same time, in the result section, (e.g., Fig. 1) p values were also provided without any indication of calculations of these values and significant levels. Furthermore, the authors frequently over-stated or miss-used "statistical difference" of the treatment effects. For instance, in Fig. 3, suggesting by the overlaps of the 95% CIs, there were no N effects on CH4, N2O, area-scaled GWP, and yield-scaled GWP, and a marginal effect on yield at high application rates. However, the authors considered N effects significant overall. The discussion was plain and most of time simply repeated the results or results from other studies. For example, as stated by the authors, the study was to "achieve a trade-off between increasing rice yield and reducing GHG emissions. . ." (Lines 401-404), but yet there is no in-deep discussion on how the results of the meta analysis would contribute to this goal. Instead, the authors focused on what management would reduce yield-scale emissions, largely ignored the balance between GHG emission and rice yields and no rice yield was provided and discussed.

Response: We clarified statistics and specified the p-value used in ANOVA tests. Description of Fig. 3 was revised according the comment. The goal of "achieve a trade-off between increasing rice yield and reducing GHG emissions. . ." is to evaluate "rice yield/GHG emissions," or yield-scaled GHG emissions, rather than area-scaled emissions. We did not discuss the implementation, but called for using yield-scale GHG emissions as a tool and metric to evaluate rice management and variety selection.

Referee 1 comment: The authors stated in lines 105-107 that the objective of this study was to "provide references for appropriate cultivar selection based on yield-scaled GHG emissions - to achieve higher yields with lower GHG emissions". The objective was miss-leading and not the focus of this study at least for the following observations, 1) as mentioned above, the authors largely ignored the rice yields in the section of results

and discussions; 2) it is not clear whether the studies on rice varieties used in meta-analysis were actually side-by-side (at least not indicated in method section). The varieties effects on yield and GHG emission can be easily confounded by soil properties, temperature, and other environmental factors, if the studies were not conducted side-by-side; 3) management can affect the grain yield, GHG emission, and yield-scale GHG emission. Recommendations on cultivar selection should consider the interactive effects of management, rice yield, and GHG emissions.

Response: Our focus is to synthesize GHG emissions impacted by rice varieties and management. We did not intend to discuss the yield itself, which is a subject of agronomic papers. We used yields as to normalize GHG emissions for a better metric to evaluate GHG emissions from agriculture. We conducted a cross-site synthesis that considers environmental influences as a random variation across sites. The rice fields are mostly located in southern China where rice yields are comparable despite a small variation in environmental influences. Rice varieties and fertilization are two major factors determining rice yields, and thus are used in this study to evaluate CH4 and N2O emissions. We suggest evaluating "rice yield/GHG emissions," or yield-scaled GHG emissions, rather than area-scaled emissions.

Other comments from Referee 1 Line 33-35, need to revise, it is kind of COPY AND PASTE from Linquist (2012); Lines 55-58, 70-74, 77-87, 270-272, it is not easy to understand the points or logics that the authors are trying to state. Lines 62-64, it is overstated; it is not even supported by your own results that there is no significant difference in total GHG emission between Indica and Japonica; Lines 105-107, the meta analysis on just two varieties in not enough to provide "reference and recommendations . . .", especially the experiments of rice varieties were not side-by-side; Line 112, why CO2 emissions are not included? Need justification, even though rice field is generally considered as a sink of CO2. Lines 124-127, the statement is confusing; Lines 164-169, need more descriptions, e.g. whether the GDAT is sub-section of the growing season? If so, how the rice productions use to calculate the yield-scaled emissions

of GDAT? And what is the relationship between rice varieties with GDAT? Do different varieties have different GDAT? Lines 173-176, what is the number of the side-by-side studies? Is the number statistically big enough for your calculation and conclusion? Line 184, "exp", typo? Lines 200-201, you have set the significance level as 95% CIs, why later on (result section) use p-values? It is confusing. Need more descriptions, otherwise the result and subsequently discussion is confusing and not easy to understand. Lines 251-257, repeat of the results. Lines 322-327, repeat of the results. Lines 351-355, this temperature effect is not related to your discussion of variety and management; Lines258-362, you state that seedling stage is important, but your analysis was based on studies without seedling stage, does this mean your conclusion and analysis is less important or invalid? Line 363, based on your determination of significance as 95% CIs, Fig 3 indicates that the difference among N treatments were not always significant. Line 380, does your suggestion of replacing high yield scale-GWP varieties with low ones also involve in changing cropping systems (described on lines 382-384)? How about rice yields?

Response: Lines 33-35: We made revision in the revised manuscript; Lines 55-58, 70-74, 77-87, 270-272: We made revision in the revised manuscript Lines 62-64: Agreed. We made revision. Lines 105-107: We revised as "provides a new perspective to select rice varieties." Line 112: As mentioned above, synthesizing CO2 emissions is out of scope of this work. Lines 124-127: we made revision according to the suggestion. Lines 164-169: The GDAT is the growth duration after transplanting except for the seedling stage. Different varieties have different GDAT. Lines 173-176: The number of the side-by-side studies is twenty-seven, and the sample size was enough for our calculation and conclusion. Line 184: "exp" is the abbreviation of "exponential". Lines 200-201: As mentioned earlier, we clarified the statistics. Lines 251-257 and Lines 322-327: we made revision according to the suggestion. Lines 351-355: we made revision according to the suggestion. Lines258-362: Our conclusion and analysis are based on studies without the seedling stage and transplanting. The seedling stage is also important, because the life cycle assessments of GHG emissions from various

rice varieties at the yield scale are critical and urgently needed for the development of win–win policies for rice production technology to achieve higher yields with lower emissions in China. However, research on GHG emissions during the seedling stage is lacking. Line 363: We made it clear. Line 380: Based on our results, area-scaled and yield-scaled GWP could be reduced by 22% and 35%, respectively, if indica rice varieties were replaced by japonica rice varieties in the same paddy fields. Meanwhile, the overall rice yield would not reduce.

Interactive comment on Biogeosciences Discuss., 10, 19045, 2013.