Southern Oregon Climate Action Now

SOCAN

Confronting Climate Change

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Reference SB85-1

Chair Golden and members of the Senate Committee on Natural Resources:

I write as cofacilitator of Southern Oregon Climate Action Now (SOCAN), an organization of over 2,000 rural Southern Oregonians who are concerned about the climate crisis and urge statewide action to address it. The mission of SOCAN is to promote awareness and understanding of the science of global warming and its climate chaos consequences and stimulate individual and collective action to address it. Since rural Oregonians occupy the frontlines in experiencing the impact of the drought, shrinking snowpack, wildfires and extreme weather that the climate crisis imposes, we are strongly committed to statewide action.

I write today to express support for SB85 Amendment 1, the Moratorium on Confined (or Concentrated) Animal Feedlot (Feeding) Operations (CAFOs).

Rather than detailing the full array of reasons that CAFOs are offensive, I will focus on the environmental and climate negatives. CAFOs are cruel and inhumane methods of producing food that deny the sentience or feelings of the confined animals and treat them as non-sentient unfeeling objects. The CAFO business model assigns to the animals in their charge but a single purpose – to generate profits for CAFO owners and stockholders. No doubt this concern will be addressed by others.

Over a decade ago Hribar (2010), writing for the National Association of Boards of Health, pointed out that most meat and dairy products were no longer being grown in small family farms but had shifted to large farms with single species buildings or open pens. Hribar (2010) acknowledged that “properly managed, located, and monitored, CAFOs can provide a low-cost source of meat, milk, and eggs, due to efficient feeding and housing of animals, increased facility size, and animal specialization” and that they can enhance the local economy. However, her main concern, even a decade ago, was the negative effects of the operations on environmental and human health; she also expressed the concern that Animal Feeding Operations (AFOs) pose a potential environmental hazard noting that this was recognized as long ago as the 1972 Clean Water Act.

In terms of the **Groundwater** hazard, Hribar (2010) stated: “Groundwater can be contaminated by CAFOs through runoff from land application of manure, leaching from manure that has been improperly spread on land, or through leaks or breaks in storage or containment units.”

The **surface waters** of the state and nation are threatened by manure escaping from treatment lagoons, particularly problematic during heavy rainfall (events which are expected to increase in frequency with climate change) and consequent floods (Hribar 2010). Contaminants include nitrogen, nitrates, phosphates and ammonia. The first three of these serve as nutrients promoting algal blooms which initially starve water bodies of light, and then die only to decay and starve the water bodies of oxygen as anaerobic decomposition occurs. This suffocates aquatic animals whether invertebrate, insect larva, or fish.

Within and near the CAFO, **air quality** is compromised by emissions of gaseous and particulate items that pose health hazards to workers and neighboring communities (Hribar 2010). Notable among these are ammonia, hydrogen sulfide, and methane. Anyone living near or driving by a CAFO and inhaling is well aware of these consequences. Table 1 (from Hribar 2010) summarizes the air quality problems.

CAFO Emissions	**Source**	**Traits**	**Health Risks**
Ammonia	Formed when microbes decompose undigested organic nitrogen compounds in manure	Colorless, sharp pungent odor	Respiratory irritant, chemical burns to the respiratory tract, skin, and eyes, severe cough, chronic lung disease
Hydrogen Sulfide	Anaerobic bacterial decomposition of protein and other sulfur containing organic matter	Odor of rotten eggs	Inflammation of the moist membranes of eye and respiratory tract, olfactory neuron loss, death
Methane	Microbial degradation of organic matter under anaerobic conditions	Colorless, odorless, highly flammable	No health risks. Is a greenhouse gas and contributes to climate change
Particulate Matter	Feed, bedding materials, dry manure, unpaved soil surfaces, animal dander, poultry feathers	Comprised of fecal matter, feed materials, pollen, bacteria, fungi, skin cells, silicates	Chronic bronchitis, chronic respiratory symptoms, declines in lung function, organic dust toxic syndrome

Table 1 Typical pollutants found in air surrounding CAFOs. (from Hribar 2010)

The environmental impacts of CAFOs in the area of groundwater and surface water contamination are responsible for the ubiquitous fish kills (e.g., Nicole 2013, Ellison 2018, Merchant and Osterberg 2020, Redman 2020) that are associated with CAFO mismanagement. These present serious inconvenience to neighboring communities.

In the discussion from over a decade ago, Hribar (2010) continues by delineating the human problems caused by CAFOs, discussing odors largely a result of the ammonia, hydrogen sulfide, carbon dioxide and miscellaneous volatile and semi-volatile organic compounds; insect vectors notably house flies stable flies and mosquitoes; pathogens such as parasites, bacteria, and viruses (see Table 2); pathogens (see Table 2); anti-biotics employed to promote growth and resist disease, especially critical as more and ever more animals are confined together; and finally, property values.

Pathogen	Disease	Symptoms
Bacillus anthracis	Anthrax	Skin sores, headache, fever, chills, nausea, vomiting
Escherichia coli	Colibacilosis, Coliform, mastitis-metris	Diarrhea, abdominal gas
Leptospira pomona	Leptospirosis	Abdominal pain, muscle pain, vomiting, fever
Listeria monocytogenes	Listerosis	Fever, fatigue, nausea, vomiting, diarrhea
Salmonella species	Salmonellosis	Abdominal pain, diarrhea, nausea, chills, fever, headache
Clostridium tetani	Tetanus	Violent muscle spasms, lockjaw, difficulty breathing
Histoplasma capsulatum	Histoplasmosis	Fever, chills, muscle ache, cough rash, joint pain and stiffness
Microsporum and *Trichophyton*	Ringworm	Itching, rash
Giardia lamblia	Giardiasis	Diarrhea, abdominal pain, abdominal gas, nausea, vomiting, fever
Cryptosporidium species	Cryptosporidosis	Diarrhea, dehydration, weakness, abdominal cramping

Table 2 Select pathogens found in animal manure. (from Hribar 2010)

The concerns expressed by Hribar (2010) have not been resolved. In a literature review, Brewer (2020) focused on antimicrobial resistance problems appearing in humans that result from CAFOs and the problem of manure contamination causing eutrophication (nutrient enrichment) of waterways. Dip (2021) reported: “that communities—and children in particular—living near CAFOs have higher rates of Asthma….”, and “In 2020, factory farms spent over $140 MILLION lobbying our elected officials against effective climate change legislation to ensure they can continue to use CAFOs….”No doubt these lobbyists will be out in force in connection with SB85-1.

The Climate Crisis

It is well known, I suspect, that the sequence of events leading to our climate crisis is as summarized below:

(1) the increasing concentration of greenhouse gases released as a result of human activity leads to →

(2) the capture of outwardly radiating heat from the Earth's surface derived from incoming solar radiation (mainly in the short wavelength visible light range) being turned int longer wavelength heat radiation when arriving at and contacting the Earth's surface. This then results in →,

(3) greater heat energy in our atmosphere leading locally to reducing snowpack, greater evaporation and droughts inducing drying soils and vegetation and, in turn, greater wildfire risk plus more severe weather – especially storms, hurricanes, etc.

Projections of temperature trends resulting from the ongoing emissions of greenhouse gases suggest we plausibly will see a warming globally of between 3 and 5.1°C (5.4 and 9.1°F) relative to pre-industrial revolution conditions by the end of this century (IPCC 2021), an outcome that would devastate our natural ecosystems, agriculture, forestry and fisheries. This would be unmanageable and must be avoided!

This sequence clearly identifies the primary cause as the climate pollution resulting from human activities, particularly the release of carbon dioxide, methane, nitrous oxide and other heat-trapping gases into our atmosphere. As depicted in Figure 1, the dominant gas is carbon dioxide. However, as presented in that Figure, where the Annual Greenhouse Gas Index (AGGI) (NOAA 2022) is shown, other gases are also important. With carbon dioxide established as the basis for comparison with a Global Warming Potential (GWP) (or carbon dioxide equivalent CO_2e) of 1, other gases are reported relative to this. The most recent IPCC Assessment Report 6 (IPCC 2021) reports the value for nitrous oxide (N_2O) as 273, and that for methane (CH_4) – because it is relatively short-lived in the atmosphere - as about 80 on a 20-year basis and between 27 and 29 on a 100-year basis. The AGGI depicts the warming of the planet, measured in terms of the Radiative Forcing of the constituent gases in terms of Watts pe meter squared at the Earth's surface. The AGGI was

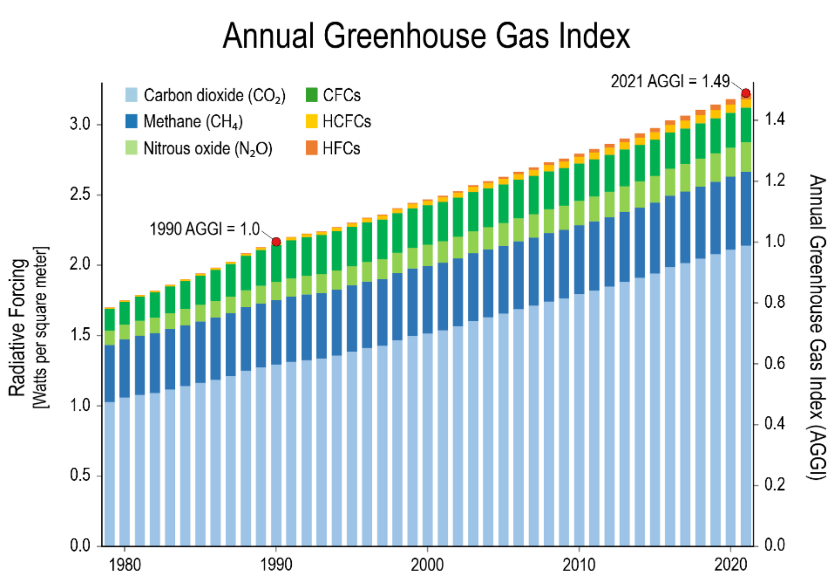

Figure 1. NOAA's Annual Greenhouse Gas Index indicates the contribution of gases other than carbon dioxide to global warming. (NOAA 2022)

set at unity (i.e.,1) in 1990 with the deviation from that before and after 1990 showing a clear and consistent increase. By 2021, the AGGI had reached 1.49. This means that the AGGI has increased nearly 50% in a little over two decades. Potentially equally disturbing is the realization that gases other than carbon dioxide are contributing substantially to the problem. All other gases combined are responsible for about 33% of overall global warming while the leader among these other gases is methane, contributing about 8% to global warming. The message should be clear, but in case not: this means that in addition to reducing the carbon dioxide emissions and atmospheric concentration, we must address the other gases, especially methane

An estimate of the contribution of livestock to the global climate crisis via emissions of gases from enteric fermentation () was reported as 14.5% a decade ago (Gerber *et al.* 2013). Incidentally, and entirely parallel anaerobic bacterial breakdown process occurs in the gut of cattle to that driving decay in anaerobic CAFO manure lagoons. The product in both cases is methane. Since the overall contribution of methane to the atmosphere is much less than the reported value of 14.5% (see Figure 1 and discussion) this number seems high. Globally, methane comes from a diversity of sources, including, for example, natural wetlands, rice paddies, fossil fuel (especially fossil [natural] gas) extraction, processing and transmission, and permafrost thawing. Thus, either the earlier 14.5% estimate was high, or sources of other greenhouse gases have increased substantially thereby reducing the percentage role of methane from enteric fermentation. In the U.S., Massey and Keintzy (2021) reported that enteric fermentation in cattle is responsible for 179 million of the U.S. total of 6,577 Million Metric Tons of total emissions, all measured in terms of carbon dioxide equivalent. This is slightly over 2.7% of U.S. emissions. If this value is accurate, and the U.S. contribution of methane to the problem follows the global trend (i.e., about 8%), then enteric fermentation is responsible for over 25% of our national methane emissions. The IPCC (2019), reporting on emissions from land use, concluded “Agriculture, Forestry and Other Land Use (AFOLU) activities accounted for around 13% of CO_2, 44% of methane (CH_4), and 81% of nitrous oxide (N_2O) emissions cumulatively during 2007-2016. This represents 23% (12.0 ± 2.9 $GtCO_2eq$ yr-1) of total net anthropogenic emissions of GHGs.” Hersher and Aubrey (2019) note that currently 50% of vegetated land globally is dedicated to agriculture, while 30% of the cropland grows grain just to feed animals. Our hunger for meat products makes meat production a leading cause of deforestation – a process that both emits carbon dioxide and other greenhouse gases itself and thwarts the capacity of removed trees to sequester further carbon from the atmosphere. The indication is that we should examine agricultural activities that result in methane emissions and respond accordingly by reducing them.

Ritchie (2021) reported that “agricultural products as a whole contribute 33% to global [greenhouse gas] emissions” again implying we need to address them. Meanwhile, in a study of trajectories for achieving Intergovernmental Panel on Climate Change warming targets, Clark *et al.* (2020) concluded: “Even if fossil fuel emissions were rapidly reduced, emissions from the global food system are on a trajectory that would prevent achievement of the 1.5° and 2°C targets before the end of the century."

CAFOs inevitably contribute substantially to the problem since the sheer number of animals is immense. However, purely from a climate perspective, it has been suggested that grass-fed cattle, taking longer than CAFO cattle to grow, actually emit more methane per unit of product. Lupo *et al.* (2013), for example, assessed that grassfed cattle produced 37% more emissions than feedlot cattle, though they noted that 15 – 24% reductions occur when soil organic carbon gain from grassfed versus CAFO cattle was accounted. Countering the conclusion that grassfed cattle are more greenhouse gas intensive that CAFO cattle, Hayek and Miller (2021), assessing emissions using a top-down rather than bottom-up approach, concluded that the methane emissions from confined feeding operations may be 39% - 90% higher than previously reported. This would negate the CAFO benefit reported by Lupo *et al.* (2013). Hayek and Miller (2021) also suggest "We find that region-wide emissions from meat and milk production could reach 1.52 (1.41–1.62) $GtCO_2eq$ by 2050, an amount 21% (13%–29%) higher than previously predicted. Therefore, intensification may not be as effective in mitigating emissions in developing countries as is commonly assumed." The purported climate benefit of CAFOs is clearly questionable.

Meanwhile among complete Life Cycle Analyses (LCA), support for the grassfed approach has been reported. For example, Stanley *et al.* (2018) concluded that, in grassfed operations: "Emissions from the grazing system were offset completely by soil C sequestration." They added: "Soil C sequestration from well-managed grazing may help to mitigate climate change." A full life cycle study conducted on a grassfed regenerative grazing operation at the behest of General Mills at White Oaks Pastures in Georgia, concluded that the system: "effectively captures soil carbon, offsetting a majority of the emissions related to beef production." They even also suggested that the system: "may have a net positive effect on climate."

Whether the greenhouse gas emissions from CAFOs are a little more per pound of beef or a little less, the associated environmental and health negatives of CAFO production discussed above should be enough to tip the balance against them. The comment offered by Matsumoto (2019) seems entirely appropriate here: "the world [needs] to cut back on its meat consumption…" This suggestion was also evident in the Brewer (2020) review where the author "stressed the importance for a reduction in meat consumption, as this is ultimately the driver of intensified livestock production systems."

As a closing comment, I refer to the 'right to farm' laws and principles which, no doubt, will be promoted by those defending CAFOs. According to NALC (2022): "All fifty states have enacted right-to-farm laws that seek to protect qualifying farmers and ranchers from nuisance lawsuits filed by individuals who move into a rural area where normal farming operations exist, and who later use nuisance actions to attempt to stop those ongoing operations." Note that the principle is not to defend an operation such as a CAFO that itself constitutes a threat to the lives, livelihoods, and health of neighbors and small family farms.

For these reasons, SOCAN urges a moratorium on further certification of Confined (Concentrated) Animal Feedlot (Feeding) Operations and supports SB85-1. It is not necessary to study this issue; sufficient information is available to allow a rational response.

Respectfully Submitted

Alan Journet

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