

## **Soil Enrichment Protocol Public Comment**

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#### Nitrous oxide

Default emission factors have evolved over time and this protocol should reflect this. For example, Charles et al. (2017) identified emissions factors for different sources of N based on a meta-analysis of published papers. While this review is unclear in terms of certain sources, it is straight forward for animal manures and composts. Perhaps more predictive and also reflected in the literature is the role of soil texture, precipitation and type of cropping system for N<sub>2</sub>O emissions (Rochette et al., 2018). In my own research (Brown et al., 2020), we found minimal N<sub>2</sub>O emissions for surface applied dried biosolids to a sandy soil with a perennial grass crop. The observed emissions were much more in line with those predicted by soil texture and cropping factors. This approach, using soil texture, cropping and rainfall as the primary factors for N<sub>2</sub>O emissions would be straightforward to do and would better reflect actual emissions. Using single default factors across all soil textures, N sources, cropping systems, and rainfall patterns does not reflect current knowledge. Adjusting default factors would be simple and likely more reflective of actual emissions.

#### Soil carbon

As written, the draft protocol appears very concerned with carbon persistence over the 100 year time frame. The protocol requires measures of total C in soil but this reader did not see any requirements to measure bulk density. It seems that a more feasible and appropriate emphasis would be on a new soil equilibrium carbon concentration. First- without bulk density measures, total soil carbon storage is not measured. As C increases, BD decreases. Measures of increased C, taken as increased total C storage will likely not be accurate. It is also likely that field measures with a limited n and different groups sampling may give high variability. There have been a number of meta-analysis that have provided general C accumulation factors for different management practices. For these practices, it seems that use of default factors would be much less cumbersome and equally effective. Use of cover crops has been shown to accumulate 0.3 MG C ha yr for example. Adopting this practice would be easy to document. Factors have also been identified for manure use, compost use and use of municipal biosolids.

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