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## ***Interactive comment on “Eco-efficient agriculture for producing higher yields with lower greenhouse gas emissions: a case study of intensive irrigation wheat production in China” by Z. L. Cui et al.***

**Z. L. Cui et al.**

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Received and published: 20 February 2014

Dear editors,

Thank you and the reviewers for the valuable comments and suggestions, which are very helpful for us to improve the manuscript. We have made great efforts trying to address all the comments. The comments and our responses are listed below for your reference and marked as red words in new manuscript.

Sincerely, Xinping Chen Anonymous Referee #1 Overall: I think that once manuscript will undergo major editing and revision for a clarity of the presentation it can be accepted for publication. The manuscript relatively similar to Cui et al., 2013 study pub-

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lished in ES&T earlier this year, but valuable due to inclusion of more farms in the survey and addition of other GHG sources, beside N fertilizers. More important, as I have mentioned in my review, the manuscript is lacking defined hypothesis and scientific question. I think that once authors will find one it will help them to present the results in clear and meaningful way.

Thanks for your suggestion. We defined the hypothesis in this new manuscript, and added new paragraph to describe the problem of wheat production and scientific question. This new manuscript is different to Cui et al., 2013 study published in ES&T earlier this year. In this study, we focus on the different management system with different year level within optimal N management, and their GHG emission. In early studies, we just focus on in-season N management and its environments.

The manuscript has some problems, mostly related to poor presentation quality see below: The manuscript needs very intensive editorial work to improve English and clarity of the presentation. Especially important to revise English, as it now, the manuscript is very difficult to read due to fairly poor language.

Yes, we already asked two professional editors with English as native language to revise this manuscript.

Title: Too cryptic and general - how Eco-efficient agriculture is defined if you apply more than 200 kg N ha<sup>-1</sup>? Why not to make it simpler? When you will rewrite your hypothesis to be more specific, you can find more specific title. While in the manuscript you are speaking about tradeoffs is not reflected in hypothesis and title. May be "Tradeoffs between high yields and GHG emissions in irrigated wheat production"?

Yes, you are right. The title had changed to "Tradeoffs between increasing grain yield and mitigating greenhouse gas emissions in winter wheat production in China"

Abstract: Hypothesis not presented, instead of hypothesis authors describe what they "discussing". I think that once authors will define the hypothesis for their research, the

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overall quality of the manuscript will be improved. The hypothesis will lead authors toward better presentation of their results.

Yes, you are right. We had added the hypothesis in this abstract “Here, we hypothesize that the current relationship between wheat grain yield and greenhouse gas (GHG) emissions could be transformed to produce higher yields with reduced GHG emissions by better combining crop management and optimal N management.”

Change of units, i.e. 6.05 Mg ha<sup>-1</sup> vs. 4783 kg CO<sub>2</sub>eq ha<sup>-1</sup> – I would like to ask authors to decide on the dimension and use similar units through the manuscript.

Yes, you are right! We already changed “Mg ha<sup>-1</sup>” to “kg ha<sup>-1</sup>” in the whole manuscript.

Overall – abstract should be rewritten in the way reader will understand 1) background and research question, 2) methods for answering this research question, and 3) results and brief discussion. I’m confident that abstract should be written in the same way as manuscript and provide reader with all needed information to understand presented research. As it now, the abstract is not satisfactory.

Yes, we already change them and rewritten this abstract.

Introduction: Language editing is necessary (I’m not providing to many examples, everything should be rewritten).

Yes, we already restructured this introduction, and asked two professional editors with English as native language to revise this manuscript.

Line 19 – “produce useful products” – seems to have lack of definition of what useful products are.

Yes, we already changed them to “high grain yields” in this new manuscript.

Line 28 – HY plot – or plots, how many plots have you used?

Yes, we already changed them to plots.

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Overall need to be concentrated and to the point of the research, as it now – too general, fills like authors wanted to add words and not well understand what was the purpose of the research. This is supported by very vague hypothesis. If I understand correct the major hypothesis is that if we make improvements in plant varieties and better agronomic management we can achieve higher yields with lower GHG emissions—seems too general.

Yes, we defined the hypothesis in this new manuscript, and added new paragraph to describe the problem of wheat production and scientific question.

Methods: The methods description is not satisfactory. Annual cumulative temperature mean of 4000 – 5000 C – why to provide these numbers?

Yes, this value is important to crop production. The reader can know the climate in this region.

Five fertilization levels – What they are?

Yes, this sentence changed to “Both systems (CP and HY) were tested at each of the 33 sites under four or five N treatments. Five N treatments in 15 sites in Hennan province included no N as a control (CK), and low (50% of median), median, high (150% of median), and very high (200% of median) treatments.”

New varieties – What varieties?

Yes, varieties is important to achieve high yield. Unfortunately we do not have detail of these varieties. So we change this sentence to “In the HY system, local agronomists recommended new varieties with resistance to disease, environmental stress, and lodging that also had the potential for high yields. These new varieties varied across experimental sites.”

Right combinations – define what “right” combination is?

Yes, this word already change to “better” in this new manuscript.

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Data analysis is not described well, especially the logic behind equations 1 – 3, I haven't found the equations in their presented form in Cui et al., 2013b.

Yes, we added the data in Figure S 3 and some descriptions.

Results and Discussion: Results and discussion need to be rewritten accordingly to (to be defined) hypothesis

Yes, we changed some part in the results and discussion. We hope this is clearer.

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Interactive comment on Biogeosciences Discuss., 10, 16879, 2013.

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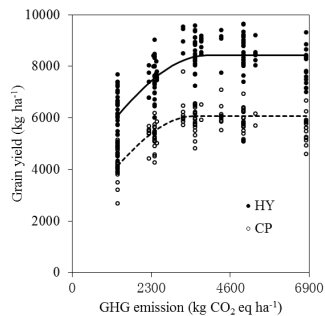
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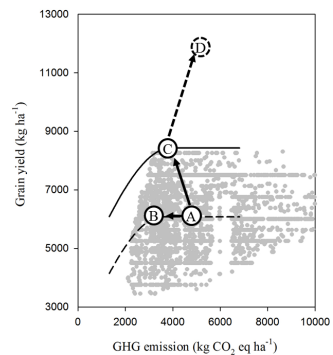
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**Fig. 1.** The relationship between GHG emissions and grain yield for the CP (small circle and dashed line) and the HY (dot and solid line) system. Data were pooled from 33 sites of on-farm experiments for CP and HY systems. The relationship between GHG emissions and grain yield was  $Y = 1940 + 4137(3X/7110 - 0.5(X/3555)^3)$ ,  $X < 3555$ ;  $Y = 6077$ ,  $X > 3555$  ( $R^2 = 0.75$ ,  $P < 0.001$ ) for CP system, and  $Y = 3845 + 4583(3X/7810 - 0.5(X/3905)^3)$ ,  $X < 3905$ ;  $Y = 8429$ ,  $X > 3905$  ( $R^2 = 0.68$ ,  $P < 0.001$ ) for HY system.

**Fig. 1.** fiure 1



**Fig. 2.** A stylized grain yield–GHG emission framework demonstrating three pathways to produce higher yields with less GHG emissions. The gray dots represent grain yields and GHG emissions for the 2,938 farmers surveyed. The line of dashed line and solid line mean relationship between grain yield and GHG emission for CP and HY system, respectively. Point A is the average for all farmers; Points B and C are the minimum GHG emissions for maximum grain yield with the CP and HY system, respectively (the details are shown in Fig.3); and Point D represents the target of 12 Mg ha<sup>-1</sup> of wheat grain yield in the future.

**Fig. 2.** figure 2