

Global economic pressures trickle down to local landscape change, altering disease risk

September 20 2012

The pressures of global trade may heighten disease incidence by dictating changes in land use. A boom in disease-carrying ticks and chiggers has followed the abandonment of rice cultivation in Taiwanese paddies, say ecologist Chi-Chien Kuo and colleagues, demonstrating the potential for global commodities pricing to drive the spread of infections. Their work appears in the September issue of ESA's journal *Ecological Applications*.

After Taiwan joined the [World Trade Organization](#) in 2001, active cultivation of [rice paddies](#) fell from 80 percent to 55 percent in just three years. The government of Taiwan subsidized twice-yearly plowing of abandoned fields to reduce the spread of [agricultural pests](#) into adjacent fields still in cultivation. Compliance has been spotty. Kuo found that, while plowing did not suppress rodent populations, it did inadvertently reduce the presence of the ticks and chiggers that use rodents as their primary hosts.

"The government considers only agricultural pests such as insects and rodents. They don't think about the disease factors," said Kuo. But land use policy can have complex and unexpected reverberations in the ecology of the landscape.

Chiggers, the larval stage of trombiculid mites, spread scrub typhus (*Orientia tsutsugamushi*), a [bacterium](#) that gets its name from the scrubby, dense vegetation that often harbors its flesh-loving host. Scrub typhus is a common culprit underlying visits to Southeast Asian hospitals

for [flu-like symptoms](#). Without antibiotics, the infection is often fatal. Ticks (Ixodidae) transmit bacteria spotted fever group rickettsiae, causing fever, aches and rash similar to Rocky Mountain spotted fever. Neither pest prefers to live underwater.

Hualien, Kuo's study area, is one of the least populous of Taiwan's counties, yet had nearly the highest incidence of scrub typhus from 1998-2007. The county is a smattering of small villages surrounded by a patchwork of flooded, plowed, and abandoned rice paddies. Flooded paddies are poor habitat for ticks and chiggers, and so cultivation of rice, which locally means carefully managed flooding of fields to drown agricultural pests, likely suppresses ticks and chiggers as well. Even the seemingly unkillable ticks die after a few weeks of submersion, and chiggers are similarly terrestrial. Though studies are few, limited data indicate that most chiggers die after a month under water.

This study did not assess flooded paddies due to the difficulty of finding and collecting rodents, ticks, and chiggers underwater. Instead, Kuo trapped rodents in fallow and plowed fields and examined their tick and chigger passengers, testing the arachnids for presence of disease-causing rickettsial bacteria. He found 6 times as many ticks on the rodents living in fallow fields – and the proportion of infectious ticks in fallow fields was three times higher, compounding the risk. Chiggers rode rodents at a rate 3 times higher in fallow fields than plowed fields.

"This study is a great example of the kinds of indirect effects that trickle down from human policies," said Bob Parmenter, an ecologist unaffiliated with the study. "It tells a nice story about how changes in international trade barriers can have unforeseen consequences."

Parmenter is director of the USDA's Scientific Services Division at Valles Caldera National Preserve near Los Alamos, New Mexico, and an expert on the influence of ecology on deadly Hantavirus outbreaks, like the current episode in Yosemite National Park (California, USA) that

has infected nine visitors and killed three.

The consequences of economic pressures on land use are also present in the eastern United States, where the small farms of the eighteenth and nineteenth centuries have reverted, to a large degree, to forest. With the return of deer and wildlands has come a rise in [ticks](#), and concurrent rise in Lyme disease. Conversely, opening new land to farming or housing can bring its own disease risks.

Many studies have investigated influence of global forces on disease, said Kuo. "Most are focused on how climate change, global travel, or habitat destruction will affect the emergence of vector-borne and zoonotic disease. We show that economic organizations can actually affect human health, by influencing the landscape."

More information: Cascading effect of economic globalization on human risks to scrub typhus and tick-borne rickettsial diseases.

Ecological Applications, volume 22 issue 6.

www.esajournals.org/doi/abs/10.1890/12-0031.1

Provided by Ecological Society of America

Citation: Global economic pressures trickle down to local landscape change, altering disease risk (2012, September 20) retrieved 26 April 2024 from <https://phys.org/news/2012-09-global-economic-pressures-trickle-local.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.