

**Ken Cassman's Comments on external reviews from Ken Cassman, May 10, 2009:**

From Dr. Jerry Mellilo

P42, L7-11 – at what spatial scale? Country or watershed suggested, but no actual area suggested, e.g., km<sup>2</sup> L12 – make it clear that NFUE discussion starts a new section – add section label “2.2.3.2”

*Response: I agree, we should specify the spatial scale for this data collection. I will leave the decision about what geospatial scale up to Bill Hess and Otto Doering who know more about the current accounting system and its capabilities. It should, however, be on a finer scale than a state.*

*I also agree we need a new heading immediately after recommendation 1 that would be: Nitrogen Fertilizer Efficiency, with the associated changes in subheading numbers.*

P47, L16 – a more complete discussion of the Crutzen et al. discussion would be useful here. Also, see the results from Scanlon et al. 2003, where diode laser and eddy flux were used.

*Response: I'm not convinced we need to go into more detail about the Crutzen et al (2008) paper. We note the discrepancy with other estimates, and then highlight the need for better predictions of N<sub>2</sub>O emissions from agroecosystems and the factors responsible for them. I looked at the paper by Scanlon et al. (2003) and it is based on measurements from intensive pasture systems in Europe where they apply heavy amounts of both N fertilizer and pig slurry. Such systems are not widespread globally, and they have a very small extent in the U.S. Bottom line, I do not recommend any changes to the text in question.*

*In fact, if we need to add additional text about the linkage between N fertilizer use in agriculture and N<sub>2</sub>O emissions, the most important issue concerns the indirect land use impacts derived from the current use of N fertilizer, which raises crop productivity substantially on existing farmland, which in turn reduces the need for expanding crop agriculture into rainforests, wetlands, and grasslands on a global basis. This is the same tradeoff as is currently required of life-cycle analyses of biofuel systems as written into the 2007 Energy Independence and Security Act. Taking a similar approach for the impact of N fertilizer would likely change the way we look at its overall impact on GHG emissions.*

P51 – biofuels discussion should note that if biofuels feedstocks are going to be grown on marginal lands, additional N inputs and irrigation may be needed.

*Response: This is a valid point, but it is covered in our recommendation #4 where we call for understanding the impact of biofuel systems on both corn-based and second generation biofuel systems. Second generation biofuels include cellulosic biofuels made from dedicated perennial crops like switchgrass and Miscanthus that are likely to be grown on marginal land.*

P64, L6 – why no finding for this topic? a big deal at the local level.

*Response: Although not entirely clear, it appears this comment is directed at N<sub>r</sub> use on turf systems. I would support a recommendation on what is needed to reduce N<sub>r</sub> load*

*and Nr losses from turf systems. Perhaps Arlen Mosier, Bill Herz, and Paul Stacy can put one together?*