



Large bioenergy plantations, such as these cottonwoods in France, can displace natural habitat and food crops. MICHEL BUREAU/MINDEN PICTURES

Bioenergy plantations could fight climate change—but threaten food crops, U.N. panel warns

By Erik Stokstad Aug. 8, 2019, 4:00 AM

In the effort to keep the planet from reaching dangerous temperatures, a hybrid approach called BECCS (bioenergy with carbon capture and storage) has a seductive appeal. Crops suck carbon dioxide (CO₂) from the atmosphere, power plants burn the biomass to generate electricity, and the emissions are captured in a smokestack and pumped underground for long-term storage. Energy is generated even as CO₂ is removed: an irresistible win-win. But this week, **the United Nations's climate panel sounded a warning about creating vast bioenergy plantations**, which could jeopardize food production, water supplies, and land rights for poor farmers.

"Our report is kind of a reality check," says Lennart Olsson of the Center for Sustainability Studies at Lund University in Sweden, a lead author of a special report published by the Intergovernmental Panel on Climate Change (IPCC) in Geneva, Switzerland. Instead of betting big on bioenergy, governments need to focus on the hard medicine of cutting fossil fuel use, he says. "There is no shortcut to climate change mitigation."

The IPCC report surveys the interactions of climate, forests, and farmlands, exploring, for example, the impact of more frequent droughts on agriculture. It confirms that stopping deforestation and preserving the carbon stored in soil are key steps to fighting climate change. But because those measures alone won't be enough to pull the planet's climate back into the safety zone, it also examines **the feasibility of BECCS, a "negative emissions" strategy** that so far has only been tested at a few power plants.

In an earlier special report in October 2018, **IPCC called for holding the rise in global average temperatures** to no more than 1.5°C above preindustrial conditions to avoid the worst consequences of climate change. It emphasized that cutting emissions won't be enough to reach that goal. Replacing coal with renewable energy, and significantly cutting oil and natural gas, would still leave gigatons of excess carbon in the atmosphere. BECCS could remove it, computer models suggested, if several million square kilometers—an area the size of India—were devoted to energy crops.

The new report examines the consequences of deploying BECCS on that vast scale and concludes it could "greatly increase" the demand for agricultural land. The pressure on conventional crops could compromise food security, as happened in 2007 when rising **U.S. corn ethanol production contributed to a spike in food prices**. (In Mexico, the price of tortillas, a staple for the poor, rose 69% between 2005 and 2011.) The bioenergy plantations could also take a toll on biodiversity—as is happening in Southeast Asia, where plantations producing palm oil for biodiesel as well as food are displacing diverse tropical forest. And they could suck up scarce water, especially in drylands, where irrigation of crops might deplete local supplies, the IPCC report says.

Olsson points out that industrial bioenergy crops can lead to the same kinds of problems as intensive food production, such as the contamination of water from excess fertilizer. Scaling up bioenergy in developing countries can also exacerbate social problems like the loss of land by small farmers, says María José Sanz Sánchez, an ecophysicist and the scientific director at the Basque Center for Climate Change in Leioa, Spain, and a reviewer of the report. She adds that large-scale BECCS might not work as well as expected: Plantations could get destroyed by pests or turn out to sequester less carbon than expected. "If this fails, we are in a deep problem," she says.

Some types of bioenergy are better than others, notes biogeochemist William Schlesinger, former director of the Cary Institute of Ecosystem Studies in Millbrook, New York, who was not involved in the report. Fast-growing grasses such as miscanthus and switchgrass, cultivated on marginal land, can be fermented into ethanol with minimal trade-offs, he says. But the growing practice of **turning trees into wood pellets for power plants** is counterproductive, he says: The trees grow back (and remove atmospheric CO₂) too slowly to avoid dangerous warming. Capturing and storing the CO₂ from the power plants, as envisioned in BECCS, would solve that problem, but "I don't know anyone who can do it economically," Schlesinger says.

Limiting the amount of land converted to bioenergy crops could lessen the unintended damage, but would also reduce any climate benefits. "There is a role for BECCS, surely, but not at the scale the models are showing," says Rob Bellamy, an environmental social scientist at the University of Manchester in the United Kingdom.

Christopher Field, a climate scientist at Stanford University in Palo Alto, California, says it might be a mistake to invest too much in BECCS before other negative emissions technologies have a chance to mature. These include **facilities that directly capture CO₂ from the air** at sites with smaller footprints. "It's important that we not succumb to the lure of something like BECCS, where the cure might be worse than the disease."