Comments on Draft CAR Soil Enrichment Protocol Version 1.0 (August 2020 edition)

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Aug 24, 2020

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We would like to thank the Climate Action Reserve for the opportunity to provide comments on its second draft *Soil Enrichment Protocol, Version 1.0, August 2020 edition* (SEP). We appreciate the provision of a red-line version to highlight changes made from the first draft version.

As we noted in our first set of comments (May 18th, 2020) selling GHG credits in an agricultural offset program requires a high level of certainty and a robust risk management accounting system, as offset sales result in GHG emissions to the atmosphere elsewhere and many land-use-based credits can be reversible. Unfortunately, in our opinion, the revisions in the second draft of the SEP (August 2020) do not improve the ability of the SEP to meet this requirement. As we stated in our first set of comments, it is our position that achieving a satisfactory level of certainty and risk management capabilities cannot be achieved at the project-scale but rather requires a regionally coordinated landscape-scale program structure. Regional verification will be required to ensure that there are real net changes in carbon stocks and reductions in other GHG emissions. The complexity of the project-level framework proposed in the SEP could lead to perverse outcomes. This potential reduces our confidence that the projects will reflect a net GHG reduction in the atmosphere when all the actions taken in a region are considered. Furthermore, current models (such as those named in the August 2020 draft, DNDC and COMET-Farm) do not have sufficient resolution and lack sufficient validation to accurately predict SOC and N_2O dynamics at the field level and may only achieve sufficient certainty when applied over large numbers of acres[1]. Using such models for regions and cropping systems not yet calibrated and validated further reduces confidence of real GHG emission reductions and introduces the chance of

[1] Chenu et al 2019 https://www.sciencedirect.com/science/article/pii/S0167198718303738?via%3Dihub

other unintended consequences. Therefore, models used must provide proof of validity with guidance as to acceptable uncertainty provided within the protocol.

The August 2020 SEP draft reduction in length of the Project Implementation Agreement (PIA), dropping the contract period from 30 years to 10 years, and the reasons offered for this change in the *Summary of Comments and Responses*, highlight our concerns over SOC permanence and the accounting options CAR is proposing for managing reversals. The size of anticipated annual SOC enhancement levels are small relative to the existing SOC stock and the literature suggests achieving statistically significant measurable enhancements will require continuous application of conservation practices for a decade or more. The shorter PIA of 10 years in combination with the Tonne Year Accounting option, which will likely be the accounting method chosen by the majority of applicants, does little to encourage long term implementation of the conservation practices expected to result in soil C sequestration. To encourage management which will result in the a more realistic potential for net atmospheric CO2 reduction when SOC enrichment and sold offset emissions are considered, we recommend that Tonne Year Accounting only be allowed as an option after completion of a 30-year PIA. This time frame would be more in line with the anticipated formation of new soil C steady states and C reversals are unlikely to exceed the proportional credit afforded by the Tonne Year Accounting approach.

We do appreciate the value of the hybrid modeling and soil sampling approach that CAR has included in the SEP. However, with regard to the changes made in the August version in an attempt to address the concerns about the inaccurate assessment of net soil carbon sequestration over the whole soil profile by depending only upon soil samples collected at a 30 cm depth, we think the SEP modification falls short. The exclusion of SOC credits for conversion to no till in fields previously managed with deep tillage techniques as a remedy for 30 cm soil sampling is not supported by recent literature, which finds no net change in carbon over the 1 meter soil profile (see, for example the systematic review of Haddaway et al 2017[2], Chenu et al 2019[3] and the exclusion of SOC enhancement from tillage by Grisom et al 2017[4] and Fargione et.al, 2018[5].) Nayak et al 2019[6], not only points to the need for 1-meter soil samples to adequately measure net soil C sequestration but also points to the evolution of eddy covariance approaches as an upcoming and superior way to measure net soil C and N_2O fluxes. Various efforts are underway to develop high resolution datasets to support testing and validation of soil flux measurements from field level to satellite-based

[2] Haddaway et al 2017 https://environmentalevidencejournal.biomedcentral.com/articles/10.1186/s13750-017-0108-9

[3] Chenu et al 2019 https://www.sciencedirect.com/science/article/pii/S0167198718303738?via%3Dihub

[4] Griscom et al 2017 https://www.pnas.org/content/114/44/11645

[5] Fargione et al 2018 https://advances.sciencemag.org/content/4/11/eaat1869

[6] Nayak et al 2019 https://doi.org/10.1016/j.scitotenv.2019.02.125

assessments. These techniques may provide simpler and more cost effective methods of measuring net SOC enrichment. However, given the current questions surrounding the validity of using a 30 cm soil sample depth as an accurate measure of SOC enrichment, the CAR protocol should require that a statistically appropriate percentage of soil samples in each stratified collection of samples be taken to 1 meter. While current models may only include predictions to 30 cm, a subsample of 1 meter deep samples would allow the net soil C enhancement over the full soil profile to be compared to the 30 cm sample, allowing for corrections for the 30 cm soil C estimates. Furthermore, the data collected by requiring a subsample of soil samples to 1 meter depth will help stimulate modeling to this depth and work towards resolution of the current debate over the true net soil carbon enrichment.