

Empowerment of women worldwide key to achieving competing goals of food sufficiency and biodiversity protection

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Eileen Crist, associate professor at Virginia Tech's College of Liberal Arts and Human Sciences and the lead author of the review paper. Credit: Virginia Tech

Is feeding the world's human population compatible with protecting the biological diversity of the planet?

In an article published in this week's *Science*, an interdisciplinary team of experts argue that both of those goals can be achieved by increasing women's access to education, reproductive health services, and contraceptive technologies.

In a special issue on Earth's ecosystem, the authors explore the interplay between the world's burgeoning [human population](#) and the dramatic loss of other species.

"It's the food. Follow the food and then you'll know why the planet's diversity of life is in trouble," said Eileen Crist, an associate professor of science and technology in society in Virginia Tech's College of Liberal Arts and Human Sciences and the lead author of the review paper.

"We're causing a mass extinction, and agriculture is arguably the primary driver of those losses."

Between 1970 and 2010, the world lost more than half its wild animals, according to a World Wildlife Fund report. Among the disappearances were an estimated 39 percent of terrestrial wildlife, 39 percent of marine wildlife, and 76 percent of freshwater wildlife.

These devastating losses, tied to efforts to feed an increasingly crowded world, are only expected to deepen. The United Nations estimates that the human [population](#), now at 7.5 billion, will reach more than 9 billion by mid-century and 11 billion by the end of the century. Those numbers, especially in concert with growing levels of affluence, will exert increasing pressure on Earth's remaining biodiversity.

"In order to feed everyone, we're going to have to double or even triple our agricultural yield by the end of the century," Crist said. "But we've already taken up the most lush, arable land for cultivation, and we've squeezed wild nature into increasingly narrow pockets around the world. How can we make more food without destroying more nature?"

In an effort to solve this issue, agricultural experts are pursuing "sustainable intensification," which aims to increase food production without additional biodiversity declines or more natural areas coming under cultivation. Yet Crist and her coauthors argue that while these critical measures are needed they are not likely, by themselves, to succeed.

"It's important to work on the supply side, but, in parallel, we need to work on lowering the demand side," Crist said. "Without concerted attention to stabilizing and gradually reducing the global population, nature will continue to take the fall."

The authors contend that achieving a sustainable world—one that provides an equitable, high quality of life for all people while safeguarding the planet's biodiversity—calls for bringing [population growth](#) to the forefront of international concerns. The authors believe policy discussions on population levels have been muted in the past few decades in part because of discomfort around global imbalances. High-income countries, which account for a disproportionate use of resources, are more likely to have stable or even declining populations, while low-income countries have growing populations.

Yet excessive consumption of resources is no longer the sole province of the developed world, the authors write. Instead, the global middle class of 3.2 billion in 2016 is expected to rise to roughly 5 billion by 2030. Forty percent of India's population is predicted to join the ranks of the middle class by midcentury, adding almost half a billion consumers to

the global economy—up from 50 million in 2006—from one nation alone.

"A key solution to unsustainable population growth is the empowerment of women," Crist said. "By enhancing their human rights, giving them and their partners access to reproductive health services and contraceptive technologies, and improving their educational attainment, we can help address this planetary crisis."

Education of girls and women has been shown to have a direct correlation in slowing childbearing rates.

"Wherever women are empowered educationally, culturally, economically, politically, and legally, fertility rates fall," the authors write. "Populations tend to move toward states of zero or negative growth when women achieve equal standing with men, as long as family planning services and contraceptives are readily available."

Crist's coauthors are Camilo Mora, an assistant professor and marine biodiversity specialist at the University of Hawaii at Manoa, and Robert Engelman, a senior fellow at the Worldwatch Institute, a globally focused environmental research organization based in Washington, D.C.

"The human population is not the only variable stressing Earth," the authors conclude. "But it is a powerful force that is also eminently amenable to change, if the international political will can be mustered."

More information: "The interaction of human population, food production, and biodiversity protection," *Science* (2017).
[science.sciencemag.org/cgi/doi ... 1126/science.aal2011](https://science.sciencemag.org/cgi/doi/10.1126/science.aal2011)

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