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Bamboo's Ability to Store Carbon Called Into Question

A small study of plants wrapped in plastic hints that bamboo may be less green than thought, although other experts remain skeptical.



Workers haul harvested bamboo out of the forest of Anji, China.

PHOTOGRAPH BY FRITZ HOFFMAN, NATIONAL GEOGRAPHIC

By **Brian Clark Howard**

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For years people have promoted bamboo as an eco-friendly material for everything from countertops to chopsticks. The fast-growing plant has been thought to store up carbon from the atmosphere as it grows, trapping the greenhouse gas.

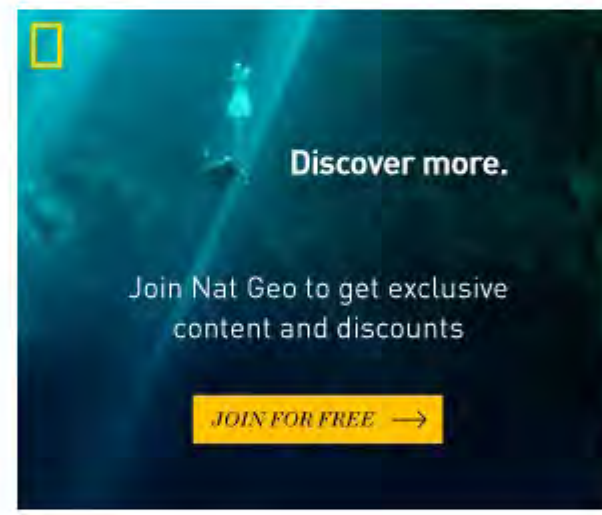
But scientists had never actually measured bamboo's storage ability. Now a study casts doubt on that process and even suggests that bamboo may be a carbon emitter. The researchers are quick to point out that their work was limited to only two plants grown over a short period of time, and that much more investigation is needed before bamboo's green cred can be rejected or reaffirmed.

Bamboo is a fast-growing business, worth \$27 billion in China alone, a figure that could rise to \$48 billion by 2020. To better understand how the recent shift to cultivating and using more bamboo affects carbon dioxide levels in the atmosphere, scientists in India wrapped two bamboo plants tightly in plastic. One was six months old and the other was a year old. Next, they measured the gas exchange across the plants' tissues for 24 hours.

Conventional wisdom suggests that the scientists would see carbon dioxide going into the plant and oxygen leaving, thanks to the equation of photosynthesis. But what they found surprised them, says study leader E.J. Zachariah, a researcher at the National Centre for Earth Science Studies in Thiruvananthapuram.

The plants actually appeared to release large amounts of carbon dioxide into the air, the team reported in February in the journal *Plant Biology*. These releases were higher when outside temperatures were warmer and in the younger plant. The gas may have come from incomplete photosynthesis as the plants grew quickly, through other processes inside the plants, or from the plants' ability to draw the gas up out of the soil, says Zachariah, who notes more research is needed. From the day-long study period, the scientists extrapolated across the whole eight-year lifespan of the bamboo, estimating that the plants are net emitters of carbon dioxide during that time, not net sinks, as has been commonly assumed.

"Our work suggests bamboo behaves more like rice when it comes to carbon dioxide than woody plants," Zachariah says, referring to the fact that rice is thought to release carbon during its lifetime while trees tend to store it up.



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Still, Zachariah cautions that the measurements were made on only one of 1,500 species of bamboo (*Bambusa vulgaris*), under a limited range of environmental conditions, and only for a short time.

"We have not yet done a study over the whole lifecycle of the plant," says Zachariah. "So it is too early to say how bad bamboo is for carbon overall. But we have found an interesting new observation, and we hope more research will take place."

Troubling Conclusion

When asked to review the new research, three plant scientists who study bamboo at

other institutions and who are linked through the International Network for Bamboo and Rattan call the work interesting but say the final conclusion is questionable.

Zachariah's research methods were problematic, according to Guomo Zhou and Xinzhang Song from China's Zhejiang A & F University and Changhui Peng from the University of Quebec. Two plants make up too small of a sample size for any reasonable conclusions, they say. Twenty-four hours also isn't long enough, and extrapolating over eight years introduces too much uncertainty.

"Carbon emissions should be greatly variable with different growing season and bamboo age," the scientists write in an email.

To really assess the net impact of a bamboo forest on the carbon dioxide levels in the atmosphere, more variables would have to be measured, such as emissions from soil microbes. To conclude from this limited study that bamboos may be net carbon emitters is "misleading and unacceptable," the scientists write.

Not the Only Knock Against Bamboo

Materials scientist [Andrew Dent](#) agrees that more studies are needed before making any generalizations about bamboo and carbon. Still, he adds that if additional research were to find more negative effects, "it could be a problem for the marketing of bamboo for sustainability."

The green credibility of the material has also occasionally been questioned for other reasons, says Dent, who serves as vice president of [Material ConneXion](#), an institute and library for study of eco-friendly materials with locations in several countries.

Some natural forests in Asia have been cleared as farmers have switched to profitable bamboo plantations. And fabric made from bamboo is typically processed with harsh industrial chemicals, raising concerns about pollution. Designers should also consider the environmental impacts of shipping bamboo from around the world when they might be able to use a renewable material that is available locally.

There are many considerations behind each choice of material, says Dent, and one product isn't always best for every application.

"The idea that any material is going to be a silver bullet for sustainability is a challenge," says Dent. "People thought bamboo was an amazing material, but we need to choose carefully and assess the best information that is available."

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