

Review of “Quantifying the difference in Carbon Sequestration Rates in Organic and Conventional Agricultural Systems”

This review addresses the paper’s suitability, clarity, significance, accuracy and contribution. Comments for each area are provided along with some additional comments, mostly regarding editing, at the end of the review. Each additional comment identifies the section of the paper to which the comment refers.

Suitability

1. The paper addresses the potential impacts of organic agricultural systems on the carbon cycle. This is relevant to the overall theme of climate change, specifically as a potential mitigation strategy.
2. In addition, the question is sufficiently focused so that the paper’s content addresses several aspects of the question adequately.

Clarity

1. The paper’s chronology aids the understanding of the underlying concepts. Beginning with the basic mechanisms of carbon sequestration nicely sets the stage for the inner workings of those mechanisms in different agricultural systems.
2. The specific experimental designs and procedures are well-described for the studies reviewed in the Quantifying the difference section.
3. The Quantifying the Difference section makes several references to “combustible carbon”. Perhaps this could be defined or contrasted with other modifications used in the paper, such as “organic carbon”.
4. The Terrestrial Carbon Sequestration section provides the most process-oriented technical discussion in the paper. While the description is sufficiently detailed, a schematic figure, if available, would be a welcome supplement to the discussion.

Significance

1. The paper’s opening sections clearly identify the motivation for studying the topic, namely improving soil quality and reducing atmospheric carbon dioxide.
2. The contrast between conventional agriculture and organic agriculture is especially strong; the differences are highlighted and the impact of the differences on the motivating concerns are described.
3. The paper offers no-till organic agricultural systems as a potential climate change mitigation strategy. While the overall impact of the strategy (globally) may be difficult to quantify, it is nevertheless a feasible possibility, as the paper points out.

Accuracy

1. This issue may point more towards clarity, but one aspect of the carbon sequestration process is not obvious to me. What is the primary disadvantage (with regard to sequestration “potential”) for degraded soils? Is it the unavailability of plant material to remove carbon dioxide from the atmosphere (less impact as an atmospheric carbon sink) or the fact that they actually become an atmospheric source of carbon at that point?

2. The final paragraph links the contrast among agricultural systems back to climate change by outlining the responses of agricultural systems to changes in climate (most notably changes in precipitation). The final sentence refers to resistance to “climate instability.” The definition of climate instability, and how it relates to greenhouse emissions, is unclear to me. Perhaps this refers to the variability in the climate system or perhaps the likelihood of extreme weather events.

Contribution

1. In my view, the paper’s major contribution is the discussion of no-till organic systems: “No-till systems represent a system that has a very high potential for accumulating carbon in soils.” The discussion further offers some potential challenges for this system along with *realistic solutions*.
2. Since the topic of the paper relates to quantifying carbon sequestration, it may benefit to have some discussion of any existing studies specifically for no-till organic systems, or, if none exist, what sort of investigation could be done, along the lines of the two studies outlined earlier in the paper. As I understand those studies, a no-till strategy was not employed for the organic systems.

Additional Comments

1. The paper makes many references to the chemical symbol for carbon dioxide, CO₂. However, the letter O’s appear to me to be the number zero instead.
2. Abstract: “... farming techniques represent a management practices ...”, the “a” should be removed.
3. Introduction: the IPCC’s fourth *assessment* report
4. Terrestrial Carbon Sequestration (top of page 3): “... for soil health, indication the level ...” could be “... for soil health, *indicating* the level ...”
5. Land Use Changes (first paragraph): “... can lead to the lose of organic ... ” should be “... can lead to the loss of organic ...”
6. Land Use Changes (middle of first paragraph): “... and removal crops ...” should be “... and removal of crops ...”
7. Quantifying the Difference (sixth paragraph): The first sentence here requires some attention, specifically “ ... that the ? in the organic ... ” and “ ... the organic legume bases system ...”. Also, in the following sentence, “to not” should be “to note”.
8. Quantifying the Difference (seventh paragraph): The final sentence has “ ... planing cover crops ...” which should probably be “ ... planting cover crops ... ”
9. Implications (first paragraph): The sentence that begins “Other cultural practice ...” could use reconstruction, perhaps begin with “Another”
10. Implications (final paragraph): The end of the first sentence should read “ ... used *to* mitigate climate change.”

