Review of the manuscript BG- 2015-478 (revised version 4) entitled: 'Global warming potential and greenhouse gas intensity in rice agriculture driven by high yields and nitrogen use efficiency: A 5-year field study'

I reviewed the previous version of the manuscript. Compared with that version, this current version (v4) is considerably improved. Most of the comments and suggestions made on the previous version have been followed and revised, and I commend authors for their efforts. In general, the responses to my previous comments are adequate, except on two key issues. These two issues are: (1) Whether to call this as a '5-year study', and (2) The inadequacy of explaining the methodology of estimating GHG emissions from 'farm machinery production' in Table 4.

The reasons for my concern relating to above noted two issues are explained below, but I would like to re-iterate first, my full support for the publication of this study, due to the present global priority of developing cropping systems that are capable of increasing food production while minimizing the environmental impact. Therefore, provided that the two key issues I am explaining here are corrected, I recommend this manuscript for publication in the journal Biogeosciences.

Issue 1: Whether to call this as a '5-year study'

I carefully considered the response provided by authors to my previous comment on this issue; however, I cannot agree with their response due to following reasons:

In lines 78 to 80 in the manuscript, authors have stated that: 'In this study, we evaluated GWP and GHGI of rice-wheat crop rotation managed under several scenarios of ISSM by taking CO2 equivalent emissions from all sources and sinks into account for 5 years.'

However, what follows in the statistical analysis (Table 3) do not support this statement. Statistical analysis included only three years of data. Presentation of the results in the remaining Tables and Figures was also limited for only three years of data. Furthermore, following text in the manuscript indicates clear contradictions with the above statement:

Line 203: During the three cropping rotations..... rice and wheat yields...
Line 205: On average over the three cycles, the annual rice yield...
Line 212: ...rice and wheat yields from the three years were not...
Line 225: ... During the three annual rice-wheat rotations.....CH4 fluxes ranged from...
Line 229: ... Temporal variation was significant during the three cycles (Table...
Line 263: Across the three years ISSM-N1 and ISSM-N2...
Line 323: During the three years, the annual cumulative CH4 emissions...

Considering these contradictions it is difficult to agree with author's explanation. As the discussion and conclusions of the manuscript are largely (I would say 90%) based on three years of data, it is not reasonable to call it as a '5-year' study.

I suggest authors to consider following revisions in order to minimize these obvious contradictions: (a) the title of the manuscript could be revised as: '**Global warming potential and greenhouse gas intensity in rice agriculture driven by high yields and nitrogen use efficiency**'; and (b) Particular places of the text that put emphasis on the phrase: '5-year study' (e.g. reference to '5-year' in Line 17) should be revised.

Issue 2: Methodology of estimating GHG emissions associated with farm machinery production:

In response to my previous comment on this issue, authors have responded saying: 'We used electricity energy units of kilowatt hour (0.0725 kg CE/kg active ingredient) for calculating CO2 emissions from farm machinery production as presented in Table 1 of Lal 2004.'

This explanation is not adequate. The above emission factor (from Table 1, Lal 2004) is simply the one used for calculating the CO2 emissions per unit of electricity consumed.

Estimating GHG emissions associated with farm machinery production is somewhat complex and involves several steps that need to be explained adequately. For example: Carbon dioxide equivalent (CE) emissions associated with the production of particular piece of farm machinery are influenced by following parameters:

(a) Carbon equivalent emission factor (EF) for producing a unit weight of machinery (CO2eq/kg machinery),
(b) Average weight (W) of the piece of farm machinery (kg),
(c) The fraction of machine life used for a particular farm operation (Fraction).

For calculating the item 'c' above, two parameters are needed: (d) Average life span of the piece of machinery (hours), and (e) Time, this piece of machinery is used for a given field operation (e.g. tillage or planting) (hours/ha)

Authors have not sufficiently explained any of these parameters, steps and any source reference for how different values of 'kg active ingredient/ha' under the column: 'farm machinery production' in Table 4 was obtained. The newly added 'supplementary resources 2' provides only a seasonal breakdown of the data already presented in the upper part of the Table 4 and do not provide any additional information.

I suggest authors to briefly explain, how these values were derived in the supplementary resource 2, since the methodology for this type of emission reporting need to be transparent.

In addition to two key issues mentioned above, following minor comments (mostly editorial corrections) need to be corrected.

Minor corrections that needs to be corrected:

Line 58: 'into' is one word. Not 'in to'
Line 112: ...and N supplied from rapeseed cake in...

Line 121: ...rapeseed cake manure was applied for the rice crop.

Line 146: ... The CH4 and N2O fluxes were calculated

Line 147: ... over time as described by Jia et al. (2012).

Line 175: ...N, P, and K fertilizer...

Line 178: ... 1.3 kg C equivalent kg−1 N (Lal, 2004).

Line 184-185: '...no specific coefficients were available for China.' Or '... no specific coefficients were available for local conditions'.

Line 188-189: Chemical fertilizer was hand broadcasted for each fertilization event.

Line 190: ...crop seasons are presented

Line 194-195: One-way analysis of variance was conducted to compare the cumulative fluxes of CH4 and N2O, and grain...

Line 252: Should be as: Irrigation was the second largest source o

Line 298: ...fertilizer..

Line 316: should be:... period could be due to reduced N losses by leaching and volatilization...

Line 391: The decrease is 14% and 18% relative to GHGI in FP scenario. Please replace the word: 'dramatically' with the word 'significantly'. Should read as: Compared with the FP, the ISSM-N1 and ISSM-N2 scenarios significantly reduced the GHGI, ...

Line 405: Above ground crop residue was removed in this study. Therefore, this sentence should be revised. For example, you may say as: This may be due to the incorporation of rapeseed cake and enhanced below-ground crop residue associated with higher crop productivity (Ma et al., 2013).

Line 418: ...in the future, because...

Line 423: Should read as: Of the two crops, CH4 and irrigation were important for rice, but less important for wheat, in which N2O losses were expected to...

Line 442: Should read as: ...increasing grain yields and at the same time reducing the substantial environmental impact of intensive agriculture...

Line 466: ...GHGI was lowered by 23%.

Corrections that should be done for Table 4:

Please indicate, what is the active ingredient for each input category, immediately below the heading as you have already done for irrigation water (cm). For example: Tillage ((kg diesel/ha), planting (kg diesel/ha)....

Corrections that should be done for Table 5:

Please check the negative or positive symbols for the value of SOCR in Table 5. I made this comment before; however, it is still not corrected. If the soil is a sink for C, the value should be negative. If the soil is a source of C, the value should to be positive. (SUM of values of each GHG category for each scenario would not yield the value of GWP you have presented in Table 5 at present, because the negative/positive symbols you have put for SOCSR at present is not correct).