propellers absorbed photons of slightly different energies, suggesting that the weak nuclear force in their cores had altered the iron's energy levels.

Compton says his team's experimental results are in line with theory. According to calculations, "the presence of the chiral electroweak force produces a shift in the energy levels of chiral molecules very close to this number that we're getting," he says. Still, he adds, the work is preliminary, and his team has yet to do essential experiments to rule out possible artifacts.

Could such an energy difference have an impact on the origin of biomolecules? Possibly, says Compton. Other calculations show that the same effect would give left-handed amino acids a slightly lower overall energy than their right-handed brethren, which would favor their chemical production. But because the difference is so small, and thus the preference for the left-handed amino acids so weak, Compton believes that at this stage it's more likely that the spinning electrons given off by radioactive decay are responsible for biology's choice of handedness. If so, researchers may have finally found the source of nature's chiral bias: not light from the depths of space, but subtle forces in the very heart of matter. **–ROBERT F. SERVICE**

ECONOMIC DEVELOPMENT

A Shifting Equation Links Modern Farming and Forests

New studies of deforestation around the world suggest that high-tech agriculture can be either culprit or savior

New research is raising questions about sustainable growth, a notion dear to both environmentalists and development specialists. Both camps have embraced the assumption that improving agricultural practices in the developing world should relieve pressure to cut down nearby forests. But when looking at more than two dozen cases of deforestation, economists David Kaimowitz and Arild Angelsen of the Center for International Forestry Research (CIFOR) in Bogor, Indonesia, noticed that the real-world equation was a bit more muddled: In Brazil, for example, a new strain of soybeans planted by farmers wound up accelerating the destruction of the tropical forest, while in the Philippines an irrigation project protected a tropical forest elsewhere on the same island.

In a book about their findings, due out next year, the duo also looks beyond these case studies to determine why agricultural development can have such differing impacts. Among the key factors they identify are how the new technologies affect the labor market and migration, whether the crops are sold locally or globally, and how profitable farming is at the boundary between cultivated land and forest. Senior environmental adviser John Spears of the World Bank calls the work "extraordinarily valuable" and says the bank is developing forest protection policies that take it into account.

Before the mid-1980s, says economist Robert Faris of the Harvard Institute for International Development, conservationists tended to be antigrowth. More recent thinking, crystallized in a 1992 world development report from the World Bank, suggested that economic development and environmental conservation could be complementary: As farmers earned more from their existing plots—thanks to better irrigation, new crops, an investment in tools, and easier access to markets—they would be less motivated to clear marginal land.

But when Kaimowitz and Angelsen examined studies presented at a CIFOR-sponsored conference last March in Costa Rica, they found that growth and conservation are only sometimes compatible. "If you think from the outset that the objectives [of development and conservation] are complementary, then you'll likely get it wrong," says Angelsen.

One important variable is how much labor an agricultural system requires, says Angelsen, now at the Agriculture University of Norway in Aas. Brazilian soybean cultivation is highly mechanized, says Kaimowitz, and large plantations of a new strain that thrives in the tropics displaced small southern Brazilian farmers who had cultivated grains, vegetables, and coffee. These farmers were forced to the agricultural frontier, where they cleared forest to eke out a living.

In contrast, projects that create employment can relieve deforestation pressure, as a project on the Philippine island of Palawan shows, says economist Gerald Shively of Purdue University in West Lafayette, Indiana. An irrigation project there, he found, drew wage laborers to newly created rice fields in the lowlands and reduced pressure to cultivate forested areas. "You've got to create opportunities elsewhere to pull people away from the forest," says Shively. Or even from farming itself: "As bad as it sounds," says Faris, "sweatshops are friends of the forest" by concentrating laborers in already developed areas. "The question is," he says, "what [forest] do you have left when you get to that point?"

Development theorists have also assumed that easier access to markets would make farmers' crops more profitable and thus allow them to farm less land and spare the forest, according to Kaimowitz. "But if you can produce twice as much, it makes just as much sense to produce more on more land," he says. As an example, he points to Nicaragua, where cattle grazing is very land intensive but profitable. Building roads to remote regions allows farmers to sell their cattle easily, with profits going to clearing more land to graze more cattle. New roads into the Amazon Basin and improved ports along the river will likewise spread soybean farming into areas that once were jungle, he predicts.

In place of the simple assumption that has guided many development projects in the past—that poverty is the cause of deforestation—Angelsen says that big plantation projects are more likely to contribute directly to deforestation than are small farmers. The challenges, he says, are to foresee how specific development strategies will impact a region's environment—displacing workers or making forest-clearing profitable, for example—and to identify projects that achieve both economic and ecological objectives.

Burning issue. This Indonesian forest has been slashed and burned to make way for an expanding oil palm plantation.

CREDIT: CARMEN GARCIA

Ultimately, says Kaimowitz, high-tech farming in the tropics should reduce the overall amount of land dedicated to agriculture, as it already has in the United States and Europe. "But that may or may not be relevant for saving the forest [today]." **–LAURA HELMUTH**