

Interactive comment on “Global cropland monthly Gross Primary Production in the year 2000” by T. Chen et al.

T. Chen et al.

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Response to Referee #1 where our response is marked by “Response:”. We sincerely appreciate the reviewer’s comments and time spend on our manuscript.

General Remarks: This paper calculates maximum light use efficiency (LUE) parameter estimates for 26 different crop types and then uses these new values in a light use efficiency model to calculate global gross primary production (GPP). Rather than using a single parameter for all crops, the authors improve on existing estimates by using an individual maximum LUE estimate for each crop, which was calculated from flux tower measurements and a literature survey. Another improvement in this study is the use of a monthly distribution of cropland coverage, rather than a constant annual distribution. Both the LUE parameter values and the resulting global GPP were evaluated against

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previous estimates. I think that the developed light-use efficiency parameters and the resulting GPP estimates will be useful for a variety of research applications, including model development and evaluation, as well as carbon source and sink analysis. I believe that the authors meet all the necessary requirements for publication and think that this paper should be published in Biogeosciences.

Specific and Technical Comments: Overall I found the paper very concise and clear. I found a few technical issues that can easily be fixed:

Page 3467, lines 22-25: The sentence starting with “During the early period. . .” is confusing. I believe the authors are trying to say that LUE models were first used to calculate biomass and that these estimates were evaluated against field measurements, but please clarify this.

Response:

Modifications were made to clarify this and the sentence now reads as “Since the 1970s, this LUE approach was mostly evaluated using field measurements of plant dry matter and solar radiation.”

Page 3468, line 17: Add an “s” to make the phrase “key parameters”.

Response:

Corrected.

Page 3468, line 28: Add a comma after GPP

Response:

Added.

Page 3470, line 1: The reference to Table 1 did not match up to the discussion, so please remove this reference.

Response:

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This was removed in the revision.

Page 3473, top three paragraphs: The authors compare their LUE parameters to Zhao and Running (2010), but this discussion was a little confusing. It is my understanding that Zhao and Running only used a single value for all crops, which was 1.044 g CM/J. However, in the text the authors say that their values are “higher than those used in Zhao and Running”, implying they used more than one value. The section then ends with the statement that their value for the crops with no data available are set to a value close “to the value used by Zhao and Running”. This statement implies what I expect, that there is only a single value of Zhao and Running being compared, but it would be helpful if these paragraphs were revised a little to be clearer and consistent.

Response:

This part was revised to improve clarity: “those” -> “the one”; This part was revised as: “The other 4 types (citrus, date palm, grapes and coffee) were all assigned 1.2 g C MJ-1, which is the lowest value of our estimates for other perennial crops (1.21 g C MJ-1) rounded to one decimal.”

Page 3473, line 20: remove “s” from “values” at the end of the sentence to state “This value. . .”

Response:

Corrections were made.

Page 3473, line 27: I believe your estimates given for GPP and the corresponding reference are backwards. From a previous statement in the text, I think the low value of 8.2 Pg C/yr is from Saugier et al. (2011) and the higher value of 14.8 PgC/yr was reported by Beer et al. (2010). Please just switch this order in the first line of page 3474.

Response:

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Corrected.

Page 3475, lines 16-19: These two sentences starting with “For example. . .” are awkward and confusing. I think they want to say that if they used the value of 1.25 gCM/J the NPP would be unrealistically high, and this is all from Potter et al. (1993); however, I think this would be clearer if these two sentences were reworded.

Response:

These two sentences were reworded as: “For example, Potter et al. (1993) found that if ϵ *NPP would be set to 1.25 g C MJ-1 as in Heimann and Keeling (1989), annual NPP would be an unrealistically high 185 Pg C yr-1. Therefore, a value of 0.5 g C MJ-1 for ϵ *NPP was initially used in CASA (Potter et al., 1993).”

Page 3475, line 28: Add a “the” to make the phrase “GPP in the United States” clearer.

Response:

Added.

Page 3476, bottom two paragraphs: I found these paragraphs a little confusing. In particular, the last paragraph starts with “First, the LUE vary. . .”, but I’m not sure what it is “first” for. I think that they are describing additional sources of uncertainties, but they already used a first, second and third sequence in the previous paragraph describing the uncertainties associated with crop coverage. I think a simple rewording of these two paragraphs would really clarify their points.

Response:

The sentence “Uncertainties in our estimates were due to several aspects” was moved to the beginning of the next paragraph. The “first . . .” relates to the first sentence “Compared with natural ecosystems, croplands usually have three important distinct features which influence their carbon exchange”.

Page 3476, line 21: Change “vary” to “varies” (to make it consistent with the later plural

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use of “changes”)

Response:

“vary” – “varies”.

Page 3476, line 23: Remove the “s” to make the phrase “to constrain the parameters”

Response:

“constrains” – “constrain”.

Page 3477, line 2: Add a comma after “quantify”

Response:

Added.

Page 3477, line 26: The “on” should be “treated as one biome”

Response:

“on” -> “one”

Page 3478, line 2: Remove the “s” to make the phrase “each type”

Response:

“types” -> “type”

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