5/18/20
To: Climate Action Reserve Soil Enrichment Team
From: Carbon Cycle Institute
Re: Comment on: CAR April 17, 2020 draft "Soil Enrichment" protocol.

Dear CAR Soil Enrichment Team;

Thank you for the opportunity to comment on the April 17, 2020 draft "Soil Enrichment" Protocol. We recognize the significant effort the protocol represents. We are, however, disappointed by two significant omissions in the Protocol.

1) Acceptable Land Management practices (p. 4) fail to include agroforestry practices. Indeed, riparian areas and agroforestry features (hedgerow, windbreaks, etc.) are explicitly excluded from acreage considered under the Protocol. Given the importance of such practices and landscape features in building long-term carbon reserves on farm, enhancing farm-scale microclimates for improved productivity (i.e., enhanced C capture) and supporting ancillary ecosystem services (Bentrup et al 2018, Dollinger and Jose 2018, Shrestha et al 2018, Schoenberger et al 2012, Udawatta et al 2012), this gap constitutes a significant deficiency.

2) Significantly, compost is not mentioned in the Protocol, except as "organic fertilizer," and as a source of N. We highlighted this gap in our comments on the March draft of the Protocol, and were assured compost would be addressed in subsequent drafts. Unfortunately, compost remains unrecognized as an opportunity for rapid carbon enhancement of the agricultural ecosystem in the April draft as well. Compost is ***not a fertilizer,*** and its soil carbon enhancing characteristics are only marginally related to its available N content (which is minimal). The protocol further appears to erroneously quantify nitrous oxide emissions from compost using total N content, when it is the readily available mineral N, not total N, that drives N2O emissions from organic soil amendments (Chadwick et al 2011, Yamulki 2006). While compost does contain some N (typically 1-2%), treating it as a nitrogen fertilizer within the Protocol misses the enormous opportunity to rapidly build soil C with compost production and use, and erroneously treats organic N as equivalent to mineral N. The Protocol also ignores the direct carbon conservation benefits of composting organic materials, and the avoidance of methane and black carbon emissions associated with compost production and use (Sustainable Conservation 2015, Vaughan et al. 2014, Delonge et al 2013). Table 4.1 (p. 27) should include compost and the Protocol should include appropriate analysis to quantify the benefits of both compost manufacture and use.

Compost produced through a managed, aerobic, thermophilic process represents a particularly potent GHG reduction strategy by: 1) avoiding production of short-lived climate pollutants (CH_4, N_2O and black carbon) associated with alternative waste management strategies; 2) optimizing conservation of photosynthetically fixed carbon within compost feedstocks via the controlled decomposition ecology of the compost environment; 3) enabling direct application of beneficial high-carbon amendments to soils; 4) displacing synthetic sources of nutrients and avoiding their attendant water quality and GHG costs, and 5) minimizing agroecosystem nutrient losses, including nitrous oxide (N_2O) and ammonia (NH3) volatilization and nitrate (NO_3) leaching, through the tightening of soil nutrient cycles associated with increased soil organic matter (SOM) (Bowles et al 2015, Oudart et al 2013, Parkinson et al 2004).

The use of compost in crop, pasture and rangeland ecosystems offers the most rapid means of directly increasing SOC, through direct additions of stable, beneficial SOM, enabling the rapid elevation of SOC to levels that would take decades or more to achieve through agroecosystem management alone. Compost further provides necessary plant nutrients in organic form, helping to displace the use of nutrient cycle-forcing synthetic fertilizers, including N, a significant source of N_2O (Vaughan et al 2014). Compost also offers a means of transferring biomass and associated nutrients from areas of excess to areas of deficit, greatly facilitating the recycling and balancing of nutrients at landscape and regional scales.

The great value of compost is not in plant nutrients per se, but the provision of solar energy –in the form of photosynthetically fixed organic carbon- to the soil ecosystem. This biologically fixed solar energy drives soil processes that in turn support plant nutrition, soil health and agricultural productivity. It is precisely the distinction between the conventional "limiting factor" approach and the "soil organic matter" approach to soil fertility that, classically, defines the difference between "organic" and "conventional" agricultures (Fukuoka 1985, Rodale 1960, Steiner 1958, Turner 1951, Sykes 1949, Howard 1943, Balfour 1943). Compost N is largely organic, that is, complexed with carbon, leading to significantly slower mineralization and loss rates than inorganic N (Ryals and Silver 2013, Yamulki 2006, Sikora and Szmidt 2001, Eghball 2000).

Because most of the working land soils of the world have the capacity to hold significantly more organic carbon than they currently do (Sanderman et al 2017), the promise of a soil carbon enhancement protocol can best be realized by optimizing the opportunities for SOC increases wherever possible. We urge CAR to look beyond compost nutrient content to the understanding that it is compost organic carbon, as embodied solar energy, that supports receiving soil's ecological processes and thus soil-plant-water relations, including enhanced photosynthetic capture of CO2, within the broader agricultural ecosystem (Ryals et al 2015).

The goal of the Soil Enrichment Protocol is presumably to engage the enormous potential of working land soils to reduce anthropogenic forcing of the climate system. It is imperative, therefore, that all the ways in which this catastrophic process is being aggravated, and all the opportunities for its reversal, are addressed to the fullest extent possible. Because compost is produced from existing feedstocks -whether originating on or off farm- which are largely waste products that would otherwise require some manner of disposition with associated potential negative environmental impacts, its use does not result in additional forcing of global biogeochemical cycles, as occurs with the manufacture and use of synthetic fertilizers and anaerobic and pyrogenic disposal.

The time for timid steps and half measures in response to climate change is far behind us (Plattner et al 2013). The world cannot meet its GHG reduction goals without ambitious, soil focused, global working lands program (IPCC 2019). Compost, while appropriately recognized as only one component of such a program, is particularly effective because of its multi-faceted impacts on the climate change equation: decomposition within the compost environment maximizes both carbon and nitrogen conservation as compost biomass, while minimizing emissions of short-lived climate pollutants, including black carbon associated with burning of biomass, and CH_4 and N_20 emissions from anaerobic disposal alternatives. The compost environment effectively pre-processes and stabilizes organic materials for safe and beneficial application to working land soils. Compost offers the simplest and fastest way to safely increase soil organic matter levels on working lands; its use should be strongly supported within the Protocol with respect to both avoided emissions (displacement of synthetic N sources, and CH_4, N_2O and black carbon avoidance) and CO_2 sequestration as SOC.

CalRecycle's significant body of research on compost use is notably absent from the Draft Protocol, and should be reviewed for data relevant to this question (CalRecycle 2009, CIWMB 2007). CAR should convene a panel of subject experts to insure both agroforestry and compost –the latter undoubtedly the single most powerful tool available for rapidly increasing agricultural soil organic carbon- are properly addressed within the Protocol. If Protocol authors assume the use of separate, compost-specific protocols for this purpose, this should be explicitly stated; the enormous potential of compost should be recognized, and those protocols should be specified in the document.

Thank you again for the opportunity to comment on the April 17, 2020 draft "Soil Enrichment" protocol. We recognize the significant effort the protocol represents, and hope the significant gaps in the Protocol elucidated here can be resolved in the final version.

Sincerely,

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