DUCTOR®

July 12, 2023

Cheryl Laskowski, PhD
California Air Resources Board
1001 I Street
Sacramento, California 95814

Dear CARB Staff,

Thank you for the opportunity to comment on the proposed Tier 1 dairy and swine manure (DSM) Calculator.

Ductor was founded in 2009 with the ambitious aim of creating a solution that would help solving today's environmental challenges in the energy and agriculture sector. Today we build, own, and operate turnkey microbiological facilities that turn organic resources from the agricultural sector into sustainable fertilizers and biogas. We are focused on building and operating anaerobic digestion facilities throughout the United States including in California that will reduce agricultural emissions.

We have taken in interest in Low Carbon Fuel Standard (LCFS) programs throughout the United States and appreciate the opportunity to provide feedback on California's LCFS regulation. Our comments on the proposed Tier 1 DSM Calculator are summarized below.

CARB's exclusion of N_2O emissions in the proposed DSM calculator represents a missed opportunity to leverage emissions reductions in the livestock sectors.

As highlighted in the study by Tian et al. (2020) on global nitrous oxide (N_2O) sources and sinks, mitigating N_2O emissions is an urgent need. Recent data indicates that the growth in N_2O emissions exceeds some of the highest projected emission scenarios. Human-induced emissions, driven primarily by nitrogen additions to croplands, have increased by 30% over the past four decades, reaching 7.3 teragrams of nitrogen per year. This substantial increase has contributed significantly to the atmospheric burden of N_2O.[1]

Nitrous oxide is a potent greenhouse gas (GHG) that contributes primarily to stratospheric ozone depletion, and its effects are approximately 300 times more potent than those of CO_2[2] [3]. Agricultural soil is a major source of N_2O, and intensive production of beef, poultry, and pork results in increased amounts of manure production, which in turn increases N_2O emission

[1] Tian, H., Xu, R., Canadell, J. G., Thompson, R. L., Winiwarter, W., Suntharalingam, P., ... & Yao, Y. (2020). A comprehensive quantification of global nitrous oxide sources and sinks. Nature, 586(7828), 248-256.
[2] Akiyama, H.; Sano, T.; Nishina, K.; et al. N2O Emission Factors for Organic Amendments in Japan from Measurement Campaign and Systematic Review. Sci. Total Environ. 2023, 864, 161088.
[3] IPCC Climate Change 2007: Mitigation of Climate Change. Working Group III.; Cambridge, UK, 2007;

rates. This is a concern at both the global and North American scales[4]. To reduce the impact of agricultural practices on global warming potential (GWP), there is a need for alternative nitrogen fertilizers that produce low GHG emissions from soil[5]

The California Air Resources Board's (CARB) California Greenhouse Gas Emission Inventory - 2022 Edition underscores the importance of addressing emissions in the agricultural sector. While California has made notable progress in reducing emissions in the transportation sector, emissions reductions in agriculture, including potent short-lived climate pollutants (SLCP) like methane and even more potent and long-lived gases like N_2O, have not been as successful. In fact, agricultural emissions were higher in 2020 than in the year 2000 (see Figure 1). Still, the LCFS has driven progress in the reducing methane from manure management, and we encourage CARB to maintain the successful approach under the LCFS to deliver additional reductions from that sector, in-line with the State's SLCP reduction goals under Senate Bill 1383. This is a successful model that can also be applied to reduce N_2O emissions from its largest source – agriculture – and provide a powerful tool to address N_2O emissions, which have not been a major part of CARB's climate programs.

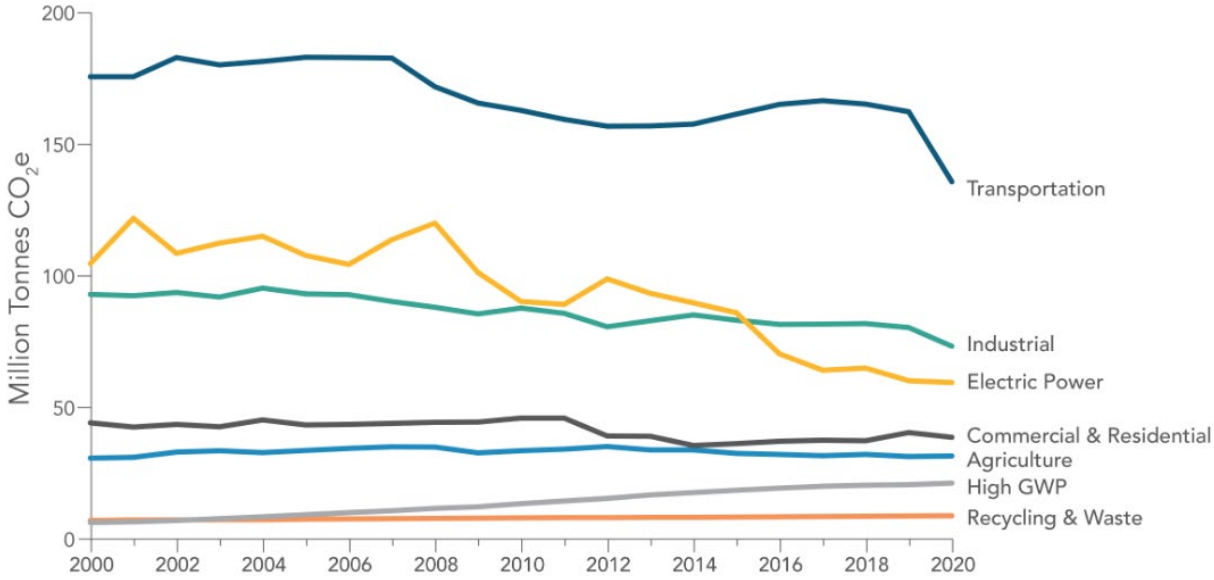


Figure 1. Emissions in MMT CO2e. Source: https://ww2.arb.ca.gov/ghg-inventory-graphs

Specifically, N_2O emissions, including from manure management, account for a substantial portion of agricultural emissions. N_2O emissions account for nearly a quarter of all agriculture greenhouse gas emissions, including 15% of manure management emissions and 85% of crop growing and harvesting emissions. According to the 2022 Scoping Plan, agricultural N_2O emissions are one of the largest sources of lingering emissions in 2045, which need to otherwise be mitigated indirectly, through costly direct air capture of CO_2 emissions. Simply put, addressing agricultural greenhouse gas emissions requires prioritizing reductions in N_2O emissions, including from manure management.

[4] Garthwaite, J. (October 7, 2020). "Stanford expert explains why laughing gas is a growing climate problem." Stanford News.
[5] Menegat, S., Ledo, A., & Tirado, R. (2022). Greenhouse gas emissions from global production and use of nitrogen synthetic fertilisers in agriculture. Scientific Reports, 12, 14490. doi: 10.1038/s41598-022-18773-w

There is a precedent for considering avoided N_2O emissions in other waste management sectors, and in-line with advancing the State's SLCP reduction goals. CARB has recognized the potential for mitigating N_2O emissions from anaerobic decomposition of other waste streams, as demonstrated by the inclusion of avoided N_2O emissions in the Tier 1 Organic Waste (OW) calculator. Similarly, CARB should recognize and account for N_2O emissions from manure management. Doing so would unlock untapped potential for N_2O emission reductions in the agricultural sector.

By allowing for avoided N_2O and methane emissions from poultry farming, CARB can create incentives for emissions reductions in this important livestock category.

Poultry is a vital agricultural commodity in California, and taking proactive steps to reduce agricultural emissions from poultry farming aligns with the state's goals of mitigating short-lived climate pollutants and other greenhouse gases, including N_2O.

As of September 2021, the poultry industry has been the fastest-growing section of the animal husbandry industry. Poultry production will continue to experience significant growth due to factors such as the increasing demand for white poultry meat and vegetarian diets with eggs. We currently can mitigate the increasing emissions of N_2O and CH_4 by this industry by adding poultry manure pathway to the CARB program. Based on CARB's GHG inventory, while dairy and beef cattle were the largest emitters of CH_4 and N_2O from manure management, poultry manure management emitted more CH_4 and N_2O than swine farming in 2020 (see Figure 2). However, currently CARB has designed a Tier 1 manure-based pathway to include swine operations, but not poultry operations.

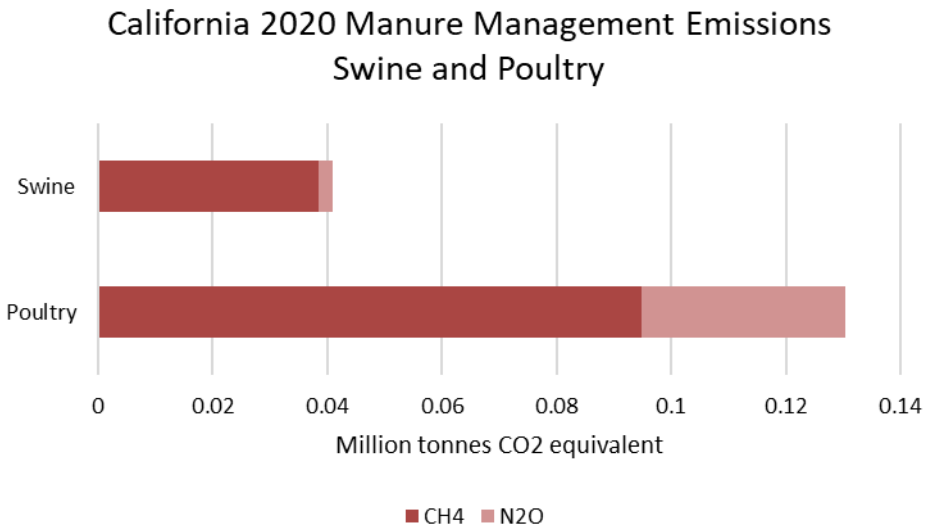


Figure 2. Source: CARB, 2022: https://ww2.arb.ca.gov/ghg-inventory-data

Ductor encourages CARB to include RNG produced from poultry manure in the Tier 1 DSM calculator and encourages CARB to incorporate avoided N_2O emissions into the calculator for manure-based pathways, like it does for OW. Specifically, CARB should enable poultry-based pathways to easily develop Tier 1 pathways accounting for avoided N_2O emissions (along with avoided methane), to ensure equal treatment with other manure-based pathways and OW-based pathways. Poultry farming holds immense economic value for California, generating

billions of dollars in revenue[6] and supporting tens of thousands of jobs. Excluding poultry operations from generating avoided emissions credits in the LCFS through a Tier 1 manure-based calculator that accounts for avoided N_2O emissions will limit the ability of CARB to address emissions N_2O emissions, including from this important source.

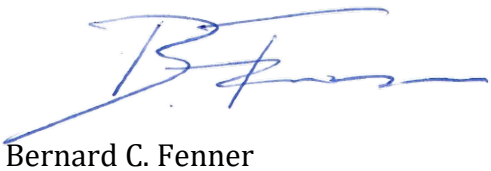
Including default co-product credits for the benefits of displaced fertilizer represents an additional opportunity to reduce agricultural emissions.

We recommend that the California Air Resources Board (CARB) update the Draft DSM Calculator to include default co-product credits for the benefits of displaced fertilizer. These credits would recognize the nitrogen, phosphorus, and potassium (NPK) benefits of digestate, a byproduct of anaerobic digestion facilities.

CARB has previously granted co-product credits for digestate based on the amount of conventional fertilizer displaced[7]. These credits help to offset the emissions associated with conventional fertilizer production and use. We recommend that CARB reestablish these important co-product credits in the Tier 1 Calculator to further reduce agricultural emissions in the state.

We appreciate the opportunity to provide feedback and contribute to the ongoing efforts to address agricultural emissions and mitigate environmental challenges. We believe that by including N_2O emissions from manure management and allowing avoided emissions from poultry farming, CARB can unlock substantial potential for reducing greenhouse gas emissions in the agricultural sector. Thank you for your time and consideration in advancing sustainable solutions and working towards a greener future for California.

Sincerely,



Bernard C. Fenner
CEO Ductor
President Ductor Americas Inc.

[6] California Poultry Industry Federation. Poultry Statistics. Retrieved from https://cpif.org/poultry-statistics/
[7] https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/fuelpathways/comments/tier2/t2n-1248_summary.pdf

Ductor Americas, Inc.
1200 18th Street NW, Suite 700
Washington, District of Columbia, 20036
www.ductor.com
info@ductor.com