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Biogeosciences Discussions

Interactive comment on "Regional uptake and release of crop carbon in the United States" *by* T. O. West et al.

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General comments:

Overall, this is a well-written paper that succinctly describes the methodology for this new geospatially-distributed crop carbon data product for the United States, as well as associated efforts to balance the crop carbon budget for this region. The geospatially-distributed data product will be especially useful for constructing total source and sink maps for the United States in other carbon budgeting studies. My suggestions here are intended to make the paper easier to follow and more interesting in terms of the interpretation of the results.

One general caveat is that it's hard to know which of the datasets used in the crop

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carbon budget shown here were created for this paper, and which were previously published. I would try to make this clearer throughout the paper.

Specific comments:

The geospatially-distributed net crop carbon exchange figures (Fig. 4, (g) & (h)) and discussion are interesting, although it might be nice to have a sense of the magnitude of these fluxes in the context of total carbon flux to & from the atmosphere. Perhaps a map of percent area in agricultural production would help the reader to get a sense of where agricultural fluxes are likely to be the dominant component in the total carbon budget.

I would like to see more interpretation of the trends found in the US crop carbon budget from 2000 to 2008. Are there other points to highlight beyond the increase in use of corn for ethanol (and the corresponding reduction in livestock feed, carryover, etc.)?

Some example points for discussion of the crop carbon budget are as follows: it looks like human food consumption has been growing over this 9-year period, but crop carbon for livestock feed has been declining. Given increasing meat consumption, does this mean that there are more grass-fed cows or is more of this meat imported? Also, there appears to be an increase in both imports and exports of agricultural products. What is driving this? (Who are the major trading partners?) Why did the amount of harvested cotton decline from 2005 to 2007 (p. 640, lines 14-15), and then go up again in 2008? How much of the change in crop NPP over this period is due to weather vs. management practices and land use? What drives the amount in carryover from year to year? Is this purely market-driven, or are there laws requiring a certain amount of crop production to be held in reserve? For example, 2004 had the smallest amount held in carryover, despite the highest harvest over the period. What drove that outcome?

It may be that the answers to the previous questions are common knowledge, or previously published, but I think that more interpretation of the numbers within the crop carbon budget over this nine year period would make the paper more interesting to

BGD

8, C208–C211, 2011

read.

Overall, the crop carbon budget is remarkably balanced given the complexity associated with tracking all flows of agricultural carbon within the United States. However, it looks like the imbalance is consistently in one direction, except for 2008, (i.e. not all of the fixed carbon in NPP has been accounted for in terms of subsequent releases back to the atmosphere.) Maybe you could speculate on where you think this "missing carbon" may be within the different categories of the budget? Even without firm evidence, it would be nice to see more interpretation in this area.

It was somewhat confusing to me when livestock consumption included just crop carbon, and when it included both crop carbon and pasture. Specifically, the paragraph starting with "The county level flux estimates in our analysis. . ." on page 638 was confusing. You state that "Consumption of crop carbon and pasture carbon cannot be differentiated by livestock population and county." But then, the following statement says "However, we excluded non-crop carbon (i.e. pasture grazing) from the national crop carbon budget." How were you able to do this at the national scale, but not at the county scale? Also, it looks like you did not disaggregate pasture grazing from livestock emissions in Table 4 at the scale of US Farm Resource Regions. Why not?

Also, I think that the previously mentioned paragraph on page 638 was the first mention in the paper of using slightly different methodology for the national budget vs. the geospatially-distributed dataset. I think that a clearer up-front mention of these two final data products (before discussing individual components, maybe in Section 2 before 2.1) would be warranted. The final statement on page 634, line 25 says that the estimates are at the annual, county scale. I would also mention the national crop carbon budget here, and why you used slightly different methodology at this aggregated scale.

Page 639, first sentence in Results: I would add a caveat to this sentence stating that this crop carbon data product will be useful for comparing to atmospheric measurements only after accounting for other non-agricultural CO2 fluxes, both biospheric and

BGD

8, C208–C211, 2011

anthropogenic, particularly in areas with mixed land-use.

Technical corrections:

Would it make sense to post this geospatially-distributed dataset in a publicly available ftp site, and make mention of it in the paper? Regardless, I think you should include a statement regarding how to access this data for interested scientists.

Figure 4 is very small and hard to see. Do you need to show both the county-level and per unit area maps? I might choose one or the other. Also, maybe you could put the figures in the first 3 rows on a common scale, so you would only have to show one legend per column? I could also see putting the fourth row (net crop carbon exchange) into its own figure given the scale difference.

Interactive comment on Biogeosciences Discuss., 8, 631, 2011.