

## Research Finds Link between Increased Crops and Deforestation in Amazon, but Issue Not So Cut and Dry

A team of Geographers from Kansas State University, University of Texas, Austin and Michigan State University proved what environmental scientists have suspected for years: Increasing the production of soybean and biofuel crops in Brazil increases deforestation in the Amazon.

Although this cause-and-effect finding seems fairly straightforward, the issue of deforestation in the Amazon is more complex and more devastating than previously believed, the geographers' study found.

Marcelus Caldas, an assistant professor of geography at K-State, and colleagues Eugenio Arima from the University of Texas at Austin, and Peter Richards and Robert Walker from Michigan State University, published their findings in a recent issue of the environmental science journal, *Environmental Research Letters*. Their study, "Statistical confirmation of indirect land use change in the Brazilian Amazon," looks at how mechanized agriculture in Brazil affects the country's forest in the Amazon, which is the second largest forest in the world. Arima and Richards are lead authors.

Using data from 2003-2008, the team statistically linked the loss of forest area as the indirect effect of changing pastureland into space for soybean and biofuel crops in counties bordering the Amazon. Caldas, who grew up in Brazil, said this finding wasn't too surprising as most Brazilians are aware of the issue. What is shocking, however, is how much of an effect this is having on forests, he said.

"Between 2003-2008 soy production expanded in Brazil by 39,000 square kilometers," Caldas said. "Of this 39,000 square kilometers, our study shows that reducing soybean production by 10 percent in these pasture areas could decrease deforestation in heavily forested counties of the Brazilian Amazon by almost 26,000 square kilometers -- or 40 percent."

Caldas said he and his colleagues hope this link between crops and deforestation will motivate Brazil's environmental policymakers to develop more dynamic agricultural regulations to slow deforestation.

Although the numbers and data back this connection, the notion that deforestation will cease completely is unlikely because of other complexities like money and livestock. Demand for Brazil's crops is high and there's a desire to produce more for buyers.

"In the international market, China is buying a lot of soybeans from Brazil," Caldas said.

The Brazilian government says soybean and sugarcane are grown largely in degraded pasture, but data from the team's work with geographic information systems, or GIS, shows that many of these crops have crept into the Brazilian savanna, a large area bordering the Amazon that's used for cattle. Consequently, this has created deforestation in the savanna, driving cattle inside the Amazon.

"Our data shows that the Amazon now has 79 million heads of cattle," Caldas said. "Fifteen years ago, it had less than 10 million. That means that there's a problem with cattle moving inside the forest."

A problem is brewing in the near future, too. As the world's population grows and buyers look for countries where food is produced less expensively, more grain crops are expected to transition to Brazil because it is a breadbasket, according to the team's research.

"Because of that, Brazil is going to say they can increase crops here because there's going to be a demand for food," Caldas said. "So if they start to increase food production, it's all going to directly affect deforestation in the Amazon."

Funding for the team's work has come from the National Science Foundation and NASA projects at Michigan State University and the University of Texas at Austin. The research team has spent more than 15 years studying Brazil's countryside.