

Timing is everything for renewable energy use

November 12 2015, by Nancy Bazilchuk



Bioenergy offers one way to cut carbon emissions. Credit: Thinkstock

As the world prepares for the UN climate talks in Paris later this month,

researchers warn that there's no time to waste in shifting to renewable energy sources if we are to avoid dangerous climate change. That's especially true when it comes to bioenergy, which causes a temporary increase in CO₂ levels that is later removed as replacement biostocks grow.

When it comes to limiting global temperature increases from greenhouse gas [emissions](#), timing is everything – even when it comes to "climate friendly" CO₂ emissions from bioenergy, research from the Norwegian University of Science and Technology (NTNU) has shown.

The carbon dioxide from bioenergy, or energy derived from biological materials such as forestry or agricultural waste, is taken up by the plants or other organisms that replace whatever was harvested to produce the bioenergy in the first place.

That's what makes bioenergy climate friendly—any CO₂ that is produced by burning the fuel is later removed from the atmosphere.

But there is an important time lag in CO₂ uptake that will be reflected in a temporary increase in global temperatures, says Francesco Cherubini, a researcher at the Norwegian University of Science and Technology's Industrial Ecology Programme. The lag is due to the fact that it takes time for new bioenergy stocks – trees or crops – to grow.

Fossil fuels cause nearly permanent temperature rise

This time lag is important as policymakers evaluate strategies to keep global temperature increases to 2 degrees C by 2100, he says. While CO₂ emissions from fossil fuels cause a nearly permanent temperature rise, CO₂ from renewable biomass perturbs the climate only in a reversible and temporary way.

"If we adopt bioenergy sooner, it will thus have less of an effect on temperature increases (by 2100)," he said. Cherubini described the timing of bioenergy emissions and associated [global temperature](#) increases in a paper in Nature Climate Change from late last year.

Emission cuts economically feasible

Cherubini presented his findings this July at the "Our Common Future under Climate Change," which with nearly 2000 participants from almost 100 countries, was the largest international science conference before the COP21 international [climate talks](#) in Paris that start at the end of this month.

The conference concluded with an "outcome statement" that "distills the scientific foundation for action," including a finding that mitigation to limit warming to less than 2 degrees C above preindustrial levels is economically feasible. But the statement also concludes that for this to happen, [greenhouse gas emissions](#) must be cut by 40-70 percent over current levels by 2050 at the latest.

The closing window of opportunity

At the same time, other research like Cherubini's reinforces the idea that adopting new approaches to limit emissions must happen sooner rather than later.

One 2013 study in Nature found that the timing of international action to limit emissions has by far the largest impact in determining whether or not the world can cap global warming at no more than 2 degrees C. The Nature study also showed that delaying emissions limits from 2020 to 2025 would make it far less likely that warming can be restricted to 2 degrees.

"Emissions should peak around 2020 to increase our chances of staying within the 2 degree target," Cherubini said. "But this does not look like it is going to happen. Now we are on the 'business as usual' trajectory, which is a warming of 5 degrees C by 2100."

More information: Francesco Cherubini et al. Linearity between temperature peak and bioenergy CO2 emission rates, *Nature Climate Change* (2014). [DOI: 10.1038/nclimate2399](https://doi.org/10.1038/nclimate2399)

Provided by Norwegian University of Science and Technology

Citation: Timing is everything for renewable energy use (2015, November 12) retrieved 3 May 2024 from <https://phys.org/news/2015-11-renewable-energy.html>

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