This letter comments on the biogenetic emissions exemptions of the Cap and Trade Program that were addressed in the afternoon session of CARB's workshop on Potential Amendments to the Cap-and-Trade Regulation on October 5, 2023. We note the workshop's recognition of the 2022 Scoping Plan direction for transportation fuels to "not incentivize consumption of feedstocks with little or no GHG reductions from a life cycle perspective", "to send appropriate market signals that do not result in unintended consequences" and that the "production of alternative fuels not come at the expense of global deforestation, unsustainable land conversion, or adverse food supply Impacts." Based on these criteria Climate Action California (CAC) **recommends that emissions from crop-based renewable diesel, ethanol and biodiesel not be exempt from Cap and Trade compliance costs**. We also **recommend that these crop-based biofuel emissions be assigned the same compliance cost per gallon as the fossil fuels they replace.** There has been longstanding disagreement over the extent of emissions resulting from various crop-based biofuels, specifically are their carbon intensities higher or lower than petroleum fuels. This letter discusses this disagreement in more detail and focuses on the European Union's approach to crop-based biofuels which we find relevant for California. We also note that the recent steep increase in the global price of soybean oil has been linked to the rapid growth of renewable diesel production in the US. We note that South

American savanna lands with significant tree coverage, biodiversity and carbon storage are being destroyed at an alarming rate as conversion to agricultural land to grow soybeans continues unabated. We will also discuss the problems associated with the use of tallow and used cooking oil (UCO) to produce biofuels.

A major concern is our lack of confidence in the models used by CARB to estimate the indirect land-use change (ILUC) portion of the carbon intensity of crop-based biofuels. Various models used by the European Union (EU) to calculate the carbon intensities of biodiesel and renewable diesel made from palm, soybean, rapeseed (canola) and sunflower oils estimate that all have carbon intensities **greater** than those of the fossil diesel they are meant to replace. CARB models, on the other hand, find the carbon intensities of these seed oil-based biodiesels and renewable diesels to be substantially **lower** than those of fossil diesel. **The large differences in the carbon intensity values produced by CARB and EU models are primarily a result of their different estimates of indirect land use change (ILUC) effects.**

The **EU**'s commitment to a science-based approach regarding ILUC is reflected in its **definition and calculation of ILUC**. According to a supplementing regulation to the EU's Renewable Energy Directive (RED) II, (EU) 2019/807 Section 2, "ILUC can occur when land previously devoted to food or feed production is converted

to produce biofuels, bioliquids and biomass fuels. In that case, food and feed demand still need to be satisfied, which may lead to the **extension of agricultural land into areas with high carbon stock such as forests, wetlands and peat land**, causing additional greenhouse gas emissions." Section 8 of this regulation further states " Scientific literature also demonstrates that the impact of ILUC on the potential of biofuels, bioliquids and biomass fuels to achieve greenhouse gas savings is particularly pronounced for oil crops. Renewable fuels made from such feedstocks are therefore widely considered as having a higher ILUC-risk…The report on feedstock expansion, reflecting the latest best available scientific data on the worldwide expansion of the production area of food and feed crops into land with high carbon stock, confirms that these crops are also...responsible for an overwhelming majority of the observed worldwide expansion of the production area of food and feed crops into land with high-carbon stock." Article 3 of this regulation defines EU criteria for determining high ILUC-risk feedstocks to include "(a) the average annual expansion of the global production area of feedstock since 2008 is higher than 1% and affects more than 100,000 hectares; (b) the share of such expansion into land with high-carbon stock is higher than 10%". RED II designated **palm oil-based biofuel** as high ILUC and required that its eligibility toward meeting mandated transportation targets be phased out by 2030. A recent Transport&Environment report for the EU

Commission indicated that soy also meets this 10% threshold. Further ILUC review is underway.

The EU's Renewable Energy Directive (RED) II adopted crop-based biofuel caps after much exhaustive study. The EU's first RED was introduced in 2009 and it decreed that every member state should have at least 10% renewable energy in transport fuel by 2020. The expectation was that almost all (9.4%) would come from crop-based biofuels, though it was agreed that the effects of indirect land-use change (ILUC) would be studied to determine if this target should be adjusted. The International Food Policy Research Institute (IFPR) was commissioned for this study which was based on its **Mirage** (Modeling International Relations under Applied General Equilibrium) **model**. The IFPR study concluded in 2011 that the ILUC effects of crop-based biofuels were significant and hence called for changing crop-based biofuel targets. This became controversial so the EU commissioned another study by IIASA, Ecofys and E4tech. Their results, published in 2016, were based on the Global Biosphere Management Model, Globiom model. The study found food-based biofuels even more harmful to the environment than the earlier Mirage study. In fact the Globium model results suggest that biofuels made from palm oil create three times as many carbon emissions as fossil fuels, and biofuels made from soybean oil two times as many carbon emissions as fossil fuels. Rapeseed (canola) oil- and sunflower oil-based biofuels were also found to create

more carbon emissions than fossil fuels. As a result, in 2017 the EU Commission proposed reducing the crop-based biofuel caps to 3.8% by 2030. However, it could not get the more political and heavily lobbied EU Parliament to agree, so RED II included a maximum crop-based biofuel target of 2020 consumption levels plus 1% or 7% whichever was lower. But **countries** were given the **option of lowering their crop-based biofuel target** further and subtracting the reduction from their transportation target. Also, they were given the **option of not allowing high Indirect Land Use Change** (ILUC) **feedstocks** to count towards their targets.

As a result, several countries have adopted lower caps for crop-based fuels and have excluded both palm oil- and soy oil-based biofuels from counting towards their mandated transportation targets. Germany adopted a cap of 4.4% for crop-based biofuels which began in 2022 and as of this year palm oil-based fuels can no longer count toward its transport target. Its Environment Ministry continues to push for a phasing out of the use of all crop-based biofuels by 2030. The **Netherlands has a 1.4% cap for crop-based biofuels and both soy oil- and palm oil-based biofuels are excluded from counting towards its mandated transportation target**. Spain's crop-based biofuel cap is 3.5% (declining to 2.5% in 2030), Finland's is 2.6% (and zero for high ILUC crops) and Estonia's is 2.5% (declining to 0.5% in 2028). While France has kept 7% as its crop-based biofuel cap, it has excluded both soy

oil- and palm oil-based biofuels from counting towards its mandated transportation target. Denmark has also excluded both soy oil- and palm oil-based biofuels from its mandated target.

Biofuels produced from food and feed crops are not eligible to count towards emissions reduction targets for aviation according to Section 20 of a recent EU regulation on sustainable aviation fuel. Nor are they able to count towards emissions reduction targets in the maritime industry. Section 28 of a recent EU regulation on maritime fuel specifies "the additional GHG emissions and loss of biodiversity caused by all types of food- and feed crop-based fuels require that those fuels be considered to have the same emission factors as the least favorable pathway."

RED III was just adopted by the European Parliament in September, 2023. While it increased the renewable energy target for 2030 substantially from 32% to 42.5%, the transport sector target increased only minimally from 14% to 14.5%. Its crop-based cap remained unchanged. Many pushed for phasing out crop-based fuels from target mandates by 2030 based on scientific studies commissioned by the EU Commission but vested interests in the EU Parliament prevented this. RED III does moves away from reliance on blending fuel mandates by requiring its 27 member countries to introduce a credit mechanism allowing operators of charging points to sell credits for renewable electricity (RES-E) sold to charge BEVs. The

higher greenhouse gas savings from BEVs are recognized by allocating RES-E a multiplier of 4.

RED II also introduced caps on the use of used cooking oil (UCO) and tallow for biofuels. It recognized that the supply of these materials was not easily increased, that there were other uses for these commodities and that opportunities for fraud were prevalent. Only categories 1 and 2 of tallow, those that carry some health risk, are eligible for meeting EU biofuel mandates. The larger category 3 tallow is not eligible because of its use in animal feed, cooking, soap and other oleochemical applications. California does allow category 3 tallow to be used to produce biodiesel and renewable diesel. This usually results in the substitution of vegetable oils for tallow thereby creating ILUC effects.
CAC recommends that category 3 tallow, by far the largest category of tallow, not be eligible for emissions exemptions under the Cap and Trade Program and that the compliance costs for biofuels produced from them equal those of the petroleum diesel they replace.

While double counting of tallow and UCO is allowed for meeting EU transport mandates, there is recognition that this extra incentive can encourage fraud. Because of this their joint contribution was capped at 1.7% out of the 14% transport mandate. **We recommend that California cap the amount of tallow and UCO that can be used to**

produce biodiesel and renewable diesel sold in California. This will require a certification procedure for the origin of the tallow and UCO used to produce these biofuels sold in California. Currently, California does not identify what type of tallow has been used to make biodiesel or renewable diesel.

We question whether California's program for determining whether vegetable seed oils have been disguised as UCO is adequate to prevent fraud. As the workshop session highlighted "biofuel use is rapidly evolving as incentives and demand for decarbonization options increase". Even though the EU has developed an inspection and certification system it is likely that some fraud exists. **California needs to do more to prevent UCO fraud.**

Various studies have concluded that **policies that target lowering greenhouse gas emissions are preferable to those that rely on renewable energy mandates**. One of these studies by GAMS, Transportation Carbon Intensity Targets for the European Union, ICCT, 2021 considers 8 scenarios and concludes (Table 1.2, p4) that excluding crop-based fuels achieves greater emissions reductions at a lower abatement cost than the scenario encouraged by RED II with caps for crop-based fuels. This study also notes that emissions reductions are even greater if **intermediate** (crops grown in winter or off season) **crop-based fuels** are also excluded. Intermediate crops are currently not included in the EU biofuel caps. The best

scenario for reducing emissions in the transportation sector in terms of both total emissions reduction and lowest abatement cost was the one with the lowest share of renewable fuels. This study's conclusions were based on carbon intensities similar to those in the Globiom model (Appendix D, pp 45-46).

Ethanol is included in our recommendation even though EU studies have found the carbon intensity of corn ethanol to be lower than that of gasoline because US studies that concentrated solely on domestic land use changes found the carbon intensity of corn ethanol to be no lower than that for gasoline. A recent PNAS study which used actual land use observations, biophysical models and a partial equilibrium analysis approach found that even modest changes in land use in US agriculture from 2006-2016 resulting from crop changes for increased ethanol production had considerable negative environmental effects. This study found the carbon intensity of corn ethanol to be definitely no less than gasoline and more likely 24% higher.

Corn and soybeans grown to produce biofuels have been **responsible for increasing global food prices in developing countries**. Corn, soybeans, ethanol, biodiesel and renewable diesel, like gasoline and diesel, are commodities that are widely traded in global markets. Corn and soybean oil prices influence the prices of their close substitutes which tend to be interchangeable for

animal feed and human food. A 2008 World Bank study attributed the rapid increase in internationally traded food prices from 2002 to 2008 to EU and US policies that resulted in large increases in the production of corn ethanol and soy biodiesel. The IMF index of internationally traded food commodity prices increased 130% over this period. From 1/2005-6/2006 maize (corn) prices almost tripled, wheat prices increased 127%, soybean oil prices increased 192% and other vegetable oil prices increased by similar amounts. The World Bank study concluded that 70-75% of the increase in food commodity prices from 2002-2008 was due to the rapid increase in crop quantities used to produce biofuels over this period. Needless to say, the increase was devastating for the poor in developing countries who spend half their household income on food.

More recently, as renewable diesel production in the US has grown rapidly, global soybean oil prices have increased rapidly. According to Statista global soybean oil prices almost doubled from 2020 to 2022. The American Enterprise Institute recently attributed the large increase in all vegetable oil prices to the recent growth in renewable diesel production in the US. There is no doubt about the existence of a clear and substantial link between crop-based biofuel production and higher food prices. The steep increase in global soy oil prices from 2020-2022 has also increased the incentive for land conversion in the savannas and forests of South America.

A decision about the value of exempting renewable diesel, biodiesel and ethanol from Cap and Trade compliance costs should depend not only on their carbon intensities, it should also depend on their impacts on biodiversity, water quality and availability, the scarcity of land and their contribution to perpetuating the harmful effects of monoculture industrial farming.

Corn and soybeans grown to produce biofuels are major contributors to the **worsening biodiversity crisis in rural areas in the US**. The massive use of corn and soy output for biofuel production in the US has fostered a monoculture system of farming in the US which has degraded soils and eliminated complex insect, bird and plant communities. Not only has this monoculture system reduced soil fertility it has reduced the ability of the ground to absorb water either for crops or aquifer recharge. Since corn and soy farmers do not require pollinators to produce their crops, the loss of bees and other pollinators in rural areas has not been a large concern to them, but has been a problem for other farmers. Crop-based biofuels and the monoculture they have encouraged have contributed mightily to the destruction of nature in our rural areas.

Crops grown for the production of ethanol (corn) and biodiesel and renewable diesel (soybeans) cover about **20% of the entire cropland acreage in the US**. According to the USDA's 2017 Census of Agriculture (results from the 2022 Census are not yet available) 320

million acres of cropland were harvested in 2017. Over half of the harvested acres were planted in either corn (almost 91 million acres) or soybeans (90 million acres). According to the USDA's Economic Research Service 45% of corn harvested in the US is used to produce ethanol and about 21% of soybeans harvested in the US is used to produce biofuels. Hence, about 41 million acres are being used annually to grow corn to produce ethanol and 19 million acres to grow soybeans for biodiesel or renewable diesel, suggesting that 60 million acres, almost one fifth of cropland, is being used to grow crops for biofuels.

Corn and soybeans grown to produce biofuels are major contributors to the **pollution of ground and surface water in the US.** Fertilizers are responsible for substantial ground and surface water pollution. The Farm Bureau estimates that about half of the fertilizer (nitrogen, phosphate and potash) consumed annually in the US is used to grow corn, another 10% is used to grow soybeans. This suggests that 22% of the all the fertilizer used on crops in the US is used for corn to produce ethanol, and over 2% is used for soybeans to produce biofuels, i.e. **almost one fourth of synthetic fertilizer use in the US is used on crops grown to produce biofuels.**

In addition, recent USDA NASS Chemical Use Surveys showed that corn farmers applied almost 2 pounds of

herbicides per acre in 2021 and soy farmers almost 1.5 pounds of herbicides per acre in 2020. Corn and soy have traditionally been the **greatest users of pesticides per acre** (including insecticides and fungicides as well as herbicides).

Corn and soybeans grown to produce biofuels are major contributors to the **unsustainable withdrawal of water from US aquifers**. The 2017 Census of Agriculture reported that 54 million acres of cropland were irrigated in 2017. (See Historical Census Table 1: 2017 and earlier years, NASS, USDA) The crop with the most irrigated acreage was corn which accounted for 12 million acres of irrigated cropland. Soy acreage was second with 9 million acres irrigated. This suggests that 5.4 million acres of corn were irrigated to produce ethanol and 1.9 million acres of soy were irrigated to produce biofuels; or 13.5% of total irrigated acreage was used to produce biofuels. Increasingly, the source of water for irrigation is groundwater rather than surface water. As droughts are forecast to increase, the US will need to rely more on irrigation for both corn and soybeans. The Ogallala-High Plains Aquifer extends from South Dakota to Texas and provides water for eight states, but it is being depleted at an unsustainable rate. **Irrigation is responsible for 90% of Ogallala groundwater withdrawals.**

The production of ethanol, biodiesel and renewable diesel from corn and soybeans are also major users of water.

The production of ethanol is more water intensive than the production of gasoline, requiring 3 gallons of water for every gallon of ethanol produced, compared to 2-2.5 gallons for gasoline. Most ethanol producers are located in the Midwest and rely on the Ogallala-High Plains Aquifer for their water needs.

In conclusion, we recommend that the Cap and Trade Program not be used to incentivize crop-based renewable diesel, biodiesel or ethanol. Not only should compliance exemptions for these fuels be removed, compliance costs for these fuels should be set equal to those for petroleum fuels. Until California has better controls for verifying the origin and authenticity of various tallow and used cooking oil used to produce renewable diesel and biodiesel these fuels should also not be incentivized by the Cap and Trade Program.