April 28, 2014

Dear Members of the California Air Resources Board,

I am writing to submit my commentary on the Scoping Plan Amendments for AB 32, the California Global Warming Solutions Act. Specifically, I would like to remark on your recommended actions and next steps for the agriculture sector, which comprises a significant portion of California's economy.

The agriculture sector is a $45 billion dollar industry that generates about $100 billion in related economic activity.[1] Given its substantial scale and the impending threats to agriculture from climate change (as evidenced by the crippling drought the state is currently experiencing), as well as California's unique position as a leader in innovative technologies that may be adopted nation-wide, there is much to be gained by farmers, ranchers, and the state as a whole from reducing overall greenhouse gas emissions (GHG) within this sector.

The current proposed updates to the Scoping Plan include voluntary measures to reduce GHG emissions, such as the adoption of manure digesters, soil management practices, improvements to water and fuel use practices, land use planning, and others. However, as a whole, the Scoping Plan is lacking in specificity, and is missing detailed information on actionable solutions that can be incorporated into farming and ranching practices.

In the short term, farmers and ranchers can adopt immediate, low-tech, and cost-effective measures that will reduce GHG emissions. In particular, measures could focus on reducing methane gas from livestock production and nitrous oxide from the usage of nitrogen-based chemical fertilizers. Together, methane and nitrous oxide comprise approximately 80 percent of GHG emissions from agriculture in the US.[2] Below, I outline possible strategies for reducing both methane and nitrous oxides through simple adaptations of farming and ranching practices.

Methane Gas (CH_4)

Methane is the second most prevalent GHG emitted from human activities in the US. Although methane has a relatively short lifetime in the atmosphere, its comparative impact pound for pound is over 20 times greater than carbon dioxide over a 100-year period.[3] After natural gas and petroleum systems, methane from domestic livestock constitutes the second largest source of emissions from all other sectors including landfills, mining, wastewater treatment, and others.[3] Domestic livestock naturally produce large amounts of methane as part of their normal digestive process. Methane is also produced when animal manure is kept or stored in lagoons or holding tanks.

The Scoping Plan Update highlights the use of manure digesters—a completely voluntary measure—as its main strategy for reducing methane emissions. Manure digesters capture methane from storage ponds or lagoons and subsequently use this captured methane to produce energy or renewable fuel. In the long term, the use of manure digesters represents an innovative and valuable solution. However, as acknowledged in the

Scoping Plan Update, there are many obstacles to implementing their use on a wide scale.[4] For one, as a voluntary strategy, purchasing and installing the technology is extremely cost prohibitive – manure digesters often cost as much as three million dollars – and actually obtaining one entails a lengthy and often confusing permitting process.[5] One livestock producer stated that "getting a digester in [California] takes an act of God."[5] The California Air Resources Board (CARB) has committed to incentivizing and removing obstacles to digester installation. However, in the interim, greater focus should be placed on low-tech fixes and improved feed and land use management practices that reduce methane gas emissions from livestock.

One simple fix that CARB can and should highlight for farmers and ranchers is the improvement of livestock diets. Supplementing cattle feed with grains, high quality fats, and more digestible fodder such as silage (a fermented feed) and legume hay can help to reduce methane production in the animals' digestive processes.[5] Livestock producers can also complement cattle feed with high quality fats (such as edible vegetable oils) in order to reduce methane emissions. According to one study, supplemental high quality fats may reduce emissions by almost 4 percent by inhibiting the rumen bacteria in the animals' gut.[6]

Another approach is to ensure that cattle have access to high-quality pasture as opposed to mature grass – one study found a 50 percent reduction in methane emissions from livestock that grazed high-quality pasture grasses.[7] One technique that ensures livestock have access to high-quality pasture grasses that have not been overgrazed is a practice known as Managed Intensive Rotational Grazing (MIRG). Adopted by many farmers globally, MIRG is a grazing management system in which pasturelands are divided into numerous paddocks or cells, and selectively grazed. This practice allows ranchers to selectively manage the timing and intensity of defolitation.[8] Lastly, incorporating legume grasses into pastures can also have significant effects on methane emissions—cattle raised on legume-grass pastures emitted 25 percent less methane than animals raised on grass-only pastures.[9] Through a variety of low-cost, low-tech feed supplementation and pasture management strategies, long-term methane reductions may be achieved starting immediately.

Although further research is required to identify optimal livestock diets and supplements, these relatively simple first steps aimed at livestock producers should be included in the Scoping Plan in order to reduce methane emissions. To be effective, these strategies must be widely communicated and financially incentivized. If these suggestions rely solely on voluntary action, it is likely that farmers and ranchers will not change their feed practices.

Nitrous oxide (N_2O)

Agricultural soil management is the largest source of nitrous oxide emissions in the United States and accounted for almost 70 percent of total US nitrous oxide emissions in 2011.[10] The impact of 1 pound of nitrous in terms of atmospheric warming is over 300 times that of 1 pound of carbon dioxide.[10] Nitrous oxide is emitted when farmers add

nitrogen to the soil through the use of synthetic fertilizers. Farmers can use a variety of fertilizer and soil management practices to reduce these emissions. Most farmers routinely over-fertilize their crops hoping to increase yields, fearing that under-use will lessen overall crop production.[5] However, when farmers over-fertilize, the unused nitrogen in the soil can form nitrous oxide. In order to reduce the formation of nitrous oxide from over-fertilized fields, farmers can time fertilizer applications for key growth phases of the crop, reduce reliance on synthetic fertilizers through the use of nitrogen fixing crops such as legumes, and explore the adoption of new tilling practices, including no-till methods. Reducing tillage has been shown to decrease nitrous oxide emissions.[11] Another low-tech improvement that may be employed is the use of drip irrigation practices in which liquid fertilizers are mixed with water. This method decreases nitrous oxide emissions through a more efficient delivery system of fertilizer to the plant roots through the irrigation system.[5]

Conclusion

While the current Scoping Plan Update outlines promising future research in the agricultural sector, there is a need to include more immediately actionable next steps that farmers and ranchers can adopt. The main strategies outlined for GHG emission reductions are mainly voluntary practices, such as the adoption of a manure digester, which is cost-prohibitive and logistically challenging. Other approaches in areas such as nitrogen management, soil management practices, water and fuel use, and land use planning, to name a few, are lacking in detail. Farmers and ranchers should be educated and financially incentivized to make use of low-cost, low-tech, immediately actionable strategies to reduce emissions of methane and nitrous oxide.

By focusing on so-called 'low-hanging fruit,' CARB has an opportunity to strengthen recommendations and next steps for reducing GHG emissions in California's agricultural sector, as well as demonstrating innovative leadership that may be followed nation-wide and globally.

Respectfully yours,
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Sources

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