

Interactive comment on “Predicting the global warming potential of agro-ecosystems” by S. Lehuger et al.

Anonymous Referee #3

Received and published: 12 June 2007

The objectives of this study were to (a) test a crop model with experimental data from two cropping systems at two different sites and to (b) then use the model to assess the GWP of these two systems over a longer period. To this purpose, CO₂ exchange was measured by eddy covariance at one site during the growth cycle of one crop in a rotation of three crops. Some measurements of N₂O were carried out on both sites but measurement duration and temporal resolution were weak. The data was then used to test the model and the model was applied to simulate soil carbon changes and the GWP balance of both systems over a period of 30 years.

From my point of view, there is no new insight gained by this study into the GWP balance of crop rotations. The measurements are too sparse to justify extrapolation to the full cycle of crop rotation, let alone to a 30 year period. Also, I am somewhat

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surprised by the lack of caution with which simulated changes in soil carbon stocks are presented. The rates presented in Figure 7 are at two sites about twice as large as have been observed on average by direct measurement after conversion of agricultural land to grassland or forest (Post and Kwon, *Global Change Biology* 6: 317-327). Why should continued agricultural use increase soil carbon stocks even more than the mentioned conversions? Also, the authors may be aware of the report by Bellamy et al. (*Nature* 437:245-248, 2005) on carbon loss from all soils in England and Wales, found through repeated measurements at more than two thousand sites between 1978 and 2003. Why should agricultural soils in France have been strong sinks for carbon during a similar period while soils on the other side of the Channel were losing measurable quantities of carbon?

The soil-crop model used in the present study is certainly a useful tool to study the GWP of different crop rotations. Still, reality check should not be limited to sparse data and extrapolation has definitively to be much more cautious.

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