

## ***Interactive comment on “Historical and future carbon emissions from croplands” by S. J. Smith***

**Anonymous Referee #2**

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This manuscript is a well written and well organized piece of science making a moderately interesting contribution to the understanding of the relevance of agricultural soil carbon pools on global carbon modeling and on the potential role of alternative agricultural management practices on the global carbon cycle. It provides further understanding on what is worth modeling when considering further options to include the human dimension of climate change related to land use both in Integrated Assessment Models coupled with climate models of intermediate complexity, and in General Circulation Models with a certain degree of representation of human land uses and decisions. It contains new insights particularly about agricultural practices that appear in the paper and the literature as relevant for the global carbon balance. I consider it an acceptable manuscript, nonetheless, there are some major points to revise that would increase its quality if properly addressed:

General comments:

C403

A note of caution specifically about the simplistic representation of carbon flows is made (pg4 line 1). Still, in the discussion section, the author could inform the reader assessing if a better representation of the flows provides (or does not) consistently higher or lower estimations, when comparing the results from this paper with those from other studies. This information could better compare the study with the existing literature and provide further understanding about the potential implications of having a higher degree of detail on the carbon flows.

The data presented in Table S1 made me ask a question: the difference between Russia and Canada in some parameters applied to agricultural soils in is huge. They are still agricultural soils and I find hard to justify such a great difference between 3.9 and 1.8 for the fast carbon pool (Column 1), could you provide an explanation for this? Why Russia has such an outlying value? My intuition is that such a big difference might come from information about soils that do not consider only agricultural soils in Russia, but also other kinds of soils up there. A deviation in this parameter could bias some of your results.

The article builds a lot of argumentation on a definition of other arable land that leave many open doors, this definition should be made clear, which I see it is difficult to achieve for all regions.

Then, what is “no-till”? It is not described, there is no clear definition. And actually is not clearly explained what alternative set of parameters is used to differentiate between conventional tillage and no tillage. It should be noted that after more than 10 years of no tillage the seed germination rates fall under economically acceptable values in some of the cited crops, and that soils change their properties and become too acidic in many cases, even poisonous. No tillage is an ideal agricultural practice, tillage will occur in any case within the time span considered, more than 100 years (!). So is this exercise modeling an agricultural practice that does not exist? Please make it clear.

Specific comments:

C404

(pg7 line 26) The author mentions the term adoption, while only models the outcome of the adoption process. This creates unnecessary wording and potential confusion.

Regarding the definitions of the sensitivity tests, it could be good to make clear if the land under no till in the "25% no till" Sensitivity case (TABLE 3) is distributed equally amongst regions.

Title: it could better make a reference to the management practices discussed.

Then, the supplementary materials contain also a few things to revise:

(pg 1, lines 18-19) When I tried to find into the reference you provide for checking the "adjusted for double cropping using the GCAM data processing methodology" aspect (Kyle et al.,2011. GCAM 3.0 Agriculture and Land Use: Data Sources and Methods. Available at: <http://wiki.umd.edu/gcam>), such explanation was not provided in that site. This information is relevant and should be provided.

In the Supplement, why the titles of the tables are at their feets? They were located at their tops on the main body.

Table S4 appear after the references, why?

Table S3 is full of exclamatory signs (!).

In line 50 and line 62 start two alternative versions of an explanation of Table S3. I understand only the latter is valid, as the RCP mention does not appear in Table S3.

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Interactive comment on Earth Syst. Dynam. Discuss., 5, 1, 2014.