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EDITORS NOTE:
Holly Gibbs, a Stanford researcher in tropical land use science, will present a talk, "Mapping Land Sources for Expanding Biofuel Croplands Across the Tropics," in the session "Biofuels, Tropical Deforestation, and Climate Policy: Key Challenges and Opportunities" Saturday, Feb. 14, at 1:30 p.m. CT, in Grand Ballroom F of the Chicago Hyatt Regency Hotel. Before the symposium, Gibbs will participate in a news briefing at 12 p.m. CT, Saturday, Feb. 14.

WEB TEASER:
Farmers across the tropics might raze forests to plant biofuel crops, according to new research.

RELEVANT WEB URLS:
FOOD SECURITY AND THE ENVIRONMENT

http://fse.stanford.edu/

UN FAO GLOBAL FOREST RESOURCES ASSESSMENT HOME

http://www.fao.org/forestry

"TROPICAL DEFORESTATION AND GREENHOUSE GAS EMISSIONS"

http://www.iop.org/EJ/abstract/1748-9326/3/3/034001

EMBARGOED FOR RELEASE until Saturday, Feb. 14, at 1 p.m. ET (12 p.m. CT)

Biofuels boom could fuel rainforest destruction, Stanford researcher warns

By Chelsea Anne Young

Farmers across the tropics might raze forests to plant biofuel crops, according to new research by Holly Gibbs, a

postdoctoral researcher at Stanford's Woods Institute for the Environment.

"If we run our cars on biofuels produced in the tropics, chances will be good that we are effectively burning rainforests in our gas tanks," she warned.

Policies favoring biofuel crop production may inadvertently contribute to, not slow, the process of climate change, Gibbs said. Such an environmental disaster could be "just around the corner without more thoughtful energy policies that consider potential ripple effects on tropical forests," she added.

Gibbs' predictions are based on her new study, in which she analyzed detailed satellite images collected between 1980 and 2000. The study is the first to do such a detailed characterization of the pathways of agricultural expansion throughout the entire tropical region. Gibbs hopes that this new knowledge will contribute to making prudent decisions about future biofuel policies and subsidies.

Gibbs will present her findings in Chicago on Saturday, Feb. 14, during a symposium that begins at 1:30 p.m. CT at the annual meeting of the American Association for the Advancement of Science. The symposium is titled "Biofuels, Tropical Deforestation, and Climate Policy: Key Challenges and Opportunities." She will participate in a press conference at 12 p.m. CT on the same day.

With climates ideal for growing biofuel crops and an abundance of arable land, tropical countries such as Brazil, Indonesia and Malaysia have already responded to growing demand for food, feed and fuel from crops such sugarcane, soy and oil palm by increasing their production, Gibbs said.

For example, the area of cropland dedicated to soybean production in Brazil has increased at a rate of nearly 15 percent

per year since 1990, and Indonesia's oil palm production tripled during the 1990's and then doubled again from 2000 to 2007, said Gibbs.

These increases are due in part to soaring global demand for food and feed. However, scientists have reason to suspect that biofuels also are playing a significant role in recent cropland expansion. "Biofuels have caused alarm because of how quickly production has been growing: Global ethanol production increased by four times and biodiesel by 10 times between 2000 and 2007," Gibbs said. "Moreover, agricultural subsidies in Indonesia and in the United States are providing added incentives to increase production of these crops."

"The crops that are most prized as current-generation biofuels, such as oil palm and sugarcane, also are those crops most suited to tropical countries," she added.

Land expansion controversy

Before Gibbs' study, few had focused on the question of the origin of new croplands—a question that has been a source of heated debate among scientists and policymakers alike over the past few years.

"Biofuel producers typically indicate that they are establishing new soy fields or oil palm plantations on degraded or already cleared lands," Gibbs said, "while environmental groups and some scientists point to Amazonian rainforests or Southeast Asian peat swamps as the land sources."

Gibbs was one of the first to approach the question by quantifying the types of land—pristine forest, disturbed forest, woody savannas, grasslands, plantations or agricultural land—that are being cleared to make space for the new cropland.

"If biofuels are grown in place of forests, we're actually going to end up emitting a huge amount of carbon. When trees are cut down to make room for new farmland, they are usually burned, sending their stored carbon to the atmosphere as carbon dioxide. That creates what's called a carbon debt," Gibbs said. "This is because the carbon lost from deforestation is much greater than the carbon saved from using the current-generation biofuels."

Indeed, tropical forests are the world's most efficient storehouses for carbon, harboring more than 340 billion tons, according to Gibbs' research. This is equivalent to more than 40 years worth of global carbon dioxide emissions from burning fossil fuels.

Gibbs' previous findings asserted that the carbon debt incurred from cutting down a tropical forest could take several centuries or even millennia to repay through carbon savings produced from the resultant biofuels.

On the other hand, planting biofuel croplands on degraded land—land that has been previously cultivated but is now providing very low productivity due to salinity, soil erosion, nutrient leaching, etc.—could have an overall positive environmental impact, Gibbs said.

"In a sense that would be restoring the land to a higher potential to provide environmental services for people," she added.

Both Brazil and Indonesia contain significant areas of degraded land—in Brazil, the total area may be as large as California—that could be replanted with crops, thereby decreasing the burden on forested land. "But this is challenging without new policies or economic incentives to encourage establishing crops on these lands," Gibbs said.

This is because farmers who convert degraded land to cropland must shoulder the costs of fertilizer and learn improved soil management practices to make the lands productive, whereas farmers who clear forested land often avoid these burdens.

"Government subsidies, environmental certification schemes or carbon markets could provide incentives to grow crops on degraded rather than forest lands," Gibbs said.

However, in some cases, allowing the degraded land to be returned to its natural, forested state might be the wisest use of the land, absorbing more carbon and providing ecological services such as flood mitigation, rainwater recycling and habitat for endangered species, Gibbs said.

"There are tradeoffs in all these decisions that need to be made on a case-by-case basis," she said. "We need to keep in mind that more cropland will be needed to meet the global demands for food, feed and fuel, so the best options will likely vary by circumstance."

Analyzing changing lands

The United Nations Food and Agricultural Organization (FAO) maintains a database of detailed satellite images taken over the last 20 years through the Global Forest Resources Assessment, an initiative that dates back to 1946. The FAO releases a new global assessment every 10 years.

Working closely with the FAO, Gibbs analyzed satellite data for more than 100 randomly selected sites across the tropics. By comparing satellite images taken of each specific site in 1980, 1990 and 2000, Gibbs was able to clearly see whether croplands were expanding, and if so, what they were replacing.

She examined more than 600 satellite images from the FAO and other organizations, and noticed a clear trend: "What we found was

that indeed forests were the primary source for new croplands as they expanded across the tropics during the 1980s and 1990s. So cropland expansion, whether it's for fuel, feed or food, has undoubtedly led to more deforestation, and evidence is mounting that this trend will continue."

For example, Gibbs' data show that between 1980 and 2000, more than half of new cropland came from intact rainforests and another 30 percent from disturbed forests, "This is contrary to what some biofuel proponents have suggested is occurring today," she said.

"This is a major concern for the global environment," Gibbs said. "As we look toward biofuels to help reduce climate change we must consider the rainforests and savannas that may lie in the pathway of expanding biofuel cropland."

The FAO is in the process of collecting and interpreting the data for the current decade. "This will be important to provide more recent information about expansion of croplands occurring in the midst of the biofuels boom," Gibbs said.

Although Gibbs recognizes that biofuels have certain drawbacks, including those documented in her study, she is not opposed to their regulated use. "I think that biofuels may have a critical place in our future energy plan," she said. "But the way that we're currently going about producing biofuels could have a lot of unintended consequences."

"The new administration should carefully consider the full consequences of any energy plan to make sure we protect the carbon stored in rainforests as well as reduce our fossil fuel emissions," she said.

Gibbs is funded by the David H. Smith Conservation Research Fellowship, which specializes in the intersection of environmental science and policy. She conducted the bulk of the research she

will be presenting while a graduate student at the University of Wisconsin-Madison, in collaboration with Jonathan Foley, who is now director of the University of Minnesota Institute on the Environment. Currently, Gibbs works with Rosamond Naylor, an associate professor of economics and director of the Food Security and Environment Program at Stanford. Other collaborators included Aaron Ruesch at the University of Washington and Navin Ramankutty at McGill University.

Chelsea Anne Young is a science-writing intern at the Stanford News Service.

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