Export of wood pellets from US to EU more environmentally friendly than coal

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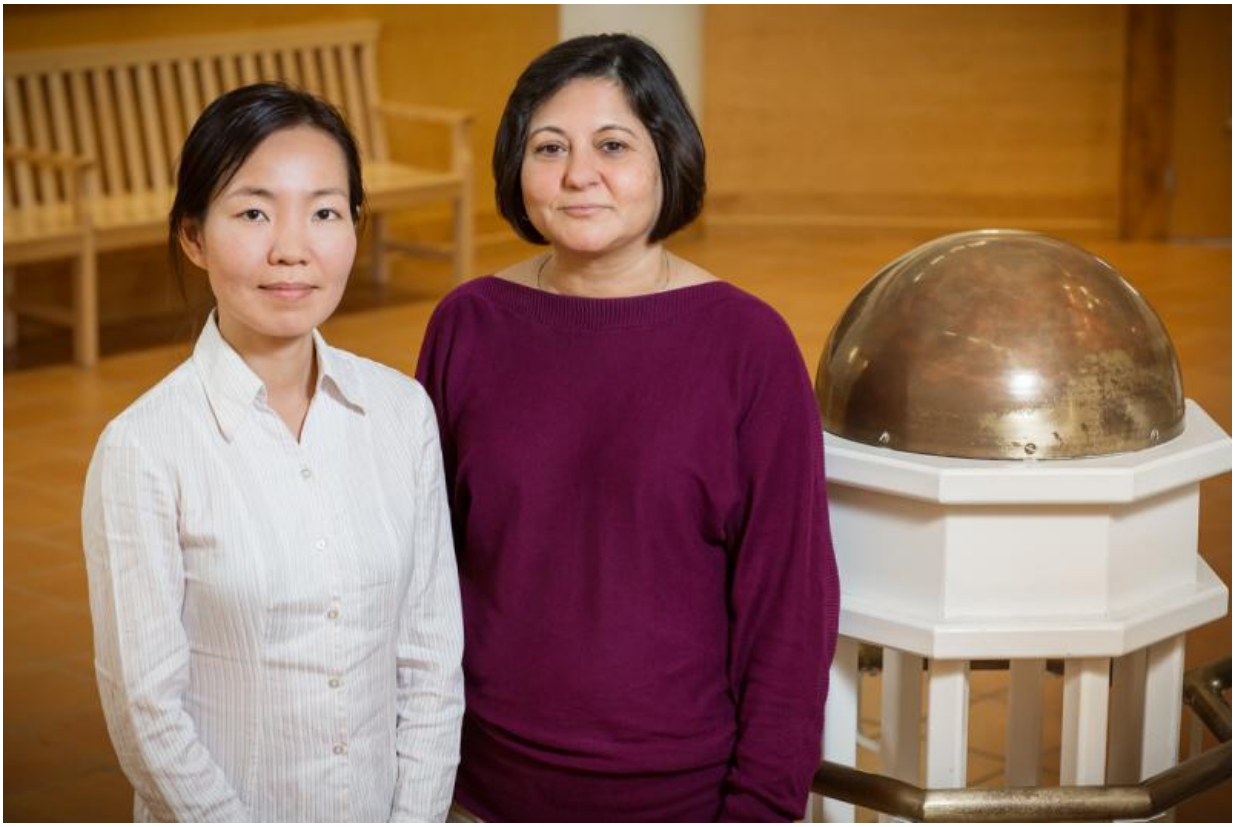

A new study co-written by Madhu Khanna, right, a professor of agricultural and consumer economics at Illinois, and Weiwei Wang, a postdoctoral research associate at Illinois, found that harvesting wood pellets in the US and exporting them to the EU was more environmentally friendly than burning coal in the EU to generate electricity. Credit: L. Brian Stauffer

As the export of wood pellets from the U.S. to the European Union has increased six-fold since 2008, questions have been raised about the environmental impact of the practice. According to a new paper from a University of Illinois expert in environmental economics, even after accounting for factors ranging from harvesting to transportation across the Atlantic Ocean, wood pellets still trump coal by a wide margin in carbon emissions savings.

The greenhouse gas intensity of wood pellet-based electricity is between 74 to 85 percent lower than that of coal-based electricity, says published research co-written by Madhu Khanna, a professor of agricultural and consumer economics at Illinois.

"One of the concerns with wood pellet production has been that it's going to lead to an increase in the harvesting of trees in the southern part of the U.S., and that the emissions that go into both the production of these pellets and their transportation to Europe will result in a product that is not going to save a lot of greenhouse gas emissions when it displaces coal-based electricity in Europe," Khanna said.

But Khanna and her co-authors, including Weiwei Wang, a postdoctoral research associate at Illinois, found that across different scenarios of high and low demand for pellets, the greenhouse gas intensity of pellet-based electricity generated from forest biomass such as pulpwood and milling residues is still significantly less than that of coal-based electricity.

"Even if you include all of these emissions that go into the process of producing and transporting pellets, and if you include for all the land-use changes that occur and the fact that you'll be diverting some amount of pulpwood and other forest biomass from conventional forest products to pellets, you can still get emissions reductions that range from 74 to 85 percent compared with coal-based electricity," Khanna said.

"Basically, wood pellets look really good next to coal, even when you account for everything else."

The researchers also found that the greenhouse gas intensity of pellets produced using a combination of forest and agricultural biomass is 28 to 34 percent lower compared with pellets produced using only forest biomass.

"You can produce wood pellets not just from forest biomass, which is how it's currently done, but you can also use agricultural biomass crops like miscanthus and switchgrass, which increases the savings dramatically," Khanna said. "And that's because agricultural biomass is able to sequester a lot of carbon in the soil while it's growing. Compared with forests, they sequester much more carbon. And as a result, the greenhouse gas intensity produced by the pellets made with agricultural biomass is much less. So the benefits from pellets increase if you're able to source it from agricultural biomass rather than just from forests."

But diverting forest biomass to pellets from traditional forest products—everything from printer paper to coffee cups—will lead to some combination of land-use changes that include increased harvests of existing trees, changes in forest management practices and even 'afforestation'—planting trees where previously there were none—to meet anticipated demand for pellets in the future, Khanna said.

"This can lead to a loss of the carbon that is being stored in trees and soil in the near term but a buildup of forest carbon stocks in the next few decades, particularly in the southern U.S., where much of the pellet production is occurring," she said.

According to Khanna, if forest owners know that there will be robust demand for wood pellets over the next 25 years, they might not convert land to other uses. Or they'll maintain their land as forestry and possibly

even convert some of their marginal land to trees or bioenergy crops, she said.

"All of that land starts sequestering carbon, which lowers the greenhouse gas intensity of wood pellets even more," Khanna said. "So that's actually a positive land-use change in the sense that it lowers greenhouse gas intensity as opposed to deforestation, which releases carbon."

The extent of the positive effects depends on how far in advance forest owners start planning.

"If they're considering a 50-year time horizon and they start doing things now, that increases the benefits of pellet production," Khanna said. "Depending on whether you assume a 15- or 50-year planning horizon, that can influence the greenhouse gas intensity you get. If it's 15, the greenhouse gas intensity is much higher than the 50-year horizon. But even then, there is a significant amount of savings compared with coal."

The study also found that 15 percent of forest biomass would be met through diverting pulpwood and mill residues from existing sources to pellets. The balance would be met through harvesting additional pulpwood and producing more mill residues—but the diversion of that 15 percent would result in a 2 percent reduction in the production of traditional forest products.

"In an indirect effect, the price of those forest products—printer paper, cardboard boxes, etc.—would jump, but only by about 3 percentage points," Khanna said.

But since more trees would need to be cut down in the future, "More trees would also have to be planted now," Khanna said.

"When you do the net calculation, a lot of the indirect effects wash out

and the net savings in carbon emissions by using pellets imported from the U.S., instead of coal for electricity, are substantial."

The paper, titled 'Carbon Savings with Transatlantic Trade in Pellets: Accounting for Market-Driven Effects,' will be published in the journal *Environmental Research Letters*.

Provided by University of Illinois at Urbana-Champaign