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On behalf of our members, the National Wildlife Federation appreciates the opportunity to comment on the proposed methodology to quantify nitrous oxide emissions reductions in US agricultural crops through nitrogen fertilizer reduction in the Voluntary Carbon Standard (VCS). While we support the wise use of offsets as a method to reduce greenhouse gas emissions, this proposed methodology has serious shortcomings that would prevent accurate measurements of greenhouse gas reductions.

The definitions of synthetic and organic nitrogen fertilizer include diverse types of fertilizer with significantly different emissions profiles. Fertilizer management, crop type and tillage system all have significant impacts on nitrous oxide emissions. Initial research has found fertilizer differences and tillage practices altering nitrous oxide emissions by 50%. While we understand that not all factors causing variation in nitrous oxide emissions can be included in such a methodology, the variation due to these causes is so significant that it must be included. Below are specific comments on different elements in the proposal.

Definition of synthetic nitrogen fertilizer
Research has found that there are reductions in nitrous oxide emissions from matching fertilizer type to environmental conditions, using controlled release fertilizers and nitrogen inhibitors. [i] A recent meta-analysis of 35 studies found that nitrification inhibitors reduced nitrous oxide emissions by an average of 38%. Polymer coated fertilizers (controlled release fertilizers) reduced nitrous oxide emissions by an average of 58%.[ii]

These reductions are ignored by proposed definition of synthetic nitrogen fertilizer, which does not distinguish between "a single nutrient fertilizer product (only including N), or any other synthetic fertilizer containing N, such as multi–nutrient fertilizers (e.g., N–P–K fertilizers) and „enhanced–efficiency" N fertilizers (e.g., slow release, controlled release and stabilized N fertilizers)." Projects seeking to use these range of technologies will be unfairly excluded.

Definition of organic nitrogen fertilizer

There are clear and obvious chemical differences between manure, compost and sewage sludge. Compost is more stable than manure, due to microbial processes of the composting process.[iii] It is often produced with specific carbon to nitrogen ratios and temperature and aeration requirements. Compost and manure are both amendments with a diverse, complex mix of nutrients including nitrogen, carbon and micronutrients. Sewage sludge often includes toxic heavy metals and various biologically active wastes such as hormones or medicines. Each of these three amendments has a widely variable chemical profile, and distinct differences from the other. They have different nitrous oxide emissions profiles.

This crucial distinction is ignored by a proposed definition of organic nitrogen fertilizer which includes "Any organic material containing N, including animal manure, compost and sewage sludge."

Fertilizer Nitrogen Sources

Farmers routinely use crop residue nitrogen to fertilize their fields. Soybeans are grown in rotation with corn to provide nitrogen. Nitrogen fixing cover crops provide nitrogen for crops. Research has demonstrated that cover crops can increase nitrous oxide emissions, if managed under certain irrigation regimes.[iv]
The proposed exclusion of fertilizer N from crop residues and cover crops fails to include a significant source of nitrous oxide affected by the project and within the project boundaries.

Fertilizer Nitrogen Management

Research has demonstrated that the timing and placement of nitrogen fertilizers significantly affects nitrous oxide emissions.[v] By assuming that all nitrogen fertilizer applications produce the same nitrous oxide emissions, the proposal fails to include a significant source of variation in nitrous oxide emissions affected by the project and within the project boundaries.

Emission Measurements

Research demonstrates that compost has lower nitrous oxide emissions than urea. Compost has been shown to have 49% lower emissions when nitrous oxide and carbon dioxide are taken into account.[vi] Different nitrous oxide emissions are expected based on whether fertilizer is synthetic or organic, and what kind of synthetic fertilizer is applied.

In method one, the protocol proposes an emissions factor "EF_{BDM1}" be used as an emissions factor for all kinds of nitrogen fertilizer. This fails to accurately assess significantly different nitrous oxide emissions from different nitrogen sources.

In method two, the protocol proposes an emissions factor "EF_{BDM2}" be used as an emissions factor for all kinds of nitrogen fertilizer. This fails to accurately assess significantly different nitrous oxide emissions from different nitrogen sources.

Research demonstrates that nitrogen lost to leaching and runnoff differs depending on nitrogen source.[vii] Diverse types of synthetic and organic fertilizers have different leaching rates in the same year, with the same climate and soils.
The protocol proposes one leaching factor "$Frac_{LEACH-(H)}$" for all fertilizers, dependent solely on precipitation and evapo-transpiration. This ignores what can be significant losses of nitrogen to ecosystems, depending on fertilizer types.

Tillage Impacts

Research demonstrates that tillage practices interact with fertilization to significantly vary nitrous oxide emissions.[viii] Tillage affects soil moisture and compaction levels, which determine nitrous oxide emissions to a large extent. By ignoring tillage, the protocol fails to account for a significant source of variation in nitrous oxide within the project boundaries.

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[ii] Akiyama, Yan, Yagi. "Evaluation of effectiveness of enhanced-efficiency fertilizers as mitigation options for N_2O and NO emissions from agricultural soils: meta-analysis." Global Change Biology (2010) 16:6 1837-1846

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