Farming and biodiversity can coexist, say Stanford researchers

June 27 2012, By Max McClure

The Yellow-billed Cacique will likely persist and thrive in low-intensity agriculture. Credit: Daniel Karp

(Phys.org) -- Although bird species disappear with intensive agriculture, research in Costa Rica shows that forest intermingled with cultivated land rescues biodiversity.

To keep up with projected demand, farming output will need to double in the next few decades. This inconvenient fact is bad news for the environment as a whole, and biodiversity in particular. Large-scale, high-

intensity agricultural production, scientists say, dramatically reduces variation between bird communities of different areas.

But Stanford scientists say there may be a way to increase agricultural land without substantially impacting biodiversity.

A new paper by biology graduate student Daniel Karp, with Stanford biology professors and Stanford Woods Institute for the Environment fellows Gretchen Daily and Paul Ehrlich, shows that low-intensity tropical agriculture can maintain regional species differences at levels similar to those of intact forest. The study appears in today's issue of the journal Ecology Letters.

"It's one way of addressing a basic question," said Karp. "How can we feed people while preserving biodiversity?"

Animal farm

Karp was interested in "beta-diversity" – not the sheer number of species present in a region, but the differences between the sets of species that live in two different regions.

"The tropics have many more species total, which people know," said Karp. "But they also have a lot more beta-diversity," making Costa Rica an ideal place to study the ecological effects of agriculture.

The researchers found that "specialist" species that are adapted to particular food sources and environmental conditions disappear as land is converted to intensive agriculture. The process leaves the same population of "generalist" species in most converted lands, decreasing beta-diversity between formerly distinct regions.

"To a bird, high-intensity production is basically going to look the same

no matter where it is," said Karp. "A melon plantation in the north of Costa Rica is going to look the same as a pineapple plantation in the south."

But agriculture on a small scale, or agriculture that leaves trees or other native species intermingled with crops, retains forest-like levels of beta-diversity.

The paper's data came from 10 years' worth of bird species monitoring from ornithologist Jim Zook, working with Daily and Stanford's Center for Conservation Biology. His unique transects through different plots of Costa Rican land – some forested, some under heavy agricultural use and some in between – and years of patient monitoring have provided insight into the impacts of alternative agricultural strategies.

Services rendered

In a previous paper from the team, Zook's data showed that careful stewardship may allow agriculture and biodiversity to coexist and suggested that preservation may not need to be an all-or-nothing proposition.

Farms, for instance, rely on birds for pollination, fruit dispersal and pest control. More generally, the presence of intact, biodiverse lands near a farm guarantees society certain natural benefits, including water purification and nutrient cycling.

"If these birds are locked up in a preserve far from humans, you're not going to get any of those services as a farmer," Karp said.

Costa Rica is already one of the first nations to adopt a "payments for ecosystem services," or PES, scheme. Acknowledging the value of keeping undeveloped land near agricultural areas, the policy

compensates farmers for leaving part of their lands out of production. The new biodiversity finding offers further support for the practice, as Daily has addressed previously.

"Reducing pressure from population growth and consumption are crucial for achieving sustainability," Karp said. "But we also need to start thinking about making smarter societies – in which we can grow food and preserve ecosystem services and species at the same time."

Provided by Stanford University

Citation: Farming and biodiversity can coexist, say Stanford researchers (2012, June 27) retrieved 25 April 2024 from https://phys.org/news/2012-06-farming-biodiversity-coexist-stanford.html