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National Organic Standards Board
USDA-AMS-NOP
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Room 2648-S, Mail Stop 0268
Washington, DC 20250-0268

Docket ID # AMS-NOP-22-0042

Re. CS: Carbon dioxide

These comments to the National Organic Standards Board (NOSB) on its Fall 2022 agenda are submitted on behalf of Beyond Pesticides. Founded in 1981 as a national, grassroots, membership organization that represents community-based organizations and a range of people seeking to bridge the interests of consumers, farmers, and farmworkers, Beyond Pesticides advances improved protections from pesticides and alternative pest management strategies that reduce or eliminate a reliance on pesticides. Our membership and network span the 50 states and the world.

The petition calls for use of CO₂ for two uses— at §205.601 synthetic substances allowed for use in organic crop production as (a) algicide, disinfectants, and sanitizer, including irrigation system cleaning systems and (j) as plant or soil amendments. The CS has introduced a motion on the listing at (a) and deferred action on the listing at (j), while inviting comment.

However, the discussion by the CS of the petitioned listing at (a) focuses on the use as an acidifying agent in irrigation water in which the pH is high. Submitted documents concern use of CO₂ as a plant growth enhancer. Except for the Tansley review, they refer to aerial use of CO₂, not dissolved CO₂. The Tansley review discusses CO₂ effects on pH in terms of mobilizing soil nutrients, not neutralizing or lowering pH of irrigation water that is too alkaline. The petition makes it clear that there are other potential uses of CO₂, including a plant growth enhancer, which is not appropriate for a synthetic material.

According to §6517(c)(1) of the Organic Foods Production Act (OFPA),
The National List may provide for the use of substances in an organic farming or handling operation that are otherwise prohibited under this chapter only if—
(A) the Secretary determines, in consultation with the Secretary of Health and Human Services and the Administrator of the Environmental Protection Agency, that the use of such substances—
(i) would not be harmful to human health or the environment;

- (ii) is necessary to the production or handling of the agricultural product because of the unavailability of wholly natural substitute products; and
- (iii) is consistent with organic farming and handling;

(B) the substance—

- (i) is used in production and contains an active synthetic ingredient in the following categories: copper and sulfur compounds; toxins derived from bacteria; pheromones, soaps, horticultural oils, fish emulsions, treated seed, vitamins and minerals; livestock parasiticides and medicines and production aids including netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers; or
- (ii) is used in production and contains synthetic inert ingredients that are not classified by the Administrator of the Environmental Protection Agency as inerts of toxicological concern; and

(C) the specific exemption is developed using the procedures described in subsection (d).

The petitioner's claim for lack of harm depends on a production method that is not required by the proposed listing. The petition does not establish need for either of the petitioned uses. Furthermore, the compatibility of CO₂ is not established by the Crops Subcommittee.

§205.601 (a) algicide, disinfectant, and sanitizer, including irrigation system cleaning systems.

The CS review does not address this use. It does not consider the OFPA criteria of absence of human health and environmental harm, essentiality, and consistency with organic practices for these uses. Therefore, the proposal should be rejected.

The petition does not establish a need for carbon dioxide as a pH adjuster.

Although the motion does not mention carbon dioxide as a pH adjuster, or indicate the relevance of pH adjustment to the uses in §601(a), the subcommittee's materials focus on pH adjustment. The CS identifies sulfur burners and citric acid as alternatives. Another alternative is abandoning the dependence on irrigation. While most of these issues have been discussed by the NOSB, the crucial question with respect to compatibility with organic practices is whether sulfurous acid is used to enable the continued use of unsustainable agricultural practices. The build-up of alkaline salts results from unsustainable agricultural practices. As stated by Richard Cowen of UC Davis,

Therefore, irrigation can only be maintained on a long-term basis in the following conditions. Water is applied in such a way that salt is not allowed to build up in the soil. Usually, this means that a lot of good-quality water is applied, and that drainage is rapid and efficient. Soils need a large infusion of fertilizer, to balance the flushing that is required to keep them salt-free.

A region that can be irrigated on a long-term basis thus has

- An abundant supply of good water.
- Well-drained soil.
- Good regional drainage.
- A supply of fertilizer for the soil.

If any of these conditions fails, the system will eventually fail. Such failures have brought down civilizations that solved the engineering and logistic problems of designing, building, and maintaining irrigation systems, but neglected the long-term effects of salinization or nutrient depletion. Long-term problems of irrigation may not appear for a long time: today, for example, the valleys and basins of the San Joaquin, Rio Grande, Indus, Nile, Murray-Darling, Jordan, and Tigris-Euphrates are being irrigated, with progressive and visible increases in salinization and water-logging, and no remedy in sight. Only a few civilizations based on irrigating dry country have lasted for any length of time: sensible civilizations should not try to grow wetland crops in arid climates.

The major success stories for civilizations based on agricultural irrigation are Egypt and China. The major stories of failure are happening right in front of us. In present-day California, a giant industry is trying to maintain an irrigation economy with a diminishing supply of poor-quality water, on clay soils with very poor natural drainage, in an almost landlocked plain with poor or non-existent regional drainage, applying water that has been stripped of its natural load of silt.¹

Therefore, the NOSB needs to ask whether the “need” for acidification of irrigation water reflects unsustainable farming practices.

If the NOSB approves this motion, it must do so with an annotation strictly limiting its use to algicide, disinfectant, and sanitizer, and irrigation system cleaning systems.

The NOP has allowed hydroponic and container production to be certified organic if they do not use prohibited materials. Enhancing the growing environment with CO₂ can increase the productivity of hydroponic and container systems, especially in greenhouses.² While use of CO₂ to adjust the pH of irrigation water may have few adverse effects—outside of encouraging the unsustainable use of irrigation and, if not sourced through recycling—the NOSB must ensure that it is not taking actions that will encourage soilless forms of “organic” production. **Thus, such a listing for CO₂ must state, “For use only as algicide, disinfectant, and sanitizer, and in irrigation system cleaning systems; may not be used to enhance production in hydroponic, container, or other systems.”**

¹ Richard Cowen, “Ancient Irrigation,” Chapter 17 of *Essays on Geology, History, and People*.
<http://mygeologypage.ucdavis.edu/cowen/~GEL115/115CH17oldirrigation.html> Accessed 12/29/2012.

² See, for example, Ryu, H.R., Choi, E.Y. and Choi, K.Y., 2018. Growth Characteristics, Yield and Fruit Soluble Carbohydrate Content of Hydroponically Grown Strawberry with Carbon Dioxide Fertilization.

Environmental impacts have not been determined.

The CS says, “Carbon dioxide is a greenhouse gas and can contribute to climate change. Its increase in the atmosphere has altered the biodiversity in many ecosystems. However, the use of this product in accordance with the petition will not add to the increase of carbon dioxide. The petitioned use is for carbon dioxide produced as a byproduct of other processes. The carbon dioxide would be released to the atmosphere regardless of the petitioned use.”

There is nothing in the petition that requires the use of CO₂ produced as a byproduct of other processes. If this is the intention of the CS, then it needs to be in an annotation.

It should be noted that when this issue has been discussed during previous cycles, the point has been made that organic production should not rely on the byproducts of polluting industries. To do so is to accept polluting practices that organic has sought to end by accessing the impacts of allowed substances from cradle-to-grave—from production, use, to disposal. Clearly stated in the history of organic law and policy is the intent that organic systems “enhance” environmental protection and the complex biological communities that sustains life. To, in effect, incorporate a reliance on polluting practices runs contrary to the critical role that organic is playing and must play in incentivizing alternative non-polluting practices.

Health effects are misstated.

The CS states, “At the rates occurring in the atmosphere, it is completely non-toxic and is exempt from having a lethal dose.” While it is true that carbon dioxide is non-toxic at normal atmospheric concentrations, the uses envisioned by the petitioner may result in local concentrations that are much higher. Carbon dioxide, as a gas, has its toxicity measured in terms of concentration rather than dose. Health and safety organizations note its adverse effects at higher concentrations. “Carbon dioxide (CO₂) is a toxic gas at high concentration, as well as an asphyxiant gas (due to reduction in oxygen). Irritation of the eyes, nose and throat occurs only at high concentrations.”³ “The revised IDLH [Immediately Dangerous to Life or Health Concentration] for carbon dioxide is 40,000 ppm based on acute inhalation toxicity data in humans.”⁴ USDA’s FSIS Environmental Safety and Health Group has published a Health Hazard Information Sheet for carbon dioxide that lists hazards of various levels of exposure.⁵

At atmospheric pressure, the pH of carbonic acid has been found to be 3.92,⁶ contrary to the petitioner’s statement, repeated by the CS, that “Water pH cannot drop below pH 5.0 when carbonic acid (dissolved CO₂) is used in the acidification process.”

³ International Volcanic Health Hazard Network (IVHHN). <https://www.ivhnn.org/information/information-different-volcanic-gases/carbon-dioxide>.

⁴ National Institute for Occupational Safety and Health, 2014. <https://www.cdc.gov/niosh/idlh/124389.html>.

⁵ https://www.fsis.usda.gov/sites/default/files/media_file/2020-08/Carbon-Dioxide.pdf.

⁶ New World Encyclopedia contributors, “Carbonic acid,” *New World Encyclopedia*, , https://www.newworldencyclopedia.org/p/index.php?title=Carbonic_acid&oldid=1002606 (accessed September 2, 2022).

**Carbon dioxide as petitioned is not compatible with organic practices.
Carbon dioxide is not in any category of §6517(c)(1)(B)(i).**

CO₂ is not a production aid. We have requested that the NOSB develop a definition of “production aid,” which is defined in OFPA only by example. The examples given are “netting, tree wraps and seals, insect traps, sticky barriers, row covers, and equipment cleansers.” “Production aid” should not be used as a catch-all for anything that does not fit into another category. If that had been the intention of the framers of OFPA, there would be no need for §6517(c)(1)(B)(i). **CO₂ as an acidifying agent is not comparable to these materials. Therefore, it is not eligible for listing.**

The CS reasoning is erroneous.

The CS says, “Because carbon dioxide is approved as an organic processing substance, is already being produced, and its listing at §205.601 would be considered a recycling process, the Crops Subcommittee finds it compatible with a system of sustainable agriculture.” First, National List materials must be listed for a specific use, and the fact that it meets the criteria for listing in processing food does not make it compatible with organic crop production. Second, as mentioned above, there is nothing in the petition or proposal that would require the use of recycled CO₂. Furthermore, the fact that the listing would allow the use of CO₂ as a plant growth enhancer in hydroponic and container production is incompatible with organic principles as previously expressed by the NOSB.

Conclusion

While CO₂ may be the best alternative for pH adjustment of irrigation water, that is not the subject of the motion. In addition, documentation submitted by the petitioner and the CS proposal are inadequate to ensure that the listing would be used only to meet a need of organic producers, would not contribute to climate change, and would be compatible with organic production. Therefore, the petition should be rejected.

Thank you for your consideration of these comments.

Sincerely,



Terry Shistar, Ph.D.
Board of Directors