Subject: LCFS - Fuel values
From: naomik@envirorights.org
Date: 12/7/2007 11:43 PM
To: aprabhu@arb.ca.gov
CC: Angelajm@envirorights.org

Dear Mr. Prabhu,

I work with the AB32 Environmental Justice Advisory Committee (EJAC) and am following the LCFS closely, as the consequences of turning food into competition for fuel concerns our membership greatly. At the last LCFS lifecycle analysis workgroup meeting you indicated that the ARB would put forward initial pathway values today, December 7th. Are they available yet? Please let me know.

Also, please see attached a recently publicized report from the UK (and references) which may help inform the consideration of values to be used for agrofuels, and discusses some of the land use change issues globally. Some of the most relevant points are as follows:

- Our concern is that any small reduction in greenhouse gas emissions from fossil fuel use due to agrofuel expansion will be at the expense of large increases in greenhouse gas emissions from deforestation, from other land-use change, nitrous oxide emissions, carbon emissions from the loss of soil organic carbon, peat fires and oxidation, and potentially the loss of major carbon sinks... A recent scientific symposium on the Amazon puts the probability of continued deforestation together with rising temperatures triggering large-scale Amazon rainforest dieback within the next few decades at 10-40%.
- Crops grown for agrofuels can lead to the destruction of carbon sinks such as rainforests either because forests are directly converted to 'energy crops', or because other types of agricultural activities are displaced and pushed into forests and other important ecosystems... Ecosystem destruction is linked to 1-3 billion tonnes of carbon emissions per year, and it also causes significant regional warming as well as destabilizing the climate system in a highly unpredictable way.

- A 2006 review of life-cycle energy and greenhouse gas assessments found that 74-95% of the energy in corn ethanol comes from fossil fuel inputs, and even that study has been criticized as over-optimistic by Professor Tadeus Patzek. Even those marginal fossil fuel savings can result in greater carbon emissions, as many refineries now rely on coal rather than gas or oil for energy. Coal has the highest carbon content (25.4 tonnes of carbon per terajoule compared to 19.9 tonnes per TJ for mineral oil).
- Nitrous oxide (N2O) is the third most important greenhouse gas responsible for anthropogenic global warming. Its global warming potential

is around 296 times as great as that of carbon dioxide, and it has a long atmospheric life-time, of around 120 years. Atmospheric concentrations of N2O have increased by 17% since the industrial revolution. According to a 2006 report by the United States Environmental Protection Agency, annual global anthropogenic emissions of N2O are the equivalent of 3.114 billion tonnes of carbon dioxide emissions (which is equivalent to 849.55 million tonnes of carbon). Out of this total, agricultural nitrous oxide emissions account for the equivalent of 2.616 billion tonnes of carbon dioxide... it is expected by the United Nations Food and Agriculture Organisation (FAO) that intensive monocultures will provide the bulk of the growing agrofuel production globally... all the optimistic scenarios for increasing global biomass production for bioenergy hinge on a rise in yields, which inevitably means higher N2O emissions.

- Climate impacts from nitrous oxide have been highlighted recently in a paper by Nobel prize winner Paul Crutzen and others who suggest that nitrous oxide emissions from nitrate fertilisers have been underestimated in biofuel greenhouse gas emissions calculations . Crutzen challenges the IPCC estimate that just 2% of nitrogen which is applied to soils in the form of nitrate fertilisers is transformed by soil microbes into nitrous oxide arguing that after comparing the increase in nitrous oxide in the atmosphere to the known inputs by humans, and accounting for changes due to deforestation, that 3-5% of nitrate fertilisers must be converted to N2O. However, most life-cycle studies for biofuels also wrongly ignore part of the IPCC figure - they consider the approximately 1% of direct emissions from the field where the fertilisers are applied but ignore c.1% indirect emission from the much wider area which will be 'fertilised' through rainfall and runoffs from fields.
- In the case of oilseed rape, which accounts for 80% of EU home-grown biodiesel, Crutzen writes that biodiesel produced from it can generate up to 70% more greenhouse gas (GHG) emissions than fossil fuel diesel. Similarly, corn ethanol, which makes up most of the US biofuels market, can produce up to 50% more GHGs than petrol. The findings of the Crutzen paper have been used to calculate that US greenhouse gas emissions could rise by 6% from nitrogen pollution alone if the US Senate's plans to increase maize ethanol production sevenfold by 2022 are adopted.
- The Intergovernmental Panel on Climate Change estimate that soil carbon emissions have historically accounted for 55 billion tonnes of carbon. Soil carbon emissions vary according to soil type, climate and agricultural methods. One study estimates that, when land in temperate zones is converted from natural vegetation to crop land, emissions from the loss of soil organic carbon are around 3 tonnes per hectare, but far higher on peaty soils. A 2006 Wells-to-Wheels study by the Joint Research Council of the European Union... states: "We already warned that increase of arable area would cause loss of soil organic carbon from grassland or forest: we assume it will not be allowed."

- several studies link soybean monocultures to high N2O emissions, even if little or no nitrate fertilisers are used. This may be because of the high rate of biological nitrate fixation in legumes 16. Furthermore, glyphosate, the main herbicide used in no-till soya production degrades mainly to carbon dioxide and phosphate, according to one of its leading manufacturers, Monsanto.
- In a more recent paper, Renton Righelato with Dominick Spracklen from Leeds University show that current production methods of agrofuels will release between two and nine times more carbon gases over the next 30 years than if land was forested .
- According to figures contained in the most recent IPCC Assessment Report Four, emissions from degraded peatlands have exceeded those from deforestation in the period since 1990. Peat destruction is most rapid and extensive in south-East Asia, with Indonesia alone holding 60% of all tropical peatlands in the world. Palm oil expansion is particularly rapid in the peatland areas of both Indonesia and Malaysia, and scientists expect that nearly all of the peat will be drained, mostly for plantations, in coming years or decades. This will eventually lead to the emission of virtually all the carbon held in South-east Asia's peat – 42-50 billion tonnes, which is the equivalent of around six years of global fossil fuel emissions. The Indonesian government is planning a 43-fold increase in palm oil production, largely in response to the growing global demand for agrofuels, with around 20 million hectares more land to be converted to oil palm plantations, as well as further concessions for sugar cane and jatropha for agrofuels. A recent study by Wetlands International, Delft Hydraulics and Alterra estimates that one tonne of biodiesel made from palm oil from South-east Asia's peatlands is linked to the emission of 10-30 tonnes of carbon dioxide. Once emissions from peat fires and the loss of carbon sink capacity are taken into account, we estimate that one tonne of palm oil biodiesel from South-east Asia would therefore have 2-8 times more life-cycle carbon emissions than the amount of mineral diesel it replaces. South-east Asia's peatlands are one of the largest single carbon sinks worldwide, and their destruction is one of the largest single sources of carbon emissions worldwide – with the emission of up to 2.57 billion tonnes of carbon having been released in the worst fire season so far.
- In September 2006, NASA published a study which showed that the rate of Amazon deforestation correlates with the price of soya . Agrofuel expansion is likely to push up the price of soya, both by creating additional demand for soya biodiesel and by US farmers switching from soya production to corn for ethanol. The Amazon forest holds an estimate 100-120 billion tonnes of carbon, equivalent to 13-15 years of global fossil fuel emissions, and if it was destroyed or died back, it would dramatically increase global warming. There is strong evidence that old growth forests sequester significant amounts of carbon from the atmosphere. Our ability to stabilize greenhouse gas concentrations in the atmosphere depends on ecosystems remaining capable of sequestering carbon...

- The expansion of soya, palm oil and sugar cane, however, is also linked to deforestation in many parts of Asia, Latin America and Africa, with disastrous consequences in terms of carbon emissions, loss of carbon sinks, and regional drying and warming trends. Soya expansion is linked to deforestation in the Brazilian Cerrado, the Pantanal, South America's Atlantic Forest and a portion of the Paranaense forest in Paraguay and North of Argentina. In Argentina, more than 500 thousand hectares of forest land were converted to soya plantations between 1998 to 2002 . Sugar cane expansion is impacting on many forests, including the Amazon, the Pantanal, South America's Atlantic Forest, rainforests in Uganda, and in the Philippines. Palm oil is linked to large-scale deforestation in South-east Asia, Colombia, Ecuador, Brazil, Central America, Uganda, Cameroon and elsewhere... Primary forests in Indonesia have been found to hold 306 tonnes of carbon per hectare, whereas mature oil palm plantations hold 63 tonnes per hectare, but are not expected to survive more than 25 years at the most.
- Small-scale 'greenhouse gas savings' which can be measured in micro-studies do not outweigh the very real risk of triggering catastrophic forest die-back in the Amazon and elsewhere, which could cause massive carbon releases, trigger other irreversible climate feedbacks, and potentially disrupt rainfall patterns and thus agriculture over very large areas.
- Policy decisions should take into account of IPCC climate change predictions and must not be based on studies which fail to take these into account.

  The 2007 IPCC Summary for Policymakers predicts significant drying over large parts of northern and southern Africa, most of Brazil and parts of neighbouring countries, Chile and Argentina, Central America, large parts of Australia, the Middle East, Europe and Central Asia, with seasonal drying over much of South and South-east Asia. Together with temperature rises, those drying trends will inevitably reduce agricultural production in the very countries where monoculture expansion for agrofuels is being promoted most strongly... In Europe, per hectare yields of oilseed rape have been falling for three years running because of 'extreme weather impacts'36. Climate change is expected to intensify those extreme weather trends. Falling per hectare yields will either lead to the expansion of cropland into land under natural vegetation, or to reduced output, or both.

- Agrofuel expansion is accelerating climate change through deforestation, ecosystem destruction, peat drainage, soil organic carbon losses, and the wider effects of increased nitrate fertilization. Life-cycle greenhouse gas assessments, which only look at the microlevel, can[not] capture those wider impacts. Even at the micro-level, there is little scientific consensus, and there are large uncertainties. Agrofuel policies are being developed

without any proper risk analysis having been done. The impacts from the 'worst case scenarios' such as the complete destruction of South-east Asia's peatlands, or the irreversible die-back of the Amazon forest are of such magnitude that they clearly are not risks worth taking. Policies are being developed based on micro-studies, and ignore important secondary impacts which have far-reaching consequences. The wider impacts on loss of natural ecosystems and the global climate have been under-estimated or ignored. Assessment of the evidence demonstrates that when macro secondary impacts are considered, the net impact of increased global agrofuels production is likely to be a reduction of natural carbon sinks and an overall increase in greenhouse gas emissions. Finally, there is strong evidence that the amount of agroenergy which would be required to replace a significant proportion of fossil fuels would greatly increase human pressures on an already vulnerable biosphere, thus further threatening widespread ecological and climate collapse.

Thank you kindly for your consideration, and we hope that you take the full 6 pg report attached into account, and all of the land use issues raised in it, as you assign pathway, default and other values.

Sincerely,
Naomi Kim

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California Environmental Rights Alliance (CERA)
Ph: (510) 832-3025
C: (541) 513-0540
naomik@envirorights.org